Faculty of Animal Science and Veterinary Medicine

Outcome Based Curriculum for Bachelor of Science in Veterinary Science and Animal Husbandry

Sher-e-Bangla Agricultural University

Dhaka-1207, Bangladesh

Courtesy: HEQEP, CP-6203

Year of Publication
September 2018

Published by
HEQEP, CP-6203

Management Team

Prof. Dr. Md. Mufazzal Hossain
Sub-Project Manager
HEQEP, CP-6203
Prof. Dr. Md. Jahangir Alam
Deputy Sub-Project Manger
HEQEP, CP-6203
Prof. Dr. Md. Anwarul Haque Beg
Member, Sub-Project Management Team
HEQEP, CP-6203

Contact
Prof. Dr. Md. Mufazzal Hossain
Dept. of Animal Nutrition, Genetics & Breeding
Sheikh Kamal Faculty Building
Sher-e-Bangla Agricultural University
Dhaka-1207
Email: mufazzal_hossain@yahoo.com
Web: www.sau.edu.bd
www.saulibrary.edu.bd

Contents

Overview of Sher-e-Bangla Agricultural University

Sher-e-Bangla Agricultural University (SAU) is located in the heart of the capital city, Dhaka adjacent to the National Parliament Building. The SAU campus stands on 86.97 acres (35.21 ha) of picturesque land covered by green plantations.

The "Sher-e-Bangla Agricultural University Act 2001" was passed in the National Parliament of Bangladesh on 09 July 2001 through the transformation of the then Bangladesh Agricultural Institute (BAI). The foundation stone of the University was laid by the then Honorable Prime Minister Shiekh Hasina on 15 July 2001. This Institute was basically established on December 11, 1938 by Sher-e-Bangla A.K. Fazlul Huq, the then Chief Minister of Undivided Bengal. BAI is the oldest and the pioneer agricultural institution in Bangladesh. At that time the name of this institution was "The Bengal Agricultural Institute" was renamed "East Pakistan Agricultural Institute". Since its inception in 1938, the institute had been functioning as a "Faculty of Agriculture' under Dhaka University. Meanwhile with the establishment of Bangladesh Agricultural University (BAU) at Mymensingh in 1961 its academic function was transferred to BAU in 1964 till it's up gradation to Sher-e-Bangla Agricultural University in 2001.

The Sher-e-Bangla Agricultural University was established with a mission to expand the higher agricultural education and committed to promote sustainable research in various fields of agricultural sciences and to offer extension services for the benefit of farming communities of Bangladesh.

The University started functioning since its inception with mono faculty: The Faculty of Agricultural. Later on, Faculty of Agribusiness Management in 2007, Animal Science & Veterinary Medicine in 2011 and Fisheries and Aquaculture Faculty in 2016 started running.

Overview of the Animal Science and Veterinary Medicine Faculty

Animal Science and Veterinary Medicine (ASVM) faculty is the promising faculty of this university. The ASVM faculty started its activities since 2011. The ASVM faculty now offers Bachelor of Science in Veterinary Science and Animal Husbandry, i.e. B. Sc. Vet. Sci. & A. H., which is 5 years duration bachelor degree. In addition, execution of the postgraduate program from the ASVM faculty is going on. The ASVM faculty has its own animal production farm, dairy farm, poultry farm, clinic for animal health care, artificial insemination center, Hi Tec. Lab (funded by World Bank), ASVM Seminar Library (funded by World Bank), ASVM Seminar Gallery (funded by World Bank), all classrooms and labs with multimedia built in internet cum CPU facilities to facilitate research and impart practical training and demonstration to the students and farmers. The ASVM faculty fulfills the vital need of the country by providing professional manpower, research specialists, teachers and extension personnel to serve in livestock and poultry development in every sphere of animal agriculture of our nation.

Vision

Faculty of Animal Science & Veterinary Medicine will be a leading center of excellence in the field of animal science and veterinary education, research and advanced technological services to the communities with global standard and sustainable recognition.

Mission

- Produce world standard competent animal scientist & veterinarian who provide livestock services and innovate new technology by research and educational knowledge.
- Initiate problem-oriented research and transfer the technology in the field of livestock sector to help in sustainable development.
- Provide public services through farm consultancy, clinical, epidemiological care, diagnostic laboratory services and offer relevant outreach programs for livestock development.
- Meet the challenges that our graduates shall be facing throughout their professional career.
- Promote and advocate one health education in collaboration with one health organization towards research of zoonotic and emerging diseases and other one health issues.

- Provide and exchange intellectual ideas and technologies through national and international meeting, seminar, symposiums, workshops etc.

Program Objectives

- Produce skilled and competent animal scientists and veterinarians who can serve locally and internationally.
- Create and implement world standard education in Animal Science & Veterinary medicine.
- Promote and sustain high standards of undergraduate training in Animal Science and Veterinary education.
- Act as a center for providing solutions to animal production problems.
- Act as a problem-based solution center for improving animal and public health issues.
- Implement a sustainable linkage between local livestock rearing communities and experts.
- Inspire lifelong education and a learning attitude.
- Act as a national reference laboratory for animal production problems and diagnosis of animal diseases.
- Establish long lasting collaborations with national and international institutes, organizations and industries.

Program Learning Outcomes (PLOs)

1) Acquire and apply knowledge of animal agriculture to prepare themselves for better careers;
2) Develop intellectual skills required for critical thinking, problem solving and creativity;
3) Identify, formulate and provide creative, innovative and effective solution to agricultural (livestock) problems;
4) Develop analytical skill for enhancing decision making ability. Numeracy, statistical and computing skills are necessary to develop this skill;
5) Enhance entrepreneurship and innovation skills for career development;
6) Communicate effectively in written and spoken form. Communicates effectively to a diverse group of peoples using appropriate traditional and emerging IT media;
7) Possess necessary interpersonal skills to be valued individual and team contributors. Realize and demonstrate effective leadership responsibility. Understand and commit professionally, ethically and with human responsibility, in line with the agriculturist's code of conduct;
8) Work independently and take responsibility for personal actions. Recognize the need for and to engage in life-long learning and professional development;
9) Enhance awareness and commitment towards effective citizenship and social responsibility;
10) Acquire knowledge about livestock since through 6 months internship program (home and abroad).

Generic Skills

It is required to keep in mind that education is all about to gain a set of skills. Such skills will make the graduates competent to face the reality of life, to develop the attitude of lifelong learning and to contribute to the socioeconomic development of the country.

The curriculum of ASVM faculty will provide the following generic skills of the graduates:

Generic skills		Skill development mechanism
i.	Intellectual skills matching with program of study	Collect up to date literature, participate actively in seminar, discussion, group work
ii.	Practical & problem-solving skills	Handling lab equipment, demonstrate practical skills, field problem identification and solution
iii.	Numeracy and analytical skills	Group work, event management
iv.	Entrepreneurship and innovation skills	Assignment, industry visit
v.	Communication & IT skills	Assignment, literature search, presentation
vi.	Interpersonal, teamwork & leadership	Group work, attachment with students'

Generic skills		Skill development mechanism
	skill	organizations.
vii.	Self-management and personal development skills	Class attendance, punctuality, cooperativeness, sincerity, conduct, time management
viii.	Commitment to community, country & humanity	Involvement with extra-curricular and social activities

Curriculum Alignment/ Skill Mapping

Curriculum must be aligned with program objectives, program learning outcome and intended learning outcomes through proper skill mapping.

Format for skill mapping

Courses	Program Learning Outcome									
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
ANHP 125 & 126	X	X	X							
ANHP 157 & 158	X	X	X	X						
ANHP 155 & 156	X	X	X	X						
ANHP 217 & 218	X	X	X	X	X	X				
ANHP 316						X	X			
ANHP 470						X	X			
ANHP 159 & 160	X	X	X	X						
ANHP 215	X	X	X	X	X			X		
ANHP 227										
ANHP 255 & 256	X	X	X	X	X	X		X		
ANGB 115 & 116	X	X	X							
ANGB 253 & 254	X	X	X	X						
ANGB 355 & 356	X	X	X	X						
ANGB 413 & 414	X	X	X	X	X	X				
ANGB 153 & 154	X	X	X	X						
ANGB 313 & 314	X	X	X	X	X			X		
ANGB 455 & 456	X	X	X	X	X	X		X		
APMA 111 & 112	X	X	X	X						
APMA 211 & 212	X	X	X	X	X					
APMA 351 & 352	X	X	X	X	X					
APMA 451 & 452	X	X	X	X		X				
APMA 511 & 512	X	X	X	X	X			X		
DASC 151 & 152	X	X		X		X	X			
DASC 213 & 214	X	X	X	X		X				
DASC 353 & 354	X	X	X		X	X	X			
DASC 411 & 412	X	X	X	X	X			X	X	
MEPH 329 & 330	X	X	X	X			X	X		
MEPH 365 & 366	X	X	X	X	X		X	X		
MEPH 423 & 424	X	X	X	X	X		X	X		
MEPH 431 & 432	X	X	X	X	X		X	X		
MEPH 461 & 462	X	X	X	X	X		X	X		
MEPH 471	X	X	X	X			X	X		
MEPH 520	X	X	X	X	X		X	X		
MEPH 521	X	X	X	X			X	X		
MEPH 531 & 532	X	X	X	X	X		X	X		
MIPA 117 & MIPA 118	X	X	X							
MIPA 219 & MIPA 220	X	X	X						X	
MIPA 257 & MIPA258	X	X	X	X	X				X	
MIPA 319	X	X	X	X					X	
MIPA-357 & MIPA 358	X	X	X	X	X	X				
MIPA 417	X			X	X	X	X		X	
MIPA 429	X	X	X	X	X	X	X	X	X	

Courses	Program Learning Outcome									
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10
MIPA 457	X	X	X	X	X	X	X	X	X	
MIPA 513 & MIPA 514	X	X	X	X	X	X	X	X	X	
MIPA 221 & MIPA 222	X					X	X		X	
MIPA 259 & MIPA 260	X	X	X			X	X	X	X	
MIPA 321 & MIPA 322	X	X	X	X		X	X	X	X	
MIPA 359 & MIPA 360	X	X	X	X		X	X	X	X	
PTOX 263 & 264	X	X	X	X	X	X	X	X		
PTOX 325 & 326	X	X	X	X	X	X	X	X		
PTOX 361 & 362	X	X	X	X	X	X	X	X		
PTOX 420	X	X	X	X	X	X	X	X	X	
PATH 223 & PATH 224	X	X	X	X						
PATH 261 & PATH 262	X	X	X	X		X	X			
PATH 363 & PATH 364	X	X	X	X	X	X	X	X		
PATH 516	X	X	X	X	X	X	X	X	X	
POSC 113 & POSC 114	X	X	X	X		X				
POSC 251 & POSC 252	X	X	X			X	X			
POSC 311 & POSC 312	X	X	X	X		X				
POSC 453 & POSC 454	X	X	X		X		X			
SUTH 331& SUTH 332	X	X	X	X						
SUTH 367 & SUTH 368	X	X	X	X						
SUTH 427 & SUTH 428	X	X	X	X						
SUTH 433 & SUTH 434	X	X	X	X	X		X	X		
SUTH 465 & SUTH 466	X	X	X	X			X			
SUTH 474	X	X	X	X			X	X	X	
SUTH 523 & SUTH 524	X	X	X	X			X			
SUTH 527 & SUTH 528	X	X	X	X	X	X				
AGEC 225	X	X	X	X	X			X	X	
AEIS 529 & AEIS 530	X	X				X	X	X	X	
AGST 327	X	X	X	X						
AGST 328	X	X	X	X						
AGRO 119 & AGRO 120	X	X	X	X		X		X		
BIOC 161 & BIOC 162	X	X	X		X		X			
DEPS 121	X	X	X			X			X	
ENGL 123 & ENGL 124		X			X	X	X	X	X	
INCP 552										X
INFP 554										X
INLP 556										X
INSR 558										X

Curriculum Structure and related information

Nomenclature of Degree

The courses offered should lead to awarding the degree of Bachelor of Science in Veterinary Science & Animal Husbandry (B. Sc. Vet. Sci. & A.H.).

System of Education

Semester wise

Eligibility for Admission

The candidates should have passed HSC/equivalent from Science Group. She/he should have GPA 7.5 combined from SSC/equivalent and HSC/equivalent without 4th subject; and at least GPA 3.0 separately. She/he shall have Physics, Chemistry, Mathematics and Biology in both SSC/equivalent and HSC/equivalent examinations. These criteria can be changed by central admission committee by considering the situation.

Duration of Degree Program

Each of the degree is a five years Program divided into 10 academic semesters.

Academic Semester

There are two regular semesters (Semester I and Semester II) in an academic year. The duration of each regular semester I & II is 22 weeks. The semester I starts in January and semester II in July of each academic year.

The duration of each semester is as follows:

Classes	16 weeks
Recess before Semester Final Examination	02 weeks
Semester Final Examination (Theory and Practical) (approx.)	02 weeks
Result Preparation and Publication	02 weeks
Total	**22 weeks**

Medium of Instruction

The medium of instruction is English.

Academic Credit

When a student enrolls in Sher-e-Bangla Agricultural University, he/she shall earn academic credits. In case of theoretical course, one lecture per week per semester (16 weeks) is equivalent to one credit i.e. for a 3-credit course; there are three lectures per week. In case of practical course one practical class of two hours.

Types of Courses

The courses included in undergraduate curricula are Core/Compulsory courses: In each semester specific numbers of courses are offered as compulsory courses.

Department Wise Courses (Total Credit: 228)

Departments	**Compulsory Courses Credit Hour (Theory + Practical=Total)**
Dept. of Anatomy, Histology & Physiology	15+10=25
Dept. of Animal Nutrition, Genetics and Breeding	16+7=23
Dept. of Animal Production & Management	9+5=14
Dept. of Dairy Science	7+4=11
Dept. of Medicine & Public Health	12+8=20
Dept. of Microbiology and Parasitology	26+9=35
Dept. of Pathology	9+5=14
Dept. of Pharmacology & Toxicology	6+5=11
Dept. of Poultry Science	8+4=12
Dept. of Surgery &Theriogenology	14+9=23
Dept. of Agricultural Economics	2+0=2
Dept. of Agricultural Extension and Information System	2+1=3
Dept. of Agricultural Statistics	2+1=3
Dept. of Agronomy	1+1=2
Dept. of Biochemistry	3+2=5
Dept. of Development and Poverty Studies	2+0=2
Dept. of Language	1+1=2
Internship: (INCP 552=7 Credit, INFP 554=6 Credit, INLP 556 = 5 Credit, INSR 558= 3 Credit)	21
Total= 228 credit hours	**228**

Grading System

Numerical Grade	**Letter Grade**		**Grade Point**
80% or above	A+	(A plus)	4.00
75% to Less than 80%	A	(A regular)	3.75
70% to Less than 75%	A-	(A minus)	3.50
65% to Less than 70%	B+	(B plus)	3.25
60% to Less than 65%	B	(B regular)	3.00

Numerical Grade	Letter Grade		Grade Point
55% to Less than 60%	B-	(B minus)	2.75
50% to Less than 55%	C+	(C plus)	2.50
45% to Less than 50%	C	(C regular)	2.25
40% to Less than 45%	D	(D regular)	2.00
Less than 40%	F	(Failed)	0.00

Distribution of Marks

Theory:

Fifty percent (50%) of marks of a theoretical course is allotted for continuous assessment i.e. class participant/attendance, quizzes/assignment and class tests. The remaining (50%) of the marks is allotted to Semester Final Examination. The distribution of theory marks for a given course will be as follows:

Class participation/Attendance	10%
Quizzes/Assignment	10%
1st class test	15%
2nd class test	15%
Semester Final (20% quizzes + 30% descriptive)	50%
Total	**100%**

Practical:

- Forty five (45%) marks are allotted for first practical examination and
- Forty five percent (45%) marks are allotted for final practical examination and
- Ten percent (10%) marks are counted at the end of the semester for class attendance.

For practical final examination the internal and external examiners conduct the examinations. The controller of examination appoints the external examiners proposed by the Academic Committee of the Department concerned. The practical examinations must include experiments and/or problems, evaluation of practical notebook, viva voce and class attendance etc.

Marks for class participation/attendance are as follows:

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
Less than 70%	0

Students having less than 70% of class attendance in any course are not allowed to appear in Semester Final Examination and he/she will have to repeat the course of that semester in the next available semester with fresh enrollment. The course teacher(s) send the attendance report for both theoretical and practical courses to the Dean through respective Chairman before filling up the form of Final Examination by the student.

Course Layout and Credit Hours for B. Sc. Vet. Sci. & A.H. Degree in the Semester System

Level-1, Semester-I		
Course Code	**Course Title**	**Credit Hour (T+P)**
APMA 111, 112	Animal Science & Ecology	2+1
POSC 113, 114	Fundamental Poultry Science	3+1
ANGB 115, 116	Fundamental Nutrition	2+1
MIPA 117, 118	General Microbiology	2+1
AGRO 119,120	Fodder Production & Management	1+1
DEPS 121	Rural Sociology	2+0
ENGL 123, 124	Advanced English Language Skills	1+1
ANHP 125, 126	General Anatomy	2+1
Total		**15+7=22**

Level-1, Semester-II		
Course Code	**Course Title**	**Credit Hour (T+P)**
DASC 151, 152	Fundamental Dairy Science & Market Milk	3+1
ANGB 153, 154	Fundamental Genetics	3+1
ANHP 157, 158	Histology	3+1
ANHP 159, 160	General Physiology	2+1
BIOC 161, 162	Chemistry of Biomolecules	3+2
ANHP 155,156	Systematic Anatomy	3+1
Total		**17+7=24**

Level-2, Semester-I		
Course Code	**Course Title**	**Credit Hour (T+P)**
APMA 211, 212	Beef Cattle, Draught & Large Animal Production	2+1
DASC 213, 214	Dairy Chemistry & Microbiology	2+1
ANHP 217, 218	Embryology	1+1
MIPA 219, 220	Bacteriology	2+1
MIPA 221, 222	General Parasitology & Malacology	2+1
PATH 223, 224	General and Nutritional Pathology	3+1
AGEC 225	Livestock Economics	2+0
ANHP 215	Endocrine Physiology	1+0
ANHP 227	Neuro Physiology	1+0
Total		**16+6=22**

Level-2, Semester-II		
Course Code	**Course Title**	**Credit Hour (T+P)**
POSC 251, 252	Broiler & Layer Production	2+1
ANGB 253, 254	Poultry Nutrition	2+1
ANHP 255, 256	Systemic Physiology	2+1
MIPA 257, 258	Virology	3+1
MIPA 259, 260	Nemathelminthes & Platihelminthes	3+1
PATH 261, 262	Systemic and Aquatic Pathology & Oncology	3+1
PTOX 263, 264	General Pharmacology	2+1
Total		**17+7=24**

Level-3, Semester-I		
Course Code	**Course Title**	**Credit Hour (T+P)**
POSC 311, 312	Duck & Specialized Fowl Production	1+1

ANGB 313, 314	Livestock & Poultry Breeding	2+1
ANHP 316	Comparative & Neuro-Anatomy	0+2
MIPA 319	Mycology, Mycoplasmology, Rickettsiology & Chlamydiology	1+0
MIPA 321, 322	Veterinary Entomology & Aquatic Parasitology	2+1
PTOX 325, 326	Systemic & Aquatic Pharmacology	2+1
AGST 327, 328	Biostatistics	2+1
MEPH 329, 330	General & Systemic Medicine	2+1
SUTH 331, 332	General Surgery	2+1
Total		**14+9=23**

Level-3, Semester-II		
Course Code	**Course Title**	**Credit Hour (T+P)**
APMA 351, 352	Goat, Sheep & Small Animal Production	1+1
DASC 353, 354	Dairy Cattle and Buffalo Production	1+1
ANGB 355, 356	Livestock Nutrition	2+1
MIPA 357, 358	Immunology & Serology	2+1
MIPA 359, 360	Protozoology	2+1
PTOX 361, 362	Toxicology	2+1
PATH 363, 364	Pathology of Infectious Diseases & Avian Pathology	3+1
MEPH 365, 366	Farm Animal Medicine	2+1
SUTH 367, 368	Anaesthesiology	1+1
Total		**16+9=25**

Level-4, Semester-I		
Course Code	**Course Title**	**Credit Hour (T+P)**
DASC 411, 412	Dairy Food Technology	1+1
ANGB 413, 414	Feed Processing, Conservation & Feed Industry	2+1
MIPA 417	Animal Hygiene, Biosafety & Biosecurity	2+0
PTOX 420	Pharmacy &Therapeutics	**0+2**
MEPH 423, 424	Pet Animal Medicine	2+1
SUTH 427, 428	Gynaecology	3+1
MIPA 429	Molecular Microbiology	1+0
MEPH 431, 432	Avian Medicine	2+1
SUTH 433, 434	Farm Animal Surgery	2+1
Total		**15+8=23**

Level-4, Semester-II		
Course Code	**Course Title**	**Credit Hour (T+P)**
APMA 451, 452	Wild life, Zoo, Pet, Lab. & Aquatic Animal Management and Conservation	2+1
POSC 453, 454	Breeder Farm & Hatchery Management	2+1
ANGB 455, 456	Reproduction of Farm Animals & Biotechnology	3+1
MIPA 457	Zoonotic Microbiology	2+0
MEPH 461, 462	Zoo, Lab, Wild & Aquatic Animal Medicine	1+1
SUTH 465, 466	Obstetrics	2+1
ANHP 470	Clinical Anatomy	0+2
MEPH 471	Forensic Medicine, Jurisprudence & Ethics	1+0
SUTH 474	Radiology, Clinics Surgery & Theriogenology	0+2
Total		**13+9=22**

Level-5, Semester-I		
Course Code	**Course Title**	**Credit Hour (T+P)**
APMA 511, 512	Meat Technology & Animal By-product Management	2+1
MIPA 513, 514	Food Microbiology, Hygiene & Safety	2+1
PATH 516	Clinical Pathology & Necropsy	0+2
MEPH 520	Clinical Medicine	0+2
MEPH 521	Epidemiology & Preventive Medicine	1+0
SUTH 523, 524	Pet, Zoo and Aquatic Animal Surgery	2+1
SUTH 527, 528	Andrology & Clinical Reproductive Technology	2+1
AEIS 529, 530	Livestock Extension & Information System	2+1
MEPH 531, 532	Zoonoses & Public Health	1+1
Total		**12+10=22**

Level-5, Semester-II		
Course Code	**Course Title**	**Credit Hour (T+P)**
INCP 552	Veterinary Clinical Practices	0+7
INLP 556	Laboratory, Development & Extension Practices	0+5
INFP 554	Farm Management Practices	0+6
INSR 558	Seminar & Report Writing	0+3
Total		**0+21=21**

Teaching-Learning Strategy

The curriculum consists of teaching-learning strategies. The teaching methodologies employed depend to a large extent on the preferred teaching style of the instructor and the size of the class. It is desirable to incorporate a lot of questioning of the students into the lecture/discussion in order to keep the students engaged in the learning process.

- Class room instruction (participatory, critical thinking, decision making):
- Lab exercise (Lab and field related) and preparation of Practical Note Book
- Demonstration practice
- Group work
- Field work/visit and reporting
- Assignment
- Field problem identification and program planning
- Industry attachment
- Extension tour
- Internship

Study Tour

As a part of the academic curriculum, students at all levels are required to perform study tour for enriching their practical knowledge. In addition, students have to perform in the Animal Farms, Clinics & Hospital Visit, different Livestock Survey, Visit to Research Organizations, Extension Organizations and Non-Governmental Organizations (NGO) and a weeklong Extension field Trip at Upazilla and Village level as the practical assignments.

Internship

B. Sc. Vet. Sci. & A. H. Program Includes Internship Program in the final semester (L5SII). In this Program the students will get scope to work directly in different animal farms, veterinary hospitals/clinics, research laboratories, dairy and poultry industries, feed mills, hatcheries, meat & milk processing industries in home and abroad.

Assessment Strategy

Assessment systems are duly communicated to students at the outset of the term/semester. Assessment procedures meet the objectives of the course. The assessment system is reviewed at regular intervals. Diverse methods are used for assessment.

Both formative and summative assessment such as

- Quizzes
- Short answer
- Essay type/ broad answer
- Demonstration performance
- Reports
- Assignment/term papers
- Continuous assessments
- Presentations
- Summative assessment (final examination) strategies are followed

The students are provided feedback immediately after assessment. Fairness and transparency are maintained in the assessment system. Students are being informed in advance about methods of assessment in each course.

Department of Anatomy, Histology & Physiology (ANHP)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
Discipline- Anatomy & Histology				
1.	ANHP 125: General Anatomy (Theory)	2	1	I
2.	ANHP 126: General Anatomy (Practical)	1	1	I
3.	ANHP 157: Histology (Theory)	3	1	II
4.	ANHP 158: Histology (Practical)	1	1	II
5.	ANHP 155: Systematic Anatomy (Theory)	3	1	II
6.	ANHP 156: Systematic Anatomy (Practical)	1	1	II
7.	ANHP 217: Embryology (Theory)	1	2	I
8.	ANHP 218: Embryology (Practical)	1	2	I
9.	ANHP 316: Comparative & Neuro-Anatomy (Practical)	2	3	I
10.	ANHP 470: Clinical Anatomy (Practical)	2	4	II
Total (Theory + Practical) 9+8= 17				
Discipline- Physiology				
11.	ANHP 159: General Physiology (Theory)	2	1	II
12.	ANHP 160: General Physiology (Practical)	1	1	II
13.	ANHP 215: Endocrine Physiology (Theory)	1	2	I
14.	ANHP 227: Neuro-Physiology (Theory)	1	2	I
15.	ANHP 255: Systemic Physiology (Theory)	2	2	II
16.	ANHP 256: Systemic Physiology (Practical)	1	2	II
Total (Theory+ Practical) 6+2= 8				

Total Credit Hour	
Theory	15
Practical	10
Total	**25**

Course Code: ANHP 125 **Course Title**: **General Anatomy (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: I**
Rationale: This course is designed to provide general concept of anatomy of domestic mammals & birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about general osteology of domestic mammals & birds ✓ obtain knowledge about general myology of domestic mammals & birds ✓ gather knowledge about general splanchnology of domestic mammals& birds ✓ familiar with general angiology and lymphatic system of domestic mammals & birds ✓ gain concept about general neuro-endocrine system of domestic mammals & birds			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define anatomy and different topographical terms ✓ narrate branches of anatomy ✓ discuss descriptive terms of osteology ✓ describe basic facts and concepts of anatomy	**Introduction**: Definition, branches of anatomy, descriptive terms of topographic anatomy, basic facts and concepts of topographic anatomy	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss structure of skeleton of domestic mammals& birds ✓ explain physical properties and composition of bones ✓ classify the bones and describe the different skeleton of domestic mammals& birds	**Osteology:** In general, structure of skeleton, composition and physical properties of bones, classification of bones and the description of axial, appendicular and splanchnic skeleton of domestic mammals & birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with syndesmology ✓ classify joints ✓ discuss the general features of a true joint ✓ describe ligaments related with joints	**Syndesmology:** Definition and classification of joints, general features of a true joint, ligaments of joints	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with myology ✓ classify muscle ✓ make a list of muscle of different regions of domestic mammals	**Myology:** Definition, classification and types of different group of muscles of domestic mammals	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ state boundaries of different body cavities and their contents ✓ discuss anatomy of organs of digestive system ✓ narrate anatomy of organs of respiratory system ✓ illustrate anatomy of organs of urinary system ✓ state anatomy of organs of male and female genital system	**Splanchnology:** **Digestive system**- general anatomy of digestive system **Respiratory system**- general anatomy of respiratory system, **Uro-genital system**-general anatomy of urinary system, male genital system, female genital system	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ define the shape, location, topography, coverings, valves and vessels of heart ✓ classify circulation ✓ discuss pulmonary circulation and systemic circulation ✓ narrate general anatomy of lymphatic organs	**Angiology**: Anatomy of the organs of circulation, the blood vascular and the lymphatic system **Lymphatic system**: General anatomy of the lymphatic organs	Lecture Interactive discussion Visual presentation Brain storming Feedback Report writing	Quiz Short answer Broad answer Class attendance Report
✓ define the organs and anatomical location of endocrine system ✓ classify nervous system ✓ narrate anatomical location of sense organs of domestic mammals & birds	**Endocrinology**: General anatomy of endocrine glands **Neurology**: General anatomy of the nervous system **Aesthesiology**: General anatomy of sense organs	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R. D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
4. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.

Course Code: ANHP 126 **Course Title: General Anatomy (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**

Rationale: This course is designed to provide basic knowledge on skeleton of domestic mammals& birds.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ obtain practical knowledge on gross anatomy of domestic mammals& birds
- ✓ acquire practical knowledge on different bones and joints of domestic mammals & birds

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify the skeleton of horse, ox, goat, dog, cat, pig &chicken ✓ recognize different points on skull of horse, ox, goat, dog, cat, pig &chicken	Identification of skeleton of horse, ox, goat, dog, cat, pig & chicken; identification of the different points of the skull of horse, ox, goat, dog, pig, cat, &chicken	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify different points of vertebral column of different regions of cattle	Identification of different points of the vertebral column-cervical, thoracic, lumbar, sacral and caudal vertebrae of cattle	Lecture Interactive discussion Visual presentation Demonstration Hands on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ recognize different external points of forelimb and hind limb of cattle	Identification of the different external points of forelimb (scapula, humerus, radius-ulna, carpal, metacarpal) of ox Identification of the different points of hind limb (pelvic girdle, femur, tibia-fibula, tarsal, metatarsal) of ox; identification of digit of ox	Lecture Interactive discussion Visual presentation Demonstration Hands on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify joints of forelimb and hind limb of ox	Identification of joints of the fore limb of ox; identification of the different joints of the hind limb of ox	Lecture Interactive discussion Visual presentation Demonstration Hands on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify of different muscles of ox/goat	Identification of different muscles of ox/goat	Lecture Interactive discussion Visual presentation Demonstration Hands on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
4. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.

Course Code: ANHP 157 **Course Title**: **Histology (Theory)**	**Credit Hour: 3**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide fundamental histological structure of domestic mammals & birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about detail histological structure of basic tissues of domestic mammals & birds ✓ attain knowledge about detail histological structure of different systems of domestic mammals & birds			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define different terms related to histology ✓ classify histology ✓ discuss scopes and relationship with other subjects	**Introduction**: Definition, scope and branches of histology and its relationship to other subjects	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe detail composition of animal cells ✓ discuss physical properties of protoplasm ✓ illustrate detail features and organelles of cells ✓ talk about cellular junction and their surface modification	**Cell:** Composition of cells, physical properties of protoplasm, features of cells and cell organelles, Intercellular junctions, cell surface modifications	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with basic tissues and gland ✓ classify basic tissues and gland ✓ recognize and characterize the basic tissues ✓ differentiate basic tissues	**Description of Basic tissues**: Definition, classification, location and characteristics of basic tissues: epithelial, connective tissues (adipose tissue, cartilage, bone, blood) muscular and nervous tissues; gland and its classification	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe detail histological structure of different organs related with circulatory system ✓ distinguish histologically different vessels of circulatory system	**Description of the different organs of the circulatory system**: Heart, artery, vein, capillaries, sinusoids of domestic mammals and birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss detail histological structure of lymphatic organs	**Histology of the lymphatic organs:** Histology of the different organs of the lymphatic systems (lymphnode, spleen, thymus, tonsil, hemal nodes) of domestic mammals	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ illustrate detail histological structure of tubular organs ✓ discuss detail histological structure of organs of alimentary tract ✓ describe specific histological structure of accessory organs of digestive system	**Histology of the digestive system**: Histology of the alimentary canal and accessory organs (teeth, tongue, salivary gland, liver and pancreas)	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report
✓ describe histological structure of respiratory organs ✓ differentiate histological ally different parts of respiratory system	**Histology of the respiratory system**: Histology of the different parts of respiratory system (pharynx, larynx, trachea, bronchi, bronchiole, lung)	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe histological structure of organs of urinary system ✓ discuss histological structure of ovary, fallopian tube, uterus, vagina ✓ illustrate histological structure of different follicle of ovary ✓ discuss histology of male genital system	Description of uro-genital organs of domestic mammals and bird	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe histological structure of eye, ear, skin & hair-follicles ✓ discuss histologically different layers of skin	Description of sensory organs of domestic mammals and birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. J.A. Eurell, B.L. Frappier.2006. Dellmann's Textbook of Veterinary Histology. 6thedition.Wiley-Blackwell Publications, USA.
3. R. Getty. 1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. W.B. Saunders Company. London.
4. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
5. W.J. Bacha and L.M. Bacha. 2012. Color Atlas of Veterinary Histology. 3rd Edition. Wiley Blackwell Publications, USA.

Course Code: ANHP 158 **Course Title**: **Histology (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide detail histological anatomy of domestic mammals & birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ develop knowledge and skill about histological structure of basic tissues of domestic mammals& birds ✓ attain knowledge about histological structure of visceral organs ✓ obtain knowledge about histological structure of cardiovascular and lymphatic system ✓ gain knowledge about histological structure of endocrine glands and sense organs			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain the principles and procedure of general staining ✓ prepare permanent histological slides of different organs ✓ demonstrate staining techniques of tissues	General staining techniques of animal tissues and the preparation of permanent histological slides of domestic mammals	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify different epithelial, connective tissue, muscular tissue and nervous tissue under light microscope ✓ differentiate epithelial, connective tissue, muscular tissue, nervous tissue tissues under light microscope	Identification of histological structures of basic tissues of tissues of domestic mammals	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify different parts of the respiratory system of domestic mammals and birds under light microscope ✓ determine alveoli under light microscope ✓ demonstrate the histological difference among different parts of respiratory system ✓ make out different cells of respiratory system	Identification of histological structures of different segments of respiratory systems of domestic mammals and birds	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify neuron and other cells of nervous system ✓ distinguish among different cells of nervous system	Identification of histological structures of nervous tissues	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ discuss histological structure of digestive organs ✓ recognize different compartments of stomach of ruminants under light microscope	Identification of histological structures of digestive organs of domestic mammals and birds	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz Short answer Demonstration performance Identification Practical note book Viva voce

		preparation	Class attendance
✓ identify/classify different vessels of cardiovascular system of domestic mammals and birds ✓ discuss histological structure of heart of domestic mammals and birds	Identification of histological structures of cardiovascular organs of domestic mammals and birds	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify lymphatic organs of domestic mammals and birds under light microscope	Identification of histological structures of lymphatic organs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify histological structures of skin, eye and ear under light microscope ✓ recognize different layers of skin and eye ✓ describe histological structure of hair follicle	Identification of histological structures of sense organs of domestic mammals and birds	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ recognize different areas of pituitary gland ✓ identify different endocrine organs under light microscope ✓ classify different areas of adrenal glands under light microscope	Identification of histological structures of endocrine glands	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. J.A. Eurell, B.L. Frappier. 2006. Dellmann's Textbook of Veterinary Histology. 6thedition.Wiley-Blackwell Publications, USA.
3. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
4. R.Getty. 1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. W.B. Saunders Company. London.
5. W.J. Bacha and L.M. Bacha. 2012. Color Atlas of Veterinary Histology. 3rd Edition. Wiley Blackwell Publications, USA.

Course Code: ANHP 155 **Course Title**: **Systematic Anatomy (Theory)**	**Credit Hour: 3**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide detail concept of anatomy of domestic mammals & birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather knowledge about detail splanchnology of domestic mammals and birds ✓ familiar with detail angiology of domestic mammals and birds ✓ gain concept about detail neuro-endocrine system of domestic mammals and birds			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ discuss detail anatomy of alimentary canal of domestic mammals & birds ✓ describe detail anatomy of accessory organs of alimentary canal of domestic mammals & birds	Description of gastrointestinal tract and accessory organs of domestic mammals & birds.	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss anatomy of respiratory systems of domestic mammals and birds	Description of the respiratory systems of domestic mammals & birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with cardiovascular system ✓ discuss course of major arteries, veins and lymph vessels of different body region	Gross morphology of heart; major blood and lymph vessels of domestic mammals & birds		
✓ describe detail anatomy of urinary system of domestic mammals & birds ✓ discuss detail anatomy of genital system of domestic mammals & birds ✓ recognize common organs of urinary and genital systems of domestic mammals & birds	Description of uro-genital organs of domestic mammals & birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss detail anatomy of nervous system of domestic mammals and birds	Description of nervous system of domestic mammals and birds	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment	
✓ describe detail anatomy of sensory organs of domestic mammals & birds	Description of sensory organs of domestic mammals & birds	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
4. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.

Course Code: ANHP 156 **Course Title**: **Systematic Anatomy (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: II**

Rationale: This course is designed to provide detail anatomy of domestic mammals & birds.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ develop skill about dissection of cadaver of domestic mammals and birds
- ✓ acquire knowledge about detail form and structure of domestic mammals and birds

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain general principles of embalming of the animal and preservation of cadaver	Demonstration of embalming of the carcass and preservation of cadaver	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ discuss digestive system of domestic mammals & birds ✓ demonstrate organs of digestive system of domestic mammals & birds ✓ demonstrate organs of respiratory and urogenital system of domestic mammals & birds	Dissection and demonstration of cadaver for study of organs of digestion, respiration, circulation, reproduction and urination of cattle, goat, dog and chicken	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ discuss the nerve and spinal cord of domestic mammals and bird ✓ demonstrate different parts brain and spinal cord of different domestic mammals & birds	Dissection and demonstration of brain and spinal cord of cattle, goat, dog & chicken	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ sketch cardiovascular system of domestic mammals& birds ✓ dissect and demonstrate heart and blood vessels of domestic mammals & birds	Dissection and demonstration of heart and major blood vessels of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb of cattle, goat, dog and chicken	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain nerves and sensory organs of domestic mammals ✓ dissect and demonstrate nerves and sensory organs of domestic mammals and birds	Dissection and demonstration of cadaver for study of nerves of head, neck, thorax, abdomen, pelvis, tail, forelimb and hind limb in goat, ox and chicken; dissection and demonstration of eye, ear, nose, hoof and horn of cattle, goat, dog and chicken	Lecture Visual presentation Discussion Assignment	MCQ Short answer Demonstration Performance Identification Viva-voce Practical note book

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
4. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.

Course Code: ANHP 217 **Course Title**: **Embryology (Theory)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide fundamental concept of embryology and development of domestic mammals and bird.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about early embryogenesis of domestic mammals and bird ✓ attain knowledge about developmental anomalies of domestic mammals and bird ✓ obtain knowledge about gametogenesis of domestic mammals and bird			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define different terms related to embryology ✓ describe history, scope of embryology ✓ discuss branches of embryology	**Introduction:** Definition, history, scope, branches of embryology, different term used in embryology	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with gametogenesis ✓ explain process of formation of gamete ✓ discuss histological al structure of gametes of different domestic mammals & birds ✓ describe steps of spermatogenesis and oogenesis of different domestic mammals & birds	**Gametogenesis:** Definition, formation and histological structure of male and female gamete, steps of spermatogenesis and oogenesis; estrous cycle: definition, classification, histological changes in the reproductive tract during estrous cycle	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe steps of fertilization of domestic mammals ✓ discuss formation of zygote, cleavage, morulla, blastula ✓ differentiate among different embryological stages of different domestic mammals	**Fertilization:** Steps of fertilization; capacitation in domestic mammals **Cleavage:** Early embryonic events (formation of zygote, cleavage, morula, blastula, hatching, bilaminar embryo)	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define terms related with gastrulation ✓ describe formation of germ layers ✓ discuss derivatives of germ layers of domestic mammals	**Gastrulation: D**efinition, formation of embryonic three germ layers and their derivatives in domestic mammals.	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify placenta ✓ describe gross and histological structure of placenta in domestic mammals	**Extra-embryonic membranes:** Placenta, types of placenta, histological structure of placenta, fetal membranes	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ discuss histological structure of fetal membranes of domestic mammals			
✓ describe developmental stages of different organs ✓ discuss development of male and female genital organs during embryonic life	**Development of different systems:** Nervous system, respiratory, digestive system and uro-genital system of domestic mammals	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report
✓ characterize different developmental anomalies ✓ explain different developmental anomalies	Teratology and malformations of domestic mammals	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. J.A. Eurell, B.L. Frappier.2006. Dellmann's Textbook of Veterinary Histology. 6th edition. Wiley-Blackwell Publications, USA.
2. P. Hyttel.2010. Essentials Veterinary Embryology. 1st edition. Elsevier, USA.
3. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
4. T. A. McGeady, P. J. Quinn, E. S. Fitzpatrick, M. T. Ryan and S. Cahalan.2016.Veterinary Embryology. 2nd edition. Wiley-Blackwell Publications, USA.
5. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd edition. Elsevier Publications, USA.
6. W.J. Bacha and L.M. Bacha. 2012. Color Atlas of Veterinary Histology. 3rd Edition. Wiley-Blackwell Publications, USA.

Course Code: ANHP 218 **Course Title**: **Embryology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide fundamental concept of embryology and development of domestic mammals and birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire practical knowledge about developmental stages of embryo of domestic mammals and birds. ✓ attain realistic knowledge about different stages of follicles and corpus luteum in ovary ✓ obtain pragmatic knowledge about different stages of chick's embryo ✓ gather rational knowledge about spermatogenesis and fertilization			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify ovary of domestic mammals under light microscope	Demonstration of ovary of domestic mammals under light microscope	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ recognize different follicles and follicular stages under light microscope ✓ distinguish different ovarian folliclesunder light microscope	Demonstration of primordial, primary, tertiary/Graafian follicles of domestic mammals	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify corpus luteum under light microscope ✓ explain histological structure of uterine tube and uterus	Demonstration of corpus luteum of domestic mammals Demonstration of uterine tube and uterus of domestic mammals	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify the gamete of domestic mammals	Demonstration of male and female gamete under light microscope	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify different spermatocyte under light microscope	Demonstration different stages of spermatogenesis under light microscope	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise	Quiz Short answer Demonstration performance Identification Practical note

		Practical note book preparation	book Viva voce Class attendance
✓ identify fertilized ova of domestic mammals	Demonstration of fertilization under light microscope	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ discuss the different stages of development of chick's embryo	Demonstration of chick's embryo at different stages of development	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. J.A. Eurell, B.L. Frappier.2006. Dellmann's Textbook of Veterinary Histology. 6th edition. Wiley-Blackwell Publications, USA.
2. P. Hyttel.2010. Essentials Veterinary Embryology. 1st edition. Elsevier,USA.
3. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
4. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd edition. Elsevier Publications, USA.
5. W.J. Bacha and L.M. Bacha. 2012. Color Atlas of Veterinary Histology. 3rd Edition. Wiley-Blackwell Publications, USA.

<table>
<tr><td colspan="2">Course Code: ANHP 316
Course Title: Comparative and Neuro-Anatomy (Practical)</td><td>Credit Hour: 2</td><td>Level: 3</td><td>Semester: I</td></tr>
<tr><td colspan="5">Rationale: This course is designed to provide comparative anatomical knowledge of domestic mammals & birds.</td></tr>
<tr><td colspan="5">Course Learning Outcomes: The major learning outcomes of this course are to-
✓ obtain practical knowledge on comparative osteology of domestic mammals & birds
✓ gain practical knowledge on comparative splanchnology of domestic mammals & birds
✓ attain detail practical knowledge on courses of cranial nerves of domestic mammals &birds</td></tr>
<tr><td>Intended Learning Outcomes (ILOs)
The students will be able to-</td><td>Course Content</td><td>Teaching-Learning Strategies</td><td colspan="2">Assessment Strategies</td></tr>
<tr><td>✓ discuss comparative points of different bones of domestic mammals & birds
✓ explain comparative study of visceral organs of domestic mammals & birds
✓ compare the bones of different regions of mammals & birds</td><td>Comparative study of bones and visceral organs of the digestive, circulatory, respiratory, urinary, and reproductive systems of different domesticated mammals & birds</td><td>Lecture
Interactive discussion
Visual presentation
Demonstration
Hand on practice
Group exercise
Practical note book preparation</td><td colspan="2">Quiz
Short answer
Demonstration performance
Identification
Practical note book
Viva voce
Class attendance</td></tr>
<tr><td>✓ identify different parts of brain and spinal cord
✓ discuss anatomy of meninges
✓ describe formation and course of circulation of CSF
✓ describe the origin, course and distribution of cranial and spinal nervesof domestic mammals & birds</td><td>Neuroanatomy:
Identification of different parts of brain and spinal cord, meninges and CSF; origin, course and distribution of cranial nerves of domestic mammals & birds; origin, course and distribution of brachial and lumbar plexus of domestic mammals & birds</td><td>Lecture
Interactive discussion
Visual presentation
Demonstration
Hand on practice
Group exercise
Practical note book preparation</td><td colspan="2">Quiz
Short answer
Demonstration performance
Identification
Practical note book
Viva voce
Class attendance</td></tr>
<tr><td colspan="5">Reference Books
1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
4. R.D. Frandson, W.L. Wilke and A. D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.</td></tr>
</table>

Course Code: ANHP 470 **Course Title**: **Clinical Anatomy (Practical)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**

Rationale: This course is designed to provide clinical aspects of anatomy in relation to surgery and medicine of domestic mammals & birds.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on clinically important structure of head region of domestic mammals & birds
- ✓ gain knowledge on clinically important structure of neck and thorax region of domestic mammals & birds
- ✓ obtain knowledge on clinically important structure of abdomen and pelvis region of domestic mammals& birds
- ✓ gather knowledge on clinically important structure of appendages of domestic mammals& birds
- ✓ attain knowledge to visualize the underlying structure at the site of operation of domestic mammals & birds

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define clinical anatomy, surface anatomy, surgical anatomy, sectional anatomy, importance of clinical anatomy ✓ describe the topographic anatomy at the site of operation in the different regions of the body	Introduction to clinical anatomy; surface anatomy of the head, neck, thorax, abdomen, pelvis and limbs of domestic mammals & birds with special reference to their clinical intervention	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the topographic location of the different organs or structures of the different system of the body at the site of operation. ✓ discuss the course of vessels and nerves at the site of operation in the different regions of the body	Topographic locations of the organs of different systems of body of domestic mammals and birds in relation to surgery and medicine	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe courses of cranial and spinal nerves at the site of operation in the different regions of the body of domestic mammals& birds	Cranial and spinal nerves with reference to their clinical intervention of domestic mammals& birds	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. H.E. Konig and H.G. Liebich. 2007. Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. 1st Edition. Schattauer Verlag Publishers, Germany.
2. K.M. Dyce, W.O. Sack and C.J.G. Wensing. 2010. Textbook of Veterinary Anatomy. 4th Edition. Elsevier Inc. USA.
3. R.D. Frandson, W.L. Wilke and A.D. Fails. 2009. Anatomy and Physiology of Farm Animals. 7th Edition Wiley-Blackwell Publications, USA.
4. R. Getty.1975. Sisson and Grossman's the Anatomy of the Domestic Animals. Vol. 1 and 2. 5th Edition. W.B. Saunders Company, London.
5. S. Sission. 1910. A Textbook of Veterinary Anatomy. 2nd Edition. W.B. Saunders Company. London.

Course Code: ANHP 159 **Course Title**: **General Physiology (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide fundamental concept of physiology of domestic mammals & birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental physiological phenomena of cell ✓ gather knowledge about physiology of blood and body fluids of domestic mammals ✓ develop understanding on physiology of cardiovascular system ✓ gain knowledge about temperature regulation in animals in different conditions			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define physiology, cell, organ, organization, life, diffusion, osmosis, active transport, passive transport, filtration, bulk flow, action potential, excitation, rhythmicity ✓ classify the physiology, cell, transport through the cell membrane ✓ describe organization, physical structure and functional system of the cell ✓ explain the physiological phenomena of cells in domestic mammals and birds ✓ understand the basic concept of membrane potentials, action potentials, excitation and rhythmicity of cell	**Introduction:** Definition, classification, importance of physiology, organization of the cell, physical structure and functional system of the cell, physiological phenomenon, transport through the cell membrane- active and passive process, membrane potentials, action potentials, excitation and rhythmicity	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define blood, plasma, serum, hemoglobin, hematopoiesis, hemolysis, physiological hemolysis, anemia, polycythemia, haemaglutination leukocytosis, blood cancer ✓ discuss the properties, functions and constituents of blood ✓ describe process of hematopoiesis, nutrient essential for hematopoiesis, fate of blood cells and physiological changes of blood cells ✓ understand different blood groups, blood coagulation factors and process in mammals ✓ distinguish different blood	**Blood:** Different terminology related with blood, definition, functions, properties, cellular and chemical constituents of blood, hemoglobin, hematopoiesis, fate of blood cells, blood volume, physiological changes of blood cells, blood coagulation, haemaglutination, blood groups and immunogenetics, plasma and serum, clinical parameters of blood of domestic mammals & birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

groups and plasma & serum ✓ explain the clinical parameters of blood			
✓ define tissue fluid, lymph, synovial fluid and csf ✓ describe the sources and location of different body fluid ✓ distinguish different body fluids ✓ discuss the formation and importance of different body fluids	**Body fluid:** Classification of body fluids, tissue fluid, lymph, synovial fluid and cerebrospinal fluid, their formation and functions& regulation	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with homeostasis in domestic mammals ✓ explain importance of acid-base balance in domestic mammals ✓ clarify and distinguish acidosis and alkalosis ✓ describe different buffer systems and systems involve in acid-base balance ✓ discuss role of lungs and kidneys in homeostasis	**Acid-base Balance/ Homeostasis:** Definitions, functions, acidosis, alkalosis, blood p^h, buffer systems, systems involved in acid-base balance, role of lungs and kidneys in acid base balance	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe different definitions related with temperature and temperature regulation ✓ narrate sources of heat, normal temperature and common site of temperature recording in different mammals and birds ✓ discuss the thermoregulation physiology of domestic mammals and birds ✓ talk about thermoregulation in polar & desert animals	**Temperature regulation and environmental physiology:** Definitions, source of heat, body temperature, common site of temperature recording, physiological variations of temperature, warm and coldblooded animals, normal temperatures of different species, hibernations, heat balance, critical temperature and temperature regulations, temperature regulation in polar& desert animals	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D. M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-Blackwell Publications, USA.

Course Code: ANHP 160 **Course Title**: **General Physiology (Practical)**		**Credit Hour: 1**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide fundamental concept about blood collection from different mammals& birds and their hematological analysis.				
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather knowledge on preparation of chemicals and reagents for hematological analysis ✓ acquire knowledge about fundamental knowledge of different hematological test				
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**		**Assessment Strategies**
✓ assess the laboratory safety ✓ apply safety materials during emergency	General laboratory safety	Lecture Interactive discussion Visual presentation Demonstration Hands on practice Group exercise Practical note book preparation		Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ prepare and uses of chemicals and reagents for hematological studies	Preparation of chemicals and reagents for hematological studies	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation		Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe the technique of blood collection from different animals & birds ✓ collect blood from different domestic mammals& birds	Collection of blood from different domestic mammals and birds.	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation Study tour Report writing		Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance Report
✓ explain the principle and procedure of estimation of Hb ✓ estimate the amount of Hb in blood	Hemolysis and estimation of hemoglobin	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation		Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the principle and procedure of ESR and PCV of blood. ✓ calculate the ESR and PCV of blood.	Determination of erythrocyte sedimentation rate (ESR)and packed cell volume (PCV)	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation		Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

✓ explain the principle and procedure of total count of rbc, total count of wbcand differential leukocyte count ✓ calculate total count of RBC and total count of WBC ✓ identify different leukocytes under lm ✓ explain the effects of temperature and drugs in heart	Total count of RBC and WBC, differential leukocyte count Effects of temperature and drugs in heart	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe the procedure of hemin test ✓ differentiate between paint and blood ✓ demonstrate hemin test to determine color on sample	Hemin test	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D.M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-Blackwell Publications, USA.

Course Code: ANHP 215 **Course Title: Endocrine Physiology (Theory)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**

Rationale: This course is designed to provide fundamental concept about hormones and their physiological phenomena in reproductive cycles of domestic mammals.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire basic concept about hormones of farm animals
- ✓ obtain knowledge on physiological functions in reproductive cycles

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define endocrine physiology, endocrinology, hormone, gland and receptors ✓ classify the hormone, gland and receptors ✓ describe the general and specific function of hormones	**Introduction:** Definition of endocrine physiology, endocrinology, hormones and receptors **Function:** General and specific functions of hormones **Classification:** hormones and receptors	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss the different sources of hormone ✓ describe the biosynthesis of different hormone ✓ elucidate the mode of action of different hormone ✓ express the transportation of different hormone ✓ explain the regulation of hormones	**Biosynthesis:** Biosynthesis of steroid hormones and peptides hormones **Sources of hormones:** Hypothalamus, anterior pituitary, posterior pituitary, thyroid gland, parathyroid gland, pancreas, adrenal glands, gonads, pineal gland, corpus luteum, uterus and placenta **Mode of actions**: Steroid hormones and peptide hormones **Transport and regulation**: Transport of hormones and regulation of hormone	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain the relation between endocrine and nervous system ✓ describe the differences between endocrine and other system	**Interrelation:** Interrelation between endocrine and nervous system, difference between endocrine system and other system.	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ narrate the hormone involve in reproductive physiology, common birth facts in animals (male &female)	**Hormones involve in reproductive physiology and common birth facts in animals**: female estrus cycle, oogenesis, ovulation, corpus luteum formation, pregnancy, parturition, lactation, milk let down, capacitation, spermatogenesis, erection, ejaculation	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D.M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-Blackwell Publications, USA.

Course Code: ANHP 227 **Course Title: Neuro-physiology (Theory)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**

Rationale: This course is designed to provide fundamental concept about physiological phenomena of nervous system and correlation with other systems of domestic mammals& birds.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge about neural function of domestic mammal& birds
- ✓ gain knowledge about its importance in domestic mammal's normal life
- ✓ obtain knowledge on interrelation and synchronization with other system

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define neuron, nerve, stimuli, receptors, synapse, nerve impulse ✓ describe classification of neuron, nerve, stimuli, receptors, synapse ✓ discuss basic function of neuron, nerve, receptors, stimuli, synapse ✓ distinguish between nerve and neuron, electrical and chemical synapse, different types of receptors ✓ clarify mechanism of nerve impulse and properties of sensory receptors	**Introduction:** Neuron and its classification, nerve, stimuli and its classification, receptors and its classification, synapse and nerve impulse, neuromuscular synapse, properties of sensory receptors	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe division and basic functions of nervous system ✓ discuss different cells of nervous system with their functions ✓ illustrate function, formation and circulation of csf ✓ explain blood-brain and blood-csfbarrier	**Nervous tissues:** Basic functions, division and cells of the nervous system, blood-CSF and blood brain barrier. formation, circulation and function of csf	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define various definition related to action potential ✓ explain the membrane depolarization, hyper-polarization, membrane potential at axon hillock and ionic mechanism contributing to the resting membrane potential ✓ state relationship between ionic driving force, ion channels and membrane potential ✓ clarify role of Na+/K+-ATPase in maintaining the resting membrane potential ✓ discuss about action potential and its related conditions ✓ clarify sequence of events involved in the movement of action potential	**Elector chemical basis for neural function**: Definition, resting membrane potential, graded potential, action potential, propagation of action potential	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with autonomic nervous system ✓ explain anatomical and functional differences between central, peripheral and autonomic nervous system ✓ discuss organization of ANS, sympathetic division and parasympathetic division ✓ describe respond of sympathetic and parasympathetic division to fight or flight response ✓ clarify sympathetic and parasympathetic innervations at different body region ✓ illustrate types of neurotransmitters, function and action along with their receptors	**Autonomic nervous system**: Definition, organization, sympathetic division, parasympathetic division, neurotransmitters and their receptors	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D.M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V.Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-BlacwellPublications, USA.

Course Code: ANHP 255 **Course Title**: **Systemic Physiology (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide fundamental concept about systemic physiology of domestic mammals& birds.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about physiological phenomena of digestive, respiratory, urinary and muscular system in domestic mammals & birds ✓ attain knowledge about reproductive physiology of domestic mammals & birds ✓ gather knowledge about physiology of sense organs of domestic mammals & birds ✓ gain concept about homeostasis in domestic mammals & birds			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ clarify the factors affecting digestion ✓ describe composition, function and regulation of digestive juices ✓ explain digestion in simple and compound stomach mammals ✓ illustrate the movement of gastrointestinal tract, feces and defecation ✓ discuss the process of digestion in birds	**Digestive system:** Digestion of feed stuffs, factors of digestion, prehension, mastication, composition, function and regulation of digestive juices, digestion in simple and compound stomach mammals, movement of gastrointestinal tract, feces and defecation, digestion in birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with respiration ✓ discuss types and mechanism of respiration ✓ calculate volumes of air respirated ✓ explain exchange and transport of respiratory gases ✓ illustrate regulation of respiration and pulmonary compliance ✓ clarify respiration in birds	**Respiratory system:** Definition, types, mechanisms of respiration, exchange and transport of respiratory gases, volumes of air respired, regulation of respiration, pulmonary compliance, respiration in birds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with micturition ✓ describe functions of kidney ✓ make clear idea about formation of urine ✓ discuss urine volume regulation ✓ explain the process of micturition and renal clearance	**Urinary system:** Functions of kidney, urine formation, urine volume regulation, micturition, renal clearance	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define different terms related with muscle physiology ✓ discuss properties and function of muscles ✓ clarify isotonic and isometric contraction of muscle ✓ describe changes in the muscle during contraction ✓ explain rigormortis in domestic mammals and birds	**Muscular system:** Properties and functions of muscles, isotonic and isometric contraction, changes in the muscle during contraction, rigormortis	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ discuss the functions of ovary corpus luteum ✓ narrate reproductive cycle of domestic mammals ✓ explain the physiology lactation& milk let down mechanism in domestic mammals	**Reproductive system:** function of male reproductive tract and sex glands; functions of male reproductive tract & corpus luteum, reproductive cycle, lactation, milk let down mechanism	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe about physiological phenomena of different sense organs in domestic mammals	**Physiology of sense:** Skin, eye, ear, tongue and nose	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report writing
✓ discuss the heartbeat, regulation of heartbeat, action potential cardiac cycle and heart sounds ✓ explain different waves of ECG and their significance ✓ narrate basic concepts about different cardiovascular diseases	**Cardiovascular physiology**: origin and conduction heartbeat, regulation of heartbeat, action potential and cardiac cycle, electrocardiogram, heart sounds, heart block, regulation of heart beat &blood pressure, vasomotor mechanism	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D.M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-Blackwell Publications, USA.

Course Code: ANHP 256 **Course Title: Systemic Physiology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide fundamental concept about urinalysis in domestic mammals.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about urine analysis ✓ determine the pregnancy and respiratory air volumes			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain the principle and procedure of tests for bile constituents ✓ describe the bile constituents	Tests for bile constituents	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ discuss the composition of different domestic mammals ✓ explain causes of difference among the urine of domestic mammals	General chemistry of urine	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ perform physical examination of urine ✓ explain causes of different color, odor, volume and transparency in urine ✓ discuss importance of physical examination of urine	Physical examination of urine e.g. volume, color, odor, transparency	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe principle and procedure of determination of specific gravity of urine ✓ determine the specific gravity of sample urine ✓ explain clinical importance of specific gravity of urine	Determination of specific gravity of urine	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe principle and procedure of estimation of ammonia, chloride, phosphate in urine ✓ determine ammonia, chloride, phosphate in sample urine ✓ explain clinical importance of ammonia, chloride, phosphate in urine	determination of ammonia, chloride, phosphate in urine	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

✓ describe principle and procedure of estimation of abnormal constituents (glucose, albumin, acetone, calcium, bile pigment, bile salts) in urine ✓ estimate abnormal constituents in sample urine ✓ explain clinical importance of abnormal constituents in urine	Test for abnormal constituents of urine e.g. glucose, albumin, acetone, calcium, bile pigment, bile salts etc.	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe principle and procedure of histological examination of urinary sediments ✓ identify abnormal sediments in urine by using microscope ✓ explain clinical importance of urinary sediments	Histological examination of urinary sediments by using microscope	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe principle and procedure of determination of respiratory air volumes. ✓ discuss clinical importance of respiratory air volumes ✓ determine respiratory air volumes	Determination of respiratory air volumes	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. B. Bellwood, M. Andrasik-Catton. 2014. Veterinary Technician's Handbook of Laboratory Procedures. 1st Edition. Wiley-Blackwell Publications, USA.
2. R.M. Akers and D.M. Denbow. 2013. Introduction to Anatomy and Physiology of domestic Animals. 2nd Edition. Wiley-Blackwell Publications, USA.
3. V. Aspinall and M. Cappello. 2009. Introduction to Veterinary Anatomy and Physiology.2nd Edition. Elsevier Publications, USA.
4. W.O. Reece. 2015 Dukes' Physiology of Domestic Animals. 13th Edition. Wiley-Blackwell Publications, USA.

Department of Animal Nutrition, Genetics & Breeding (ANGB)
Course Layout

Sl. No.	Course Code and Title	Credit Hours	Level	Semester
Discipline- Nutrition				
1.	ANGB 115: Fundamental Nutrition (Theory)	2	1	I
2.	ANGB 116: Fundamental Nutrition (Practical)	1	1	I
3.	ANGB 253: Poultry Nutrition (Theory)	2	2	II
4.	ANGB 254: Poultry Nutrition (Practical)	1	2	II
5.	ANGB 355: Livestock Nutrition (Theory)	2	3	II
6.	ANGB 356: Livestock Nutrition (Practical)	1	3	II
7.	ANGB 413: Feed Processing, Conservation & Feed Industry (Theory)	2	4	I
8.	ANGB 414: Feed Processing, Conservation & Feed Industry (Practical)	1	4	I
Total (Theory + Practical) 8+4= 12				
Discipline- Genetics & Breeding				
9.	ANGB 153: Fundamental Genetics (Theory)	3	1	II
10.	ANGB 154: Fundamental Genetics (Practical)	1	1	II
11.	ANGB 313: Livestock & Poultry Breeding (Theory)	2	3	I
12.	ANGB 314: Livestock & Poultry Breeding (Practical)	1	3	I
13.	ANGB 455: Reproduction of Farm Animals & Biotechnology (Theory)	3	4	II
14.	ANGB 456: Reproduction of Farm Animals & Biotechnology (Practical)	1	4	II
Total (Theory+ Practical) 8+3= 11				

Total Credit Hour	
Theory	16
Practical	7
Total	**23**

Course Code: ANGB 115 **Course Title: Fundamental Nutrition (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: I**
Rationale: This course is arranged to provide knowledge about fundamental concept of nutrition.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather knowledge about basic concept of nutrition ✓ obtain knowledge about composition of animal body and plant body ✓ acquire knowledge about nutrients present in feed ✓ familiar with human nutrition ✓ enrich knowledge about animal feeds and feeding			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define nutrition, nutrients, food, feed, fodder, forage, foliage, feedstuffs, compound feed, balanced feed ✓ describe about the requirement of feed for maintenance, growth and production ✓ differentiate demand and supply of nutrients ✓ distinguish human food and animal feed ✓ explain about the modern techniques used in nutritional research	**Introduction:** Different terminology related with animal nutrition, causes for feed requirement, demand & supply, human food versus animal feed, modern approaches of nutrition	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain the compositional difference of plant and animal body ✓ describe the relationship among the soil, plant, animal and human	**Animal and Plant body:** Composition of plant and animal body, soil–plant-animal-human interrelationship	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify different types of nutrients ✓ describe the general functions of CHO, protein, fat, vitamin, mineral and water ✓ discuss the dietary sources of nutrients ✓ explain the % of nutrients present in major feeds	**Nutrients:** Nutrients and their functions, dietary sources, nutritional composition of feeds	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ identify the sources of energy ✓ describe energy present in nutrients ✓ explain the partitioning of feed ✓ describe the energy value of feed ✓ discuss about the nutritional balances occurred in animal body	**Energy concept:** Sources of energy, energy present in nutrients, partitioning and measurement of feed energy, nutritional balances	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ narrate the nutritional value of egg, meat and milk	**Human nutrition:** Role of animal products	Lecture Interactive	Quiz Short answer

✓ explain the importance of milk, meat and egg in human nutrition ✓ illustrate the production and demand of milk, meat and egg ✓ assess the requirement of milk, meat and egg in human body ✓ describe the dietary allowances for different age and sex group of humans	in human nutrition, requirement of milk, meat and egg in human body, dietary allowances for different age and sex group of humans	discussion Visual presentation Brain storming Feedback	Broad answer Class attendance
✓ classify animal feed stuffs ✓ define ration, balanced ration, maintenance ration, production ration, feed selection, choice feeding, feed restriction ✓ discuss requisite quality of ration ✓ explain feeding habit of sheep, goat, cattle and buffalo ✓ discuss about feeding system of livestock and poultry	**Animal Feeds and Feeding:** Feed stuffs, ration, balanced ration, maintenance ration, production ration, feeding habit of different animals, feeding system of livestock and poultry, feed selection, choice feeding, feed restriction	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
2. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford & IBH. India.
3. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
4. K.S. Singh and B. Panda. 1988. Poultry Nutrition. Kalyani Publishers. India.
5. P. McDonald, J.F.D. Greenhalgh, C.A. Morgan, R. Edwards, L. Sinclair and R. Wilkinson. 2012. Animal Nutrition. Pearson Education, UK.
6. S. Leeson and J.D. Summers. 2008. Commercial Poultry Nutrition. 3rd Edn. Nottingham University Press. USA.
7. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 116 **Course Title: Fundamental Nutrition (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**
Rationale: This course is arranged to provide practical knowledge about laboratory equipment and techniques related to fundamental nutrition.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about laboratory safety ✓ introduce with the laboratory equipment ✓ gather knowledge about different laboratory techniques related to animal nutrition ✓ identify and characterized different feeds and fodder			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ assess the laboratory safety ✓ apply safety materials during emergency	General laboratory safety	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the principles and procedure of sampling ✓ use the process for feed sample preparation	Sampling principles and procedures	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the principles and procedures of proximate analysis of feedstuffs	Principles and procedures of proximate analysis of feedstuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ determine the moisture level of feed ✓ calculate the dry matter portion present in feed ✓ explain the use of hot air oven	Determination of moisture & dry matter in feed stuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ calculate the N_2% present in feed ✓ determine the crude protein present in feed ✓ explain the use of kjeldahl machine	Determination of crude protein in feed stuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ find out crude fibre from	Determination of	Lecture	Quiz

the sample ✓ explain the use of muffle furnace	crude fibre in feed stuffs	Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ calculate the ash% present in feed	Determination of ash in feed stuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ determine the ether extract ✓ explain the use of soxhlet apparatus	Determination of ether extract in feed stuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ calculate nitrogen free extract in feed stuffs	Calculation of nitrogen free extract in feed stuffs	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ identify the feeds and fodder ✓ characterize different feeds and fodder ✓ differentiate different types of feeds and fodder	Identification of feeds and fodder	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

Reference Books

1. A. Sahoo, S.K. Sankhyan, S.A. Karim. 2015. Techniques in Animal Nutrition Research. Satish Serial Publishing House. India.
2. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
3. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford & IBH. India.
4. P. McDonald, J.F.D. Greenhalgh, C.A. Morgan, R. Edwards, L. Sinclair and R. Wilkinson. 2012. Animal Nutrition. Pearson Education, UK.
5. T.M. Prabhu and K. Chandrapal Singh. 2013. Analytical Techniques in Animal Nutrition Research. New India Publishing Agency. India.

Course Code: ANGB 253 **Course Title: Poultry Nutrition (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: II**

Rationale: This course is designed to develop students' knowledge about the concept of poultry nutrition especially in poultry feeds, feeding, feed utilization and ration formulation.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ gather knowledge about basic concept of poultry nutrition
- ✓ attain knowledge about digestion, absorption and metabolism of feed in poultry
- ✓ familiar with poultry feeds and feeding
- ✓ acquire knowledge about ration formulation

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define nutrients, nutrition, poultry nutrition ✓ explain objectives of poultry nutrition ✓ describe milestones of development in poultry nutrition ✓ discuss the problem and prospect of poultry nutrition in Bangladesh	**Introductory:** Terminology related with poultry nutrition, objectives of poultry nutrition, history of poultry nutrition	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ sketch the digestive system of poultry ✓ describe about the function of digestive tract ✓ explain chemical digestion of nutrients ✓ illustrate the absorption system of different nutrients ✓ describe about the metabolic pathway of nutrients utilization	**Utilization of nutrients:** Digestion, absorption and metabolism of nutrients (carbohydrate, protein, fat) in poultry	Lecture Discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report
✓ describe principle of poultry feeding ✓ explain prospect and limitations of using unconventional feed stuffs ✓ discuss factors affecting the selection of feed ingredients ✓ make a list of agro-industrial by products with their usage ✓ explain essential steps in ration formulation and feed inclusion level ✓ discuss about procurement and storage of feedstuffs ✓ explain about different feeding standard ✓ differentiate broiler and layer ration	**Feedstuffs and ration formulation:** Poultry feedstuffs, conventional and unconventional feed ingredients, agro-industrial byproducts, poultry ration formulation, factors affecting the selection of feed ingredients, procurement and storage of feedstuffs, feeding standard, inclusion level	Lecture Discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report
✓ describe different types of feeding systems and methods of poultry feeding ✓ illustrate advantages and disadvantages of different feeding systems ✓ calculate feed efficiency ✓ discuss factors affecting feed efficiency ✓ explain techniques of improving feed efficiency	**Poultry feeding and feed efficiency:** Feeding systems, feeding methods, feed efficiency, factors affecting feed efficiency, improving feed efficiency	Lecture Discussion Visual presentation Brain storming Feedback Assignment Report writing	Quiz Short answer Broad answer Class attendance Report

✓ differentiate feed additives from feed supplements ✓ classify feed additives ✓ use of feed additives in poultry industry ✓ select the alternatives of antibiotics in poultry industry ✓ explain about probiotics and prebiotics	**Feed additives:** Definition of feed additives, classification and use of feed additives, alternative of antibiotics, probiotics and prebiotics for animals	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define gross energy, digestive energy, metabolizable energy, net energy, basal metabolism ✓ calculate energy requirement of chicken ✓ explain factors affecting metabolic rate of birds ✓ describe symptoms of energy deficiency ✓ discuss symptoms of excess of energy	**Energy for poultry:** Terms related to energy expression and measurement, energy requirement, energy deficiency, excessive energy	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ calculate requirement of protein and fat for growing chicken and laying hen ✓ illustrate calorie-protein ratio and protein evaluation methods ✓ discuss symptoms of protein deficiency ✓ describe symptoms of excess protein ✓ explain sources, requirement and deficiency symptom of vitamin and mineral	**Nutrients requirement:** Protein and fat requirement of poultry, protein for phase feeding, calorie-protein ratio, protein evaluation, protein deficiency, excessive protein, sources, requirement and deficiency symptom of vitamin and mineral	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ interlink between vitamin and major minerals ✓ discuss interrelationships between trace minerals ✓ explain interrelationships between amino acids ✓ illustrate energy-protein interrelationships	**Nutrient interrelationships:** Interactions among the nutrients	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ achieve the latest research findings in the area of poultry nutrition	**Latest research finding:** Information about latest research innovations in field of poultry nutrition	Lecture Visual presentation	Short answer

Reference Books

1. A. Sahoo, S.K. Sankhyan, S.A. Karim. 2015. Techniques in Animal Nutrition Research. Satish Serial Publishing House. India.
2. D.V. Reddy. 2005. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
3. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford & IBH. India.
4. G.C. Banerjee. 1996. Poultry. Oxford & IBH Publisher. India.
5. K.S. Singh and B. Panda. 1988. Poultry Nutrition. Kalyani Publishers. India.
6. S. Leeson and J.D. Summers. 2008. Commercial Poultry Nutrition. 3rd Edn. Nottingham University Press. USA.
7. T.M. Prabhu and K. Chandrapal Singh. 2013. Analytical Techniques in Animal Nutrition Research. New India Publishing Agency. India.
8. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 254 **Course Title: Poultry Nutrition (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**

Rationale: This course is designed to provide applied knowledge on poultry nutrition.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ identify and characterized different feed and feed ingredients
- ✓ acquire practical knowledge about poultry nutrition
- ✓ obtain knowledge on feed management
- ✓ attain knowledge on poultry feed formulation

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify different feed and feed ingredients ✓ characterize different feed ingredients	Identification of poultry feed ingredients	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz, Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ use feeder and drinker in poultry farm ✓ clean feeder and drinker	Feeding and watering practices	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz, Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ calculate nutrient requirement of poultry ✓ find out appropriate standard for poultry in different stages	Calculation of feed requirements	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz, Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain about different steps for ration formulation ✓ apply "Pearson square test" ✓ formulate poultry ration	Formulation of ration by "Step by Step" and "Pearson square Test"	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz, Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ install computer program for ration formulation ✓ formulate ration by computer apps or program	Least cost ration formulation by using computer	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book	Quiz, Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ justify modern practice in commercial poultry farm	Field trip to commercial poultry farm in Bangladesh	Lecture, Discussion Field visit Feedback Assignment Report writing	Viva voce Report
✓ assess the actual price of feed and feed ingredients ✓ identify the available feed and feed ingredient in market	Survey of feed market	Lecture Field survey Feedback Assignment Report writing	Viva voce Report

Reference Books

1. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
2. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford & IBH. India.
3. G.C. Banerjee. 1996. Poultry. Oxford & IBH Publisher. India.
4. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
5. K.S. Singh and B. Panda. 1988. Poultry Nutrition. Kalyani Publishers. India.
6. National Research Council. 1994. Nutrients Requirements of Poultry. 9th Revised Edn. National Academy Press. Washington.
7. S. Leeson and J.D. Summers. 2008. Commercial Poultry Nutrition. 3rd Edn. Nottingham University Press. USA.
8. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 355 **Course Title: Livestock Nutrition (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: II**
Rationale: This course is designed to provide knowledge about livestock nutrition.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather knowledge about rumen ecology ✓ enrich understanding on nutrients and environment ✓ obtain knowledge about digestion and metabolism ✓ acquire knowledge about nutrients requirement of animals			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain about the environment of rumen ✓ illustrate about microbial population of rumen ✓ describe the different groups of bacteria present in rumen	**Rumen ecology:** Rumen environment, rumen microorganisms, their classification and nutrition	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain lowest critical temperature ✓ describe highest critical temperature ✓ sketch a graph of ambient temperature with thermo-neutral zone ✓ discuss effect of ambient temperature on digestion and metabolism	**Nutrition and environment:** Critical temperature, thermo-neutral zone, effect of ambient temperature on digestion and metabolism of nutrients	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ draw the digestive system of ruminant animal ✓ explain the functions of digestive tract of ruminant animal ✓ assess the microbial protein degradation ✓ detect the non -protein nitrogen in feed stuffs ✓ describe about microbial protein synthesis ✓ evaluate the digestion of CHO, protein and fat in ruminant animal ✓ illustrate the metabolism of CHO, protein and fat in ruminant animal ✓ detect NPN	**Digestion and metabolism of nutrients:** Digestion of nutrients, mechanism of microbial fermentation, utilization of end products of carbohydrates, microbial protein synthesis and their contribution to host animal, metabolism of carbohydrate, protein and fat, microbial protein degradation, NPN	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ determination of digestibility by *in vitro, in vivo, in sacco* and marker technique ✓ describe factors affecting digestibility ✓ find out TDN value	**Digestibility:** Determination of digestibility, factors affecting digestibility, determination of TDN	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report writing
✓ discus about energy systems of animals ✓ calculate energy requirement	**Energy requirements:** Energy systems for ruminants and non-ruminants, energy	Lecture Interactive discussion	Quiz Short answer Broad answer

for cattle, sheep, goat and buffalo ✓ calculate energy requirement for non-ruminant	requirements for maintenance, growth, lactation, reproduction, wool growth and work	Visual presentation Brain storming Feedback	Class attendance
✓ describe the methods for estimation of protein requirement ✓ calculate protein requirement for cattle, sheep, goat and buffalo ✓ calculate protein requirement for non-ruminant	**Protein requirements:** Methods of estimation of protein requirements, protein requirements of animals for maintenance and productive purposes	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the methods for estimation of mineral requirement ✓ calculate mineral requirement for cattle, sheep, goat and buffalo ✓ calculate mineral requirement for non-ruminant	**Mineral requirements of farm animals:** Estimation of requirements for calcium, phosphorus, magnesium and important trace elements for cattle, buffaloes, sheep, goats, horse and rabbits	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ calculate vitamin requirement for cattle, sheep, goat and buffalo ✓ calculate vitamin requirement for non-ruminant ✓ explain the interrelationship between vitamins and mineral	**Vitamin requirements for farm animals:** Requirements for maintenance, growth, lactation and pregnancy, interrelationship of vitamins and minerals	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ find out the sources of water ✓ discus factors affecting water intake of farm animals ✓ estimate water requirements for ruminants and non-ruminants	**Water and its requirements:** Sources of water, factors affecting water intake of farm animals, estimation of water requirements for ruminants and non-ruminants	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
2. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford & IBH. India.
3. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
4. P. McDonald, J.F.D. Greenhalgh, C.A. Morgan, R. Edwards, L. Sinclair and R. Wilkinson. 2012. Animal Nutrition. Pearson Education, UK.
5. T.M. Prabhu and K. Chandrapal Singh. 2013. Analytical Techniques in Animal Nutrition Research. New India Publishing Agency. India.
6. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 356 **Course Title: Livestock Nutrition (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is designed to provide practical knowledge through hand on exercise about livestock nutrition.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ attain knowledge on animal feed formulation ✓ acquire practical knowledge on feed evaluation systems ✓ obtain knowledge on feed digestibility and degradability ✓ gain practical knowledge by visiting different livestock farms			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain about different steps for ration formulation ✓ formulate of ration for different productive stage	Formulation of ration for large and small ruminants for different productive purposes	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ install computer program for ration formulation ✓ formulate ration by computer apps or program	Computer programming for ration formulation	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe evaluation of animal feed by different system	Feed evaluation systems	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ trial farm animal for determining digestibility	Feeding trial with farm animals for determination of digestibility	Lecture Interactive discussion Visual presentation	Quiz Short answer Demonstration performance Identification

		Demonstration Hand on practice Group exercise Practical note book preparation	Practical note book Viva voce Class attendance
✓ calculate rumen degradation by different fermentation methods	Rumen degradation by *In vitro* fermentation of feedstuffs using Menke's gas production technique and Tilley and Terrie method	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ determine rumen degradation by nylon bag technique	Rumen degradability study of feedstuffs using nylon bag technique	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ justify modern practice in commercial livestock farm	Visit to different livestock farms for observing feeding programs	Lecture Discussion Field visit Feedback Assignment	Viva voce Report writing

Reference Books

1. A. Sahoo, S.K. Sankhyan, S.A. Karim. 2015. Techniques in Animal Nutrition Research. Satish Serial Publishing House. India.
2. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
3. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
4. P. McDonald, J.F.D. Greenhalgh, C. A. Morgan, R. Edwards, L. Sinclair and R. Wilkinson. 2012. Animal Nutrition. Pearson Education, UK.
5. T.M. Prabhu and K. Chandrapal Singh. 2013. Analytical Techniques in Animal Nutrition Research. New India Publishing Agency. India.
6. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 413 Course Title: Feed Processing, Conservation and Feed Industry (Theory)	**Credit Hour: 2**	**Level: 4**	**Semester: I**
Rationale: This course is designed to provide knowledge about feed processing, conservation and feed industry.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather knowledge about rumen ecology ✓ familiar with nutrients and environment ✓ obtain knowledge about digestion and metabolism ✓ acquire knowledge about nutrients requirement of animals			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe importance of feed processing ✓ explain dry and wet processing methods of grain ✓ illustrate physical, chemical, biological and physico-chemical methods of poor quality roughage processing	**Processing of grains and poor-quality roughages:** Importance of processing, methods of grain processing, methods of poor quality roughage processing	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe principle and methods of roughage conservation ✓ explain crops used for silage ✓ illustrate silage microbiology and character of good silage ✓ explain crops used for hay ✓ discuss chemical changes and loss of nutrients during hay making ✓ detect nutritive value of conserved feed ✓ discuss about factors affecting nutritive value of silage ✓ explain use of additive during ensiling	**Conservation of fodders:** Principles of conservation, different methods of conservation, silage making, hay making, nutritive value of conserved feed, factors affecting nutritive value of silage, use of additives during ensiling	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report writing
✓ describe types of anti-nutritive substances ✓ explain anti-nutritional substances depression digestion and metabolism ✓ express anti-nutritional substances inactivating nutrients ✓ make list of toxin substance present in feed ✓ discus the destruction methods of anti-nutritional factors	**Anti-nutritional factors:** Classification, substances depression digestion and metabolism, substances inactivating nutrients, toxin substances present in feed ingredients	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the importance of feed mill industry	**Feed Industry:** Importance of feed milling industry,	Lecture Interactive	Quiz Short answer

✓ draw a flow chart of feed mill ✓ explain the system of raw material receiving ✓ illustrate the conveying, weighing, grinding, mixing, pelleting of ingredients ✓ explain the weighing and packing of finish products ✓ evaluate the physical and chemical characteristics of raw material	different activities of feed mill industry, raw material quality: physical characteristics, chemical characteristics, bioassays and feed microscopy	discussion Visual presentation Brain storming Feedback	Broad answer Class attendance
✓ explain the type of bin/silo used for storage ✓ describe the storage of bagging materials ✓ discuss the bulk and bag delivery of finish products	**Storage and delivery:** Types of bin/silo, bulk intake and storage, intake of bagged materials, bulk and bag in the machineries, bulk and bag transportation	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the importance of quality control ✓ illustrate quality control system of feed mill ✓ explain intensive program for quality control	**Quality control of finished products:** Importance, basic quality assurance programme	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. A. Sahoo, S.K. Sankhyan, S.A. Karim. 2015. Techniques in Animal Nutrition Research. Satish Serial Publishing House. India.
2. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
3. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
4. J. Mulder. 2008. Introduction to Compound Feed Production. PTC+. The Netherlands
5. K.S. Singh and B. Panda. 1988. Poultry Nutrition. Kalyani Publishers. India.
6. S. Leeson and J.D. Summers. 2008. Commercial Poultry Nutrition. 3rd Edn. Nottingham University Press. USA.
7. S.S. Kundu, S.K. Mahanta, S. Singh and P.S. Pathak. 2016. Animal Feed Technology. Satish Serial Publishing House. India.
8. T.M. Prabhu and K. Chandrapal Singh. 2013. Analytical Techniques in Animal Nutrition Research. New India Publishing Agency. India.
9. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 414 Course Title: Feed Processing, Conservation and Feed Industry (Practical)	**Credit Hour: 1**	**Level: 4**	**Semester: I**
Rationale: This course is designed to provide practical knowledge through hand on exercise about feed processing, conservation and feed industry.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ gather practical knowledge about different treatment of low quality roughage ✓ acquire knowledge and skill about preparation of silage and hay ✓ obtain applied knowledge about urea molasses multi-nutritional block ✓ familiar with feed mill operation			
Intended Learning Outcomes (ILOS) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe the different treatment of low quality roughage	Physical, chemical and biological treatment of low quality roughages	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ prepare silage and hay by hand on exercise	Preparation of silage and hay	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ improve nutritional quality of straw by preparing of urea molasses straw	Preparation of urea molasses straw	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ improve nutritional quality of straw by preparing of urea treated straw	Preparation of urea treated straw	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ prepare of urea molasses multi-nutritional block (UMMB)	Preparation of UMMB	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance

✓ sketch a layout of typical feed mill operation ✓ describe and practices different feed mill operation	Feed mill operation	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the use of weighing machine and grinder ✓ bled and grind the feed ingredients	Blending and grinding of feed ingredients	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ explain the use of mixing and pellet machine ✓ mix of ingredient ✓ make pellet	Mixing and pelleting of feed ingredients	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ describe the different delivery systems of finish products ✓ blend and sewing the sag of finish products	Delivery of finish products	Lecture Interactive discussion Visual presentation Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Demonstration performance Identification Practical note book Viva voce Class attendance
✓ justify modern practice used in feed mill	Visit to a feed mill	Lecture Discussion Feed mill visit Feedback Assignment Report writing	Viva voce Report

Reference Books

1. D.V. Reddy. 2018. Principles of Animal Nutrition & Feed Technology. 3rd Edn. Oxford & IBH. India.
2. G.C. Banerjee. 2018. Principles of Animal Nutrition and Feeds. Oxford & IBH. India.
3. J. Mulder. 2008. Introduction to Compound Feed Production. PTC+. The Netherlands
4. S. Leeson and J. D. Summers. 2008. Commercial Poultry Nutrition. 3rd Edn. Nottingham University Press. USA.
5. W. Guoyao. 2017. Principles of Animal Nutrition. Taylor & Francis.

Course Code: ANGB 153 **Course Title: Fundamental Genetics (Theory)**	**Credit Hour: 3**	**Level: 1**	**Semester: II**

Rationale: This course is designed to provide fundamental knowledge of genetics which provide hereditary information and its application for animal improvement.

Course Learning Outcome: The major learning outcomes of this course are to-

- ✓ acquire and apply knowledge on fundamental genetics
- ✓ gain knowledge on Mendelian genetics
- ✓ develop, recognize and awareness about multiple allele, mutation, linkage, crossing over, chromosomal aberration and DNA replication
- ✓ develop skill on molecular genetics

Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ define genetics, gamete, cross, zygote, hereditary traits, gene, locus, allele, phenotype, genotype, heterozygous, homozygous, hybrid, dominant and recessive allele ✓ describe concept, scope and application of genetics in livestock and human welfare. discuss different kinds of variation ✓ list down the branches of genetics and explain the development of the field of genetics ✓ state different types of gene action and describe basic structure and number of chromosomes of different farm animals	**Introduction to Genetics:** Genetical terminology, concept, scope, application and branches of genetics, gene action, variations & chromosome	Lecture Visual presentation Discussion	Quiz Short answer Essay type Class attendance
✓ state Gregor Johann Mendel's contribution in genetics ✓ state Mendel's two laws of inheritance ✓ explain Law of segregation and law of independent assortment with example, describe genotypic & phenotypic ratio of Mendel's laws with example in case of animal ✓ explain about modification of monohybrid and dihybrid ratios with example, explain test cross and back cross	**Mendelian Genetics:** Mendel's contribution, Mendel's laws (law of segregation & law of independent assortment), modification of Mendel's laws, test and back cross	Lecture Visual presentation Discussion	Quiz Short answer Essay type
✓ definition epistasis, epistatic & hypostatic ✓ differentiate between dominance and epistasis ✓ list down different kind of epistatic interaction with example	**Epistasis:** Epistasis, epistatic & hypostatic, kind of epistasis & epistasis interaction	Lecture Visual presentation Discussion	Quiz Short answer Essay type
✓ define multiple alleles, explain the multiple alleles with example ✓ describe coat color inheritance in rabbit ✓ categorize different blood groups & RH factor, explain blood protein polymorphism in animals ✓ explain the causes of erythroblastocis fetus	**Multiple Alleles:** Definition, coat color inheritance in rabbit blood group & blood protein polymorphism	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ define linkage. State kinds of linkage ✓ explain significance of linkage with example ✓ differentiate in linkage and independent assortment ✓ explain coupling and repulsion hypothesis	**Linkage:** Definition, types, significance, independent assortment, coupling & repulsion hypothesis	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ define crossing over ✓ describe kinds of crossing over with example ✓ explain significance of crossing over ✓ state cytological basis of crossing over ✓ define interference and coincidence ✓ discuss gene mapping	**Crossing Over:** Definition, types, significance, interference, coincidence & Gene mapping	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ classify different mechanism of sex determination with example ✓ state sex linked traits and sex-limited traits in farm animals ✓ explain sex influenced characters in farm animal ✓ define autosomal gene & sex-linked genes	**Sex determination and sex related inheritance:** Sex determination, different mechanism of sex determinate, sex linked & limited traits, Sex influenced	Lecture Visual presentation Discussion	Quiz Short answer Essay type

	characters		
✓ define chromosomal aberration, describe intrachromosomal & interchromosomal aberration ✓ classify and genetic significance of intra & inter chromosomal aberration with figure ✓ effects of chromosomal aberration	**Chromosomal Aberration:** Definition, classification & significance, effect of chromosomal aberration	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ state mutation, gene mutation & mutagen ✓ state occurrence & causes of mutation, classify of mutation ✓ explain spontaneous, induced mutation, forward & reverse mutation ✓ report experimental proof of mutation, prove phenotypic and genotypic effect of mutation ✓ list down mutagenic agent & mutation rate with genetic significance	**Mutation:** Gene mutation, causes of mutation, spontaneous, induced, forward & reverse mutation, mutagenic agent & rate & significance of mutation, experimental proof of mutation	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ list down application of molecular genetics ✓ diagram structure of nucleoside, nucleotide, DNA and RNA. Prove DNA as genetic materials ✓ differentiate between DNA and RNA ✓ explain DNA replication and gene regulation in prokaryotes and eukaryotes ✓ prove Chargaff's rules of DNA. State types and functions of DNA, RNA & plasmid. Define gene. Write down the different types of bond that double stranded DNA hold together. ✓ discuss Central dogma theory, genetic code and codon. List down properties of genetic code, codon and synonym codons ✓ explain gene expression, protein, protein synthesis & apparatus with transcription, translation and transduction. Write PCR technology for DNA amplification	**Chemical Basis of Heredity:** Basic concept & structure of chromosome, gene, RNA, DNA, nucleoside, nucleotide & nucleic acid, structure of DNA, mitochondrial DNA, complementary DNA, Chargaff's rules, central dogma theory, DNA replication, definition & properties of genetic code, codon, purin & pyrimidine base, hydrogen bond, phosphodiester bond, gene expression, gene regulation, transduction, transcription & translocation & PCR	Lecture Visual presentation Discussion Assignment	Quiz Short answer Essay type Report writing
✓ elucidate the latest research findings and information about genetics	Latest research findings and information regarding genetics	Assignment	Report

Reference Books

1. A.J.F. Griffiths, J.F. Miller, D.T. Suzuki, R.C. Lewontin and W.M. Gelbart.1996. An introduction to genetic analysis. 6 th ed. New York, W.H. Freeman and Company.
2. D.L. Hartl and E.W. Jones. 1998. Genetics: principles and analysis. 4th ed. Sudbury. Massachusetts. Jones and Barlett.
3. E.J. Gardner. M.J. Simmonds and D.P. Snustard. 1991. Genetics. John Wiley and Sons, New York.
4. F.W. Nicholas. 1987. Veterinary Genetics. Clarendon Press, Oxford
5. J.D. Hawkins. 1996. Gene structure and expression. 3rd ed. Cambridge University Press.
6. P.K. Gupta. 2015. Genetics. 4th Rev. Ed, 3 rd ed. 2014-15. Rastogi Publications. New Delhi.
7. P.S. Verma, and V.K. Agarwal. 1989. Genetics, S. Chand and Co. Ltd., New Delhi.
8. S.S. Purohit and S. K. Mathur. 2000. Biotechnology-Fundamentals and application. Agrosbios, Jodhpuir, India.

Course Code: ANGB 154 **Course Title: Fundamental Genetics (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide applied knowledge of genetics study by working out different problems related to farm animal for improvement.			
Course Learning Outcome: The major learning outcomes of this course are to- ✓ acquire knowledge on applied genetics and animal cell ✓ obtain knowledge to prepare a slide for cell division and practically observe ✓ attain knowledge on gametogenesis ✓ gather knowledge about preparation of culture media for genetic study and sexing of drosophila ✓ work out and solve the problems of Mendelian genetics and chi-square test			
Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ show materials used for genetic study and their handling	Materials for genetic study	Lecture Discussion Demonstration	Demonstration Performance Viva-voce Practical note book preparation
✓ sketch the animal cells	Animal cells	Lecture Discussion Demonstration	Demonstration Performance Viva-voce Practical note book preparation
✓ preparation of slide using onion root ✓ find out mitosis cell division using onion roots	Making slide of mitosis using onion root to observe Mitosis cell division	Lecture Discussion Demonstration Hand on practice	Demonstration Performance Viva-voce Practical note book preparation
✓ sketch meiosis cell division	Meiosis cell division	Lecture Discussion Demonstration Group Work	Demonstration Performance Viva-voce Practical note book preparation
✓ explain spermatogenesis	Gametogenesis (Spermatogenesis)	Lecture Discussion	Demonstration Performance Viva-voce Practical note book preparation
✓ discuss oogenesis	Gametogenesis (Oogenesis)	Lecture Discussion	Demonstration Performance Viva-voce Practical note book preparation
✓ demonstrate preparation of culture media of drosophila ✓ identify life cycle of drosophila	Preparation of culture media for drosophila	Lecture Discussion Demonstration Hand on practice	Demonstration Performance Viva-voce Practical note book preparation Class attendance
✓ show morphology of drosophila ✓ differentiate male and female	Morphology of Drosophila	Lecture Discussion Demonstration	Demonstration Performance Viva-voce

drosophila		Hand on practice	Practical note book preparation
✓ calculate the possible gametes formation from particular genotype ✓ solve the different problems on monohybride & dihybride crosses	Mendelian genetics	Lecture Discussion Demonstration Group Work Problem solving	Demonstration Performance Viva-voce Practical note book preparation
✓ solve Chi-square test in farm animals	Chi-square test	Lecture Discussion Demonstration Problem solving	Demonstration Performance Viva-voce Practical note book preparation

Reference Books

1. A.J.F. Griffiths, J.F. Miller, D.T. Suzuki, R.C. Lewontin and W.M. Gelbart.1996. An introduction to genetic analysis. 6 th ed. New York, W.H. Freeman and Company.
2. D.L. Hartl and E.W. Jones. 1998. Genetics: principles and analysis. 4th ed. Sudbury. Massachusetts. Jones and Barlett.
3. E.J. Gardner. M.J. Simmonds and D.P. Snustard. 1991. Genetics. John Wiley and Sons, New York.
4. F.W. Nicholas. 1987. Veterinary Genetics. Clarendon Press, Oxford.
5. J.D. Hawkins. 1996. Gene structure and expression. 3rd ed. Cambridge University Press.
6. P.K. Gupta. 2015. Genetics. 4th Rev. Ed, 3 rd ed. 2014-15. Rastogi Publications. New Delhi.
7. P.S. Verma, and V.K. Agarwal. 1989. Genetics, S. Chand and Co. Ltd., New Delhi.
8. S.S. Purohit and S.K. Mathur. 2000. Biotechnology-Fundamentals and application. Agrosbios, Jodhpuir, India.

Course Code: ANGB 313 **Course Title: Livestock and Poultry Breeding (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: 1**
Rationale: This course is designed to provide fundamental knowledge of livestock & poultry breeding.			
Course Learning Outcome: The major learning outcomes of this course are to- ✓ acquire and apply knowledge on animal breeding, animal evolution and conservation of genetic resources ✓ develop analytical skill about genetics constitution of population, variance, heritability, repeatability and breeding value ✓ develop, recognize and awareness of special breeding method and breeding policy of farm animals ✓ acquired modern knowledge on use of technology in the improvement of animal breed with disease resistance			
Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ concept of animal breeding, breed, line, type and strain ✓ describe **e**arly history of animal breeding ✓ different traits in farm animals ✓ write down importance/use and objectives of animal breeding in livestock improvement ✓ explain Robert Bake well and his contributions and classify of livestock traits	**Introduction:** Terminology, history, importance, livestock traits, contribution of Robert Bake Well	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ explain the terms related to genetic constitution of population ✓ state and proof Hardy Weinberg law ✓ discuss gene and genotypic frequency ✓ enlist the factors modifying the gene & genotypic frequencies (Selection, mutation, migration, and random genetic drift) ✓ elucidate Hardy Weinberg law in small and idealized population	**Genetic Constitution of population:** Genetic constitutes Hardy Weinberg law**,** gene and genotype frequency & idealized population	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ differentiate qualitative and quantitative traits in farm animals ✓ describe population mean, metric characters and normal distribution in population ✓ explain average effect of gene, dominance and interaction deviation ✓ partitioning of phenotypic variation in a population. And describe phenotypic variation, additive and non-additive variance, average effect of gene ✓ distinct dominance, epistatic & environment variation and interact between genotype and environment	**Values and Means:** Qualitative and quantitative traits. Populations mean, gene & environmental interaction and phenotypic variation	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ define and concept of Heritability and explain method of estimation of heritability ✓ discuss parent-offspring regression, sib analysis, twin analysis method for estimation of heritability. Describe ✓ illustrate practical application of heritability in animal	**Population Parameters:** Heritability, methods & practical application	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ define and concept of repeatability and describe different methods of repeatability ✓ estimate repeatability from balance and unbalance data ✓ uses of repeatability	**Repeatability:** Definition, importance, methods & its calculation	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ define breeding value and explain the methods of estimation of BV with its application ✓ describe single and multiple records from pedigree analysis and progeny testing method ✓ explain best linear unbiased prediction (BLUP), most probable producing ability (MPPA) and transmitting ability (TA)	**Breeding Value:** Definition, uses, record, BLUP, MPPA & TA	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ define selection and compare natural and artificial selection ✓ illustrate selection objectives and criteria ✓ discuss tandem selection, independent culling level & selection index ✓ calculate selection index ✓ enlist aids to selection and state mass, life time performance, pedigree information, progeny performance and family selection ✓ Explain sib analysis and family selection and their	**Selection:** Definition, natural & artificial selection, methods and aid of selection, selection limit	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type

advantage and limitations in animal breeding Practices			
✓ explain response to selection, selection differentials and selection limit ✓ state factors responsible for genetic gain and to know the relationship about heritability, selection differential, generation interval and selection intensity	**Response to Selection:** Response to selection, selection differential, factors, limitations. Recurrent & reciprocal recurrent selection	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ state different mating system ✓ classification of inbreeding with its advantages and disadvantages ✓ explain genetic and phenotypic effects of inbreeding and illustrate the application of inbreeding in animal breeding ✓ discuss inbreeding coefficient & inbreeding depression ✓ discuss about close breeding and line breeding	**Breeding methods:** Mating system, inbreeding & inbreeding coefficient, inbreeding depression, applications	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ students are able to know out crossing, cross breeding (criss crossing, triple crossing, back crossing), grading up, & species hybridization with its merits and demerits ✓ describe the different theory of heterosis	**Out breeding:** Definition**,** types of out breeding with its merits and demerits, heterosis	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ define biodiversity, Species diversity & Breeding system ✓ key issues in animal breeding and set up a breeding program ✓ breed association and its meaning ✓ explain FAnGR in Bangladesh and its management. ✓ describe conservation and development of FAnGR and genetic erosion ✓ illustrate Nucleus breeding system & community-based livestock breeding system ✓ discuss Breeding policy decision in our country	**Genetic diversity:** Biodiversity, breeding system, FAnGR, nucleus and community-based breeding system & genetic erosion	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ explain history of poultry breeding ✓ write down the prospects of poultry breeding ✓ describe mass, family selection, pedigree selection and explain recurrent, reciprocal recurrent selection and general combining ability ✓ calculate selection index and to know one, two and three-way crossing ✓ selection and breeding for egg and meat production in poultry ✓ describe breeding strategy for commercial meat and egg production ✓ explain breeding for disease resistance and environmental adaptation	**Poultry breeding:** History, prospects availably poultry genetic resources in our country, selection and breeding of poultry, breeding management, disease resistant & environmental adaptation	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type
✓ obtain latest research findings and practices regarding livestock and poultry breeding	Latest research findings and information regarding in the field of livestock and poultry breeding	Assignment	Report

Reference Books

1. A.B. Chapman, (Ed). 1985. General Quantitative Genetics. Elsevier Science Publishers BV, Amsterdam.
2. Cameron. 1997. Selection Indx and prediction of genetic merit in Animal Breeding.
3. C. Chantalakhana. 1988. Genetics and Breeding of Swamp Buffaloes. Elsevier Science Publishers.BV, Amsterdam.
4. Etches. 1996. Reproduction in Poultry. Amazon. Co. UK.
5. J.F. Laseley. 1978. Genetics of Livestock Improvement (3rd Edn). Prentice- Hall, Englewood Cliffs, New Jersey.
6. J.L. Lush. 1945. Animal Breeding, lowa State College Press, Ames.
7. **Md. Mohan Mia. 2017.1st Edn.** Classical and Molecular Genetics. American academy press.
8. R.D. Crawford. 1990. Poultry Breeding and Genetics. Elsevier Science Publishers BV. Amsterdam
9. S.S. Tomar. 2010. 2 nd Edn. Text book of animal breeding. Kalayani publisher.
10. W.A. Becker. 1985. Manual of quantitative Genetics (4th Edn.). Academic Enterprise, Washington, D.C.

Course Code: ANGB 314 **Course Title: Livestock and Poultry Breeding (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: 1**
Rationale: This course is designed to provide practical knowledge about livestock & poultry breeding.			
Course Learning Outcome: The major learning outcomes of this course are to- ✓ acquire knowledge on record system of breeding farm ✓ obtain knowledge about genetic resources of livestock & poultry in Bangladesh ✓ develop analytical skill about different analysis of variance, heritability, repeatability ✓ acquire knowledge on gene & genotype frequency ✓ attain knowledge about quantitative traits ✓ analyze most probable producing ability, breeding value and transmitting ability ✓ gather ideas on research activities of different research institutes by physical visit			
Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ elucidate systems of keeping breeding records in different farm animals	Data collection & recording	Lecture Discussion Demonstration Group Work	Demonstration Performance Viva-voce Practical note book
✓ identification of indigenous livestock genetic resources of Bangladesh	Animal identification and farm animal genetic resources	Lecture Discussion Demonstration Group Work	Demonstration Performance Viva-voce Practical note book
✓ calculate the gene and genotypic frequency using hardy-Weinberg law ✓ detect the changes of gene frequencies in the population ✓ calculate the requirement of generation for a particular gene frequency	Gene and genotype frequency	Lecture Discussion Demonstration Group Work Problem solving Brain storming	Demonstration Performance Viva-voce Practical note book Class attendance
✓ analyze the variance and measurement of variance components ✓ ranking the breed using multiple comparison tests ✓ estimate the component variance between & within breed & intraclass correlation	Analysis of variance measurement	Lecture Discussion Demonstration Group Work Problem solving Brain storming	Demonstration Performance Viva-voce Practical note book
✓ estimate Heritability by sib analysis (Full sib & half sib analysis ✓ estimate the heritability by regression method	Estimation of heritability for quantitative traits	Lecture Discussion Demonstration Group Work Problem solving Brain storming	Demonstration Performance Viva-voce Practical note book
✓ estimation of repeatability by intra class co-relation	Estimation of repeatability of quantitative traits	Lecture Discussion Demonstration Group Work Problem solving Brain storming	Demonstration Performance Viva-voce Practical note book
✓ prediction of Breeding Value	Estimation of	Lecture	Demonstration

(BV), transmitting ability (TA) and most probable producing ability (MPPA) & ranking the animals	breeding value, transmitting ability & most probable producing ability	Discussion Demonstration Group Work Problem solving Brain storming	Performance Viva-voce Practical note book
✓ estimation of Heterosis in dominance and over dominance theory	Heterosis	Lecture Discussion Demonstration Group Work Brain storming	Demonstration Performance Viva-voce Practical note book
✓ construct and calculate selection index	Selection index	Lecture Discussion Demonstration Group Work Brain storming	Demonstration Performance Viva-voce Practical note book
✓ estimate inbreeding co-efficient in an individual and population	Inbreeding and inbreeding co-efficient of farm animals	Lecture Discussion Demonstration Group Work Problem solving Brain storming	Demonstration Performance Viva-voce Practical note book
✓ formulate of mating design	Mating design	Lecture Discussion Demonstration Group Work Brain storming	Demonstration Performance Viva-voce Practical note book
✓ describe different activities of livestock breeding farms, centers, natural habitats and germplasm conservation center	Research institutes physical visit	Lecture Discussion Demonstration Assignment	Demonstration Performance Viva-voce Practical note book

Reference Books

1. A.B. Chapman, (Ed). 1985. General Quantitative Genetics. Elsevier Science Publishers BV, Amsterdam.
2. Cameron. 1997. Selection Indx and prediction of genetic merit in Animal Breeding.
3. C. Chantalakhana. 1988. Genetics and Breeding of Swamp Buffaloes. Elsevier Science Publishers.BV, Amsterdam.
4. Etches. 1996. Reproduction in Poultry. Amazon. Co. UK.
5. J.F. Laseley. 1978. Genetics of Livestock Improvement (3rd Edn). Prentice- Hall, Englewood Cliffs, New Jersey.
6. J.L. Lush. 1945. Animal Breeding, lowa State College Press, Ames.
7. **Md. Mohan Mia. 2017.1st Edn.** Classical and Molecular Genetics. American academy press.
8. R.D. Crawford. 1990. Poultry Breeding and Genetics. Elsevier Science Publishers BV. Amsterdam.
9. S.S. Tomar. 2010. 2 nd Edn. Text book of animal breeding. Kalayani publisher.
10. W.A. Becker. 1985. Manual of quantitative Genetics (4th Edn.). Academic Enterprise, Washington, D.C.

Course Code: ANGB 455 **Course Title: Reproduction of Farm Animals and Biotechnology (Theory)**	**Credit Hour: 3**	**Level: 4**	**Semester: II**
Rationale: This course is designed to provide knowledge of reproductive biotechnology especially artificial insemination and its application for farm animal improvement.			
Course Learning Outcome: The major learning outcomes of this course are to- ✓ familiar on basic reproductive system of farm animal ✓ gain knowledge on reproductive hormone of farm animal ✓ students will be able to know how to improve fertility condition of farm animal ✓ obtain details knowledge about artificial insemination technology by using good quality semen for improvement of farm animal ✓ acquire knowledge on modern biotechnology and its application to genetically improvement of animal			
Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ define reproduction ✓ state scope of animal reproduction ✓ types of reproduction in various species of animals ✓ explain relationship with genetics and breeding	**Introduction:** Definition, scope, types & relationship	Lecture Visual presentation Discussion	Quiz Short answer Essay type
✓ define hormones, receptor. and classify the hormone ✓ explain properties, function and mode of action of hormone ✓ chart of hormonal control of male and female reproduction with hormone assay ✓ illustrate hormone like substances-growth factors and prostaglandins ✓ interaction between genetics and endocrinology	**Reproductive Hormone:** Definition, classification, functions, growth factors & prostaglandins & interaction	Lecture Visual presentation Discussion	Quiz Short answer Essay type
✓ explain puberty, its practical application and factors affecting puberty ✓ draw a chart in puberty, estrus and ovulation in different farm animals ✓ phases of estrous cycle with time and related events in different ruminants and sign of estrus ✓ draw different stages of estrus cycle ✓ discuss breeding season and its effect on reproduction and discriminate maternal and neonatal behavior ✓ observed some measurements of the age at puberty together with characteristics of estrous cycle	**Reproductive cycle and sexual behavior:** Puberty, estrous cycle, breeding season, maternal & neonatal behavior	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster Class attendance
✓ explain fertilization of farm animal ✓ describe fusion of gametes and related preparation for activation of egg and its development	**Fertilization:** Fertilization & gamete	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ define fertility and sterility ✓ explain reproductive failure and economics of poor fertility ✓ measures the reproductive efficiency in male and female ✓ discuss common reproductive disease ✓ construct herd fertility improvement	**Herd fertility:** Fertility, sterility, efficiency, reproductive disease & herd fertility	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ explain semen physiology and sperm biology with composition and properties of semen ✓ diagram structure of sperm and explain physiology and fertilizing ability of sperm ✓ illustrate survival of sperm in vivo and in vitro condition	**Semen physiology and sperm biology:** Semen biology, composition, structure & evaluation	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ describe history of AI ✓ advantages and limitations of artificial insemination. ✓ describe the collection technique, extension and storage of semen ✓ students should be able to know the insemination requirements and related phenomena in farm animals ✓ discuss semen evaluation, diluents and their composition	**Artificial Insemination:** History, advantages, limitations of AI and collection, storage, extension of semen	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster

✓ function and composition of semen diluents and calculate the dilution ration of semen			
✓ describe management of females, explain preparation and examination of AI bulls ✓ discuss management of breeding males & teasers ✓ illustrate insemination techniques in different species ✓ discriminate time of insemination for maximum conception ✓ explain maintenance of AI records	**AI management:** Female management, bull management, AI technique, timing of AI & AI record	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ define reproductive biotechnology with scope, history and its application in animal industry ✓ illustrate estrus synchronization with its principles, general ways, hormonal doses and advantages ✓ discriminate Multiple Ovulation and Embryo Transfer (MOET) with its biological flexibility, different steps, hormonal doses and advantages ✓ illustrate frozen semen production technology ✓ discriminate methods and application of DNA, reproductive and therapeutic cloning with its research protocol ✓ concepts, consequences, advantages, disadvantages and risk of embryo cloning	**Reproductive Biotechnology:** Definition, scope, history, estrous synchronization, MOET, ET, frozen semen & cloning	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ explain *In vitro* maturation (IVM) and *in vitro* fertilization (IVF) of mammalian oocyte. and *in vitro* culture (IVC) of embryos and their transfer in surrogate mother ✓ flow diagram of collection, evaluation, IVM, IVF, IVC of goat oocytes with grading of COCs and sperm capacitation ✓ cryopreservation of semen, oocyte, embryos and evaluation of semen ✓ illustrate embryo slicing and their application in modern animal production and characteristics of X and Y chromosome bearing spermatozoa and methods of separation of sex chromosome ✓ explain embryonic stem cells culture ✓ discuss transgenic animals. and Knock-out mouse	**Assisted reproductive technologies:** IVM, IVF, IVC, cryopreservation, embryo slicing, separation of X or Y spermatozoa, ovum pick-up, stem cell, semen evaluation, transgenic animal & Knock-out mouse	Lecture Visual presentation Discussion Feedback	Quiz Short answer Essay type Assignment /poster
✓ obtain latest research findings and practices regarding reproductive biotechnology	Latest research findings and information regarding AI, semen evaluation, frozen semen, estrus synchronization, IVM, IVF, IVC, MOET, cloning, transgenic animal, stem cell, separation sex chromosome etc.	Assignment	Report

Reference Books

1. Bulter. 2008. Animal cell culture & Technology (2nd Edn). Amazon. Co. UK.
2. C.R. Austin and R.V. Short. 1991. Reproduction in mammals. Cambridge University, London.
3. C.R. Austin and R.V. short. Book 2, 1991. Reproduction in mammals. Cambridge University, London.
4. C.R. Austin and R.V. short. Book 5, 1990. Reproduction in mammals. Cambridge University, London.
5. E.S.E. Hafez . 2013. Reproduction in Farm Animals. 7th Edition. Wiley-Blackwell.
6. Houdebine. 2003. Animal Transgenesis and Cloning. Amazon.Co.UK.
7. J.R. Mitchell. and Gordon. 2009. The artificial Insemination & Embryo transfer of Dairy and beef cattle.
8. M. Richard, F.John and P. Jennifer. 2014. In vitro fertilization. John Wiley & Sons, Inc.
9. Renaville. 2008. Biotechnology in Animal Husbandry (HB). Amazon.co.UK.
10. Renaville. 2008. Biotechnolgy in Animal Husbandry. Paragon Enterprise ltd.
11. S.S. Purohit and S.K. Mathur. 2000. Biotechnolgy Fundamentals and application. Agrosbios, Jodhpuir, India.
12. Tomar and Palel. Handbook of Genetics and Biotechnology. Nipa publication Author.

Course Code: ANGB 456 **Course Title: Reproduction of Farm Animals and Biotechnology (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**
Rationale: This course is designed to provide applied knowledge of reproductive biotechnology and develop skill by working out different problems related to farm animal for improvement.			
Course Learning Outcome: The major learning outcomes of this course are to- ✓ acquire knowledge on methods of reproductive sample collection ✓ obtain knowledge about semen collection and evaluation ✓ attain knowledge about management of breeding animal ✓ practice on artificial insemination technique ✓ gather knowledge of oocyte collection, in vitro maturation, in vitro fertilization and in vitro culture ✓ familiar on research activities of different research institutes by physical visit			
Intended Learning Outcomes (ILOs) The Students will be able to-	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
✓ elucidate methods of reproductive sample collection	Collection of reproductive samples	Lecture Discussion Demonstration	Demonstration performance Practical note book Viva-voce, Class attendance
✓ practice different method of semen collection of different farm animals	Semen collection practice	Lecture Discussion Demonstration	Demonstration performance Practical note book Viva-voce, Class attendance
✓ perform evaluation of semen: enumeration of spermatozoa	Semen evaluation by enumeration of sperm	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ discuss evaluation of semen: physical & pH test	Semen evaluation by physical and pH test	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ elucidate evaluation of semen: mass motility estimation and individual count of sperm movement	Semen evaluation by mass motility & individual count	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ perform evaluation of semen: methylene blue reduction test	Semen evaluation by methylene blue reduction test	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ describe evaluation of semen: find out live and dead cell count	Semen evaluation by count of live and dead cell	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ elucidate evaluation of semen: find out normal and abnormal count of *spermatozoa* (Morphology)	Semen evaluation by studying semen morphology	Lecture Discussion Demonstration Group Work Problem solving	Demonstration performance Practical note book Viva-voce, Class attendance
✓ demonstrate management practices of breeding animals	Breeding animal management	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ demonstrate diluents preparation and extension of	Diluents preparation and	Lecture Discussion	Demonstration performance Practical note book

semen	semen extension	Demonstration Group Work	Viva-voce, Class attendance
✓ discuss production of frozen semen	Production of frozen semen	Lecture Discussion Demonstration Group Work	Demonstration performance Practical note book Viva-voce, Class attendance
✓ practice artificial insemination technique in farm animals	Artificial insemination practice	Lecture Discussion Demonstration Group Work Problem solving	Demonstration performance Practical note book Viva-voce, Class attendance
✓ practice *Oocyte* collection, *in vitro* maturation, *in vitro* fertilization and *in vitro* culture protocol	Oocyte collection by IVM, IVF & IVC	Lecture Discussion Demonstration Group Work Problem solving	Demonstration performance Practical note book Viva-voce, Class attendance
✓ observe routine activities at AI center	Practice AI center activities	Lecture Discussion Demonstration	Report Viva-voce Practical note book Class attendance
✓ describe the activities of different livestock farms, AI center and biotechnology lab	Visit research institutes	Lecture Discussion Demonstration Assignment	Report Viva-voce Practical note book Class attendance

Reference Books

1. Bulter. 2008. Animal cell culture & Technology (2nd Edn). Amazon. Co. UK.
2. C.R. Austin and R.V. Short. 1991. Reproduction in mammals. Cambridge University, London.
3. C.R. Austin and R.V. short. Book 2, 1991. Reproduction in mammals. Cambridge University, London.
4. C.R. Austin and R.V. short. Book 5, 1990. Reproduction in mammals. Cambridge University, London.
5. E.S.E. Hafez . 2013. Reproduction in Farm Animals. 7th Edition. Wiley-Blackwell.
6. Houdebine. 2003. Animal Transgenesis and Cloning. Amazon.Co.UK.
7. J.R. Mitchell. and Gordon. 2009. The artificial Insemination & Embryo transfer of Dairy and beef cattle.
8. M. Richard, F. John and P. Jennifer. 2014. In vitro fertilization. John Wiley & Sons, Inc.
9. Renaville. 2008. Biotechnology in Animal Husbandry (HB). Amazon.co.UK.
10. Renaville. 2008. Biotechnolgy in Animal Husbandry. Paragon Enterprise ltd.
11. S.S. Purohit and S.K. Mathur. 2000. Biotechnolgy Fundamentals and application. Agrosbios, Jodhpuir, India.
12. Tomar and Palel. Handbook of Genetics and Biotechnology. Nipa publication Author.

Department of Animal Production & Management (APMA)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	APMA 111: Animal Science & Ecology (Theory)	2	1	I
2.	APMA 112: Animal Science & Ecology (Practical)	1	1	I
3.	APMA 211: Beef Cattle & Large Animal Production (Theory)	2	2	I
4.	APMA 212: Beef Cattle & Large Animal Production (Practical)	1	2	I
5.	APMA 351: Goat, Sheep & Small Animal Production (Theory)	1	3	II
6.	APMA 352: Goat, Sheep & Small Animal Production (Practical)	1	3	II
7.	APMA 451: Wild life, Zoo, Pet, Lab. & Aquatic Animal Management (Theory)	2	4	II
8.	APMA 452: Wild life, Zoo, Pet, Lab. & Aquatic Animal Management (Practical)	1	4	II
9.	APMA 511: Meat and Wool Technology & Animal By-Products Management (Theory)	2	5	I
10.	APMA 512: Meat and Wool Technology & Animal By-Products Management (Practical)	1	5	I
Total (Theory + Practical) 9+5= 14				

Total Credit Hour	
Theory	9
Practical	5
Total	**14**

Course Code: APMA 111 **Course Title: Animal Science & Ecology (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: I**
Rationale: This course is designed to provide fundamental concept of livestock and their practices involved in animal sciences with ecology.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental issues of farm animals ✓ obtain knowledge on livestock management ✓ outline livestock and poultry farming techniques considering climatic effect ✓ gather knowledge for uses of animal products and their by-products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define animal science, animal husbandry and livestock ✓ explicate the scope of animal science, animal husbandry and livestock ✓ express the prospects and constraints of livestock and poultry ✓ classify the common farm and domesticated animal zoologically	**Introduction**: Definition and scope of animal science, animal husbandry and livestock; importance and constraints of livestock production; zoological classification of common farm and domesticated animals	Lecture Interactive discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the origin, domestication and distribution of livestock ✓ know farming systems of global and Bangladesh and their variables ✓ recognize the livestock contribution in global and Bangladesh perspective	**Domestication and distribution:** Origin, domestication and distribution of livestock; contribution of livestock in the farming system of Bangladesh and in the world	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ elucidate animal's terms according to age, sex and purpose	**Terminology:** Glossary of animals according to age, sex and purpose	Lecture Interactive discussion Feedback	Quiz Short answer Class attendance
✓ describe animal genetic resource and indigenous livestock of Bangladesh ✓ classify different breeds of livestock with examples according to purpose and location	**Introduction to animal genetic resources**: Animal genetic resource of Bangladesh; breeds of cattle, buffalo, goat & sheep breeds	Lecture Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ learn about livestock feeds and their classification	**Livestock feeds:** livestock feeds and classification	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ define housing for livestock ✓ describe advantages and disadvantages of livestock house ✓ select farming sites for livestock houses	**Housing of livestock:** Definition, site selection, advantages & disadvantages of different types of housing; housing system & requirement for cattle and goat	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ define farm and farm management ✓ get acquaintance with different farm management practices	**Different farm management practices**: Approaching, handling, casting, marking, dentition, castration, shearing, clipping, grooming, washing, docking, dehorning, disbudding, clothing, shoeing etc.	Lecture Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ define and differentiate health and disease status of livestock ✓ separate healthy and diseased animal ✓ prevent and control of livestock diseases in the farms	**Animal health management:** Definition of animal health & disease; signs of good and ill-health; prevention & care of diseases of livestock	Lecture Visual presentation Interactive discussion Feedback	Quiz Broad answer Class attendance
✓ gain knowledge on types, effects and causes of behavior in domestic animals ✓ identify vices of domesticated animals and their remedies	**Animal behavior**: Definition of behavior; types & effects of behavior in domestic animals; causes of behavioral responses in animals	Lecture Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ acquaint different types and measures of animal welfare and their practices	**Animal welfare**: Discussion, types of welfare, measures of animal welfare, improvement	Lecture Interactive discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ define ecology and environment ✓ describe the branches of ecology ✓ draw relationship of animal ecology with other farming disciplines ✓ acquire knowledge about climatic effect on animals and their acclimatization & adaptation	**Animal ecology and environmental adaptation:** Definition & branches of ecology; relationship of ecology with other disciplines; effect of climate on animals; acclimatization and adaptation of exotic animals in Bangladesh	Lecture Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. A. Macfadyen. 1966. Animal Ecology: Aims and Methods. Sir Isaac Pitman & Sons Ltd. London.
2. A.F. Fraser and D.M. Broom. 1990. Farm Animal behaviour and welfare, 3rd edition, Thomson Litho Ltd. Scottland, U.K.
3. F.L.H. James, Michael Ralphs and N.B. Darwin. 1988. The Ecology and Economic Impact of poisonous plants on livestock production. West view press/Boulder and London. 6. Mark Ridely. 1990. Animal Behaviour. A concise introduction. Blackwell Scientific publications. Oxford, U.K.
4. G. C. Benerjee. 2011. A Text Book of Animal Husbandry. 8th edition, Oxford and IBH publishing Co. New Delhi, 11001 India.
5. J. Webster 2011. Management & Welfare of Farm Animals. Wiley-Blackwell.
6. L. Peel and D.E. Tribe. 1983: Domestication, conservation and use of animal resources. World Animal Science A-1, Basic Information, Elsevier, 100 A.E Amsterdam, Netherlands.
7. M. K. Rai 2012. Text book of Animal Husbandry. Oxford Book Co.
8. M.E. Ensminger. 1969. Animal Science, Sixth edition, The interstate Printers and publishers Inc. Danville, Illinois, U.S.A.
9. S. Tomar 2013. Basic operations of Animal Husbandry. Oxford Book Co.
10. V.K. Singh 2017. Animal Science & Management.

Course Code: APMA 112 **Course Title: Animal Science & Ecology (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**
Rationale: This course is designed to provide applied knowledge on elementary animal production & management and to apply the practical knowledge in different farm animals.			
Course Learning Outcomes: The major learning outcomes of this course are to - ✓ obtain practical knowledge on livestock management ✓ explain applied livestock farming techniques ✓ acquire practical knowledge on different farm practices			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe the importance of study animal psychology and behavior ✓ explain elaborately animal psychology and behavior	Animal psychology and behavior	Lecture Visual presentation Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ approach and handle of farm animals	Approaching and handling of different farm animals	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the objective of restraining animals ✓ control the animal partially with different restraining tools	Restraining of animals with different tools	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the objective of casting ✓ control animal completely ✓ show different method for casting	Casting of animals	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ identify different external body points of cattle, buffalo, goat, sheep, horse, pig etc. ✓ differentiate different farm animals according to external body points of view	Identification of external body points of livestock	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the importance of live weight determination of livestock ✓ determine the live weight of animal by measuring tapes	Live weight determination of livestock	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the importance of ageing of livestock ✓ determine the age of cattle, buffalo, goat, sheep, horse, etc. by dentition	Dentition and ageing of livestock	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the objective of castration ✓ castrate livestock by different methods	Castration of livestock	Lecture Visual presentation Demonstration Hand on practice	Quiz Short answer Performance Identification

		Group discussion Practical note book preparation	Practical note book Viva voce Class attendance
✓ describe the importance of marking ✓ identify the individual animal by different marking tools	Marking of livestock	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the importance of grooming and washing ✓ practice grooming and washing of animals	Grooming and washing of animals	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the importance of bedding and clothing of livestock ✓ identify Bedding and clothing materials for livestock	Bedding and clothing of livestock	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ describe the importance of dehorning and disbudding of farm animals ✓ practice dehorning and disbudding of farm animals	Dehorning and disbudding of farm animals	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ explain the importance of shoeing of animals ✓ demonstrate shoeing of animals ✓	Shoeing of animals	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ identify livestock feeds ✓ enlist different livestock feed available in Bangladesh	Identification of livestock feedstuffs	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance
✓ justify modern practices maintained in livestock farms	Visit to the livestock farms for practical experience	Lecture Visual presentation Demonstration Hand on practice Group discussion Practical note book preparation	Quiz Short answer Performance Identification Practical note book Viva voce Class attendance

Reference Books

1. M.K. Rai. 2012. Textbook of Animal Husbandry. Oxford Book Co.
2. M.F. Fowler. 1989. Restraining and Handling of Wild and Domestic Animals. 3rd edition, Wiley-Blackwell Publishing, USA.
3. M.M. Hossain and S. Akhter. 1999. Practical Animal Science. 1st edition. Department of Animal Science Bangladesh Agricultural University, Mymensingh2202, Bangladesh.
4. S. Tomar. 2013. Basic operations of Animal Husbandry. Oxford Book Co.
5. V.K. Singh. 2017. Animal Science & Management.
6. W.C. Miller and E.D.S. Robertson. 1959. Practical Animal Husbandry. 7th Edition, Oliver and Boyd. Edingburg. Tweeddale court.

Course Code: APMA 211 **Course Title: Beef Cattle and Large Animal Production (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide knowledge on beef cattle and large animal production system.			
Course Objectives: The major learning outcomes of this course are to- ✓ acquire knowledge about different animal management ✓ explain knowledge on different animal production system ✓ apply beef cattle & large animal farming techniques ✓ demonstrate knowledge on selection & judging of different animals			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe domestication & geographical distribution of beef cattle ✓ categorize beef cattle industry ✓ generalize prospects & problems of beef cattle program	**Introduction of beef cattle**: History, domestication & geographical distribution of beef cattle; terminology related to beef cattle production; beef cattle industry in the world; prospects & problems of beef cattle enterprise in Bangladesh	Lecture Interactive discussion Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify types & breeds of beef cattle ✓ compare popular beef breeds ✓ select the animals for next generation ✓ identify the beef cattle ✓ measure the growth pattern of beef cattle	**Breeds & selection of beef cattle:** Different types & breeds of beef cattle in the world; popular breeds of beef cattle. Judging & Selection of cattle for beef cattle enterprise; methods of measuring growth pattern of beef cattle	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ narrate production program of beef cattle ✓ illustrate housing & equipment's of beef cattle ✓ detect breeding system of beef cattle ✓ discuss management of beef calf & cowherd	B**eef cattle management:** Production program of beef cattle; effect of environment on beef cattle production. Housing & equipment's of beef cattle; common breeding system of beef cattle; management of beef calf & cowherd	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ design feeding management ✓ elucidate feed additives, growth promoters, supplement & probiotics for beef fattening ✓ describe the effect of feed additives, growth promotes and probiotics	**Feeds & feeding of beef cattle:** General feeding management; concept on feed additives, growth promoters & probiotics for beef cattle production	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define health and disease ✓ know the preventive measures of beef cattle	**Beef cattle health management:** Management and common preventive measures of beef cattle	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ express domestication & geographical distribution of different animals ✓ describe draught animal's terms ✓ know the importance and constraints of beef cattle ✓ execute importance and constraints of draught power	**Introduction of buffalo and horse**: History, domestication & geographical distribution of buffalo & horse; terminology of buffalo & horse	Lecture Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify types & breeds of draught animals ✓ familiar with popular draught cattle ✓ select the animals for next generation ✓ judge the draught animals for different purposes	**Breeds & selection:** Different types & breeds of buffalo, horse in the world; most popular breeds of buffalo & horse available in the world; buffalo as a multipurpose animal; judging &selection of buffalo & horse	Lecture Interactive discussion Visual presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate housing & equipment's of draught animals ✓ explain breeding of draught animals ✓ justify training of draught animals ✓ express feeds & feeding in draught animal production	**Management:** Housing of buffalo, horse; breeding concepts of buffalo & horse production; concept of feeds & feeding in buffalo & horse production	Lecture Interactive discussion Visual presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ familiar with common draught animal ✓ take measures to preventive management of draught animals	**Health management:** Management and common preventive measures of buffalo & horse	Lecture Interactive discussion Visual presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ elucidate the basic knowledge of large animal production ✓ common behavior and psychology of horse, elephant and others large animals ✓ explain management of large animal production	**Others large animal production:** Elementary and basic knowledge on camel, elephant, donkey etc. General management of camel, elephant, donkey etc.	Lecture Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. A.I. Neumann. 1977. Beef cattle. 7th edition John Wiley & Sons. Inc. USA.
2. C.C. Mary and I.A. Dye. 1978. Commercial beef cattle production. 2nd edition, I.E.A. and Febriger Philadelphia, USA.
3. G.C. Benerjee. 2011. A Text Book of Animal Husbandry. 8th edition, Oxford and IBH publishing Co. New Delhi, 11001 India.
4. J. Drapper. 2003. The Complete Book of Horses, Horse Breeds & Horse Care: An Encyclopedia of Horses and a Comprehensive Guide to Horse and Pony Care. Anness Publishing.
5. J.W. Copland. 1985. Evaluation of large ruminants for the tropics, ACIAR Proceeding series no. 5.
6. M. K. Rai 2012. Livestock Production & Management. Oxford Book Co.
7. M.E. Ensminger. 1968. Beef Cattle Science., The interstate printers and publishers. Inc. USA.
8. S. Singh 2017. Buffalo Production. Oxford Book Co.

Course Code: APMA 212 **Course Title: Beef Cattle and Large Animal Production (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide applied knowledge and skill on beef cattle and large animal production**.**			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ obtain practical knowledge on beef cattle and large animal management ✓ analyze and apply different farming techniques ✓ demonstrate practical knowledge on beef cattle and large animal production system			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ know the objectives of handling and approaching of beef cattle, buffalo & horse ✓ perform how to approach of animals ✓ explain the safety handling	Handling of beef cattle, buffalo & horse	Lecture Demonstration Hand on practical Group exercise Practical note book preparation	Performance Practical Note book Viva voce Class attendance
✓ classify and types of beef cattle ✓ identify beef cattle and other large animals	Types and breeds of, beef cattle and other large animals	Lecture Interactive discussion Visual presentation Practical note book preparation	Quiz Short answer Identification Practical Note book Viva voce Class attendance
✓ describe the quality of good judge ✓ select & judge of beef cattle, buffalo & horse	Selection and judging of beef cattle, buffalo & horse	Lecture Visual presentation Hand on practical Group exercise Practical note book preparation	Quiz Performance Practical Note book Viva voce Class attendance
✓ describe BCS ✓ explain the importance of BCS ✓ measures body condition scoring of beef cattle	Body condition scoring of beef cattle	Lecture Interactive discussion Visual presentation Demonstration Group exercise Practical note book preparation	Quiz Performance Identification Practical Note book Viva voce Class attendance
✓ describe the general care and management of beef cattle, buffalo & horse ✓ apply different management practices of beef cattle, buffalo & horse	Care and different management practices of beef cattle, buffalo & horse	Lecture Interactive discussion Visual presentation Practical note book preparation	Quiz Short answer Identification Practical Note book Viva voce Class attendance
✓ apply the different methods of ration formulation ✓ calculate the feed and nutrients for different level of stage for different animals	Ration formulation for beef cattle, buffalo & horse	Lecture Interactive discussion Group exercise Practical note book preparation	Short answer Identification Practical Note book Viva voce Class attendance
✓ apply different management practices of large animals ✓ describe the different feeding strategies of large animals	Feeding management practices of popular large animals	Lecture Visual presentation Group exercise Practical note book preparation	Quiz Short answer Identification Practical Note book Viva voce Class attendance

✓ evaluate beef carcass ✓ grade the beef carcass	Beef carcass evaluation and beef grading	Lecture Interactive discussion Visual presentation Practical note book preparation	Quiz Short answer Identification Practical Note book Viva voce Class attendance
✓ familiar with beef fattening ✓ evaluate small scale fattening program ✓ find out the fattening program in various area	Survey of small scale fattening program in rural areas of Bangladesh	Lecture Interactive discussion Visual presentation Group exercise Practical note book preparation	Quiz Short answer Performance Practical Note book Viva voce Class attendance
✓ draw the planning of beef cattle, buffalo & horse farm ✓ design of beef cattle, buffalo & horse farm	Planning and design of small scale and commercial beef cattle, buffalo & horse farm	Lecture Interactive discussion Visual presentation Practical note book preparation	Quiz Short answer Practical Note book Viva voce Class attendance
✓ justify modern practice using in the different farm of Bangladesh	Visit of Govt. and private small and commercial beef fattening, buffalo and other large animal farm in different places of Bangladesh	Extension tour Visual presentation Report writing	Report Viva voce

Reference Books

1. A.I. Neumann. 1977. Beef cattle. 7th edition John Wiley& Sons. Inc. USA.
2. C.C. Mary and I.A. Dye. 1978. Commercial beef cattle production. 2nd edition, I.E.A. and Febriger Philadelphia, USA.
3. J. Drapper. 2003. The Complete Book of Horses, Horse Breeds & Horse Care: An Encyclopedia of Horses and a Comprehensive Guide to Horse and Pony Care. Anness Publishing.
4. J.W. Copland. 1985. Evaluation of large ruminants for the tropics, ACIAR Proceeding series no. 5.
5. M.K. Rai 2012. Livestock Production & Management. Oxford Book Co.
6. M.E. Ensminger. 1968. Beef Cattle Science., The interstate printers and publishers. Inc. USA.
7. M.E. Ensminger. 1969. Animal Science. The interstate printers and publishers Inc. Danville, Illinois, USA.
8. S. Singh 2017. Buffalo Production. Oxford Book Co.

Course Code: APMA 351 **Course Title: Goat, Sheep and Small Animal Production (Theory)**	**Credit Hour: 1**	**Level:3**	**Semester: II**
Rationale: This course is designed to provide goat, sheep, pig & other small animals production pattern & their management practices involved in veterinary and animal sciences.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental issues of goat, sheep, cat, pig & other small animals ✓ obtain knowledge on goat, sheep, cat, pig &other small animals management ✓ understand goat, sheep, pig & other small animals farming techniques ✓ gather knowledge for uses of goat, sheep, pig & other small animals products and their by-products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquaint with the history, domestication, distribution, importance and constraints of goat, sheep, pig & other small animals production ✓ describe scope of goat, sheep, pig & other small animals production in Bangladesh ✓ elucidate goat, sheep, pig & other small animals terms such as ewe, doe, ram, buck etc.	**Concept of goat, sheep & small animal:** History, domestication & distribution, importance, constraints and scopes of goat, sheep, pig & other small animals	Lecture Discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ define thermoregulation, biodimatalogy and adaptation ✓ know the effect of heat/climate stress on productive and reproductive performance	**Thermoregulation and bio-climatology:** Thermoregulation, bio-climatology & adaptation to different environment of goat, sheep, pig and small animals	Lecture Feedback Interactive discussion	Quiz Short answer Broad answer Class attendance
✓ classify and identify the different breeds of goat, sheep, pig & other small animals ✓ characterize the different breeds of goat, sheep, cat, pig and others animal	**Goat, sheep, pig & other small animals breed:** Breeds of common goat, sheep, pig & small animals & their description	Lecture Visual presentation Interactive discussion	Quiz Short answer Broad answer Class attendance
✓ select and judge the goat, sheep, pig & other small animals for different purposes	**Selection and judging:** Selection and judging of goat, sheep, pig & other small animals	Lecture Visual presentation Feedback Interactive discussion	Quiz Short answer Broad answer Class attendance
✓ define and classify housing for goat, sheep and other small animals ✓ describe advantages &disadvantages and site selection criteria of housing ✓ demonstrate housing of goat, sheep, pig & other small animals	**Housing of goat, sheep, pig and other small animals** : Define housing, advantages and disadvantages, site selection, space requirement & different types of housing of goat, sheep, pig & other small animals; general goat, sheep, pig & other small animals farm management; function and tools of a goat, sheep, pig & other small animals farm	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe different rearing system of goat, sheep, pig and other small animals ✓ differentiate different rearing and management systems of goat, sheep, pig & other small animals with their advantages and disadvantages	**Rearing and management System:** Rearing and management systems of goat, sheep, pig & other small animals; advantage and disadvantages of different rearing and management systems	Lecture Discussion Visual presentation Feedback Interactive discussion	Quiz Short answer Broad answer Class attendance
✓ define food, feed, and other nutritional terms ✓ classify feed stuffs	**Feeds and feeding:** Essential feed nutrients and their functions, different feeding system of goat,	Lecture Discussion Visual presentation	Quiz Short answer Broad answer

✓ know the purposes of feed ✓ explain functions of essential feed nutrients ✓ compare different feeding systems of goat, sheep, pig & other small animals ✓ differentiate digestive system of goat, sheep, pig & other small animals	sheep, pig & other small animals; digestive system of goat, sheep, pig & other small animals; nutrient requirement of goat, sheep, pig and small animals for age, sex and purposes	Brain storming Feedback	Class attendance
✓ describe different types of breeding practices of goat, sheep, pig and other small animals ✓ identify factors affecting reproduction of goat, sheep, pig and other small animals ✓ explain different reproductive techniques for goat, sheep, pig and other small animals	**Breeding and reproduction of goat, sheep, pig and other small animals:** Breeding practices of goat, sheep, pig and other small animals; factors affecting reproduction of goat, sheep, pig and other small animals; reproductive techniques for goat, sheep, pig and other small animals	Lecture Discussion Visual presentation Brain storming	Quiz Short answer Broad answer Class attendance
✓ define diseases of goat, sheep, pig & other small animals ✓ categorize of goat, sheep, pig & other small animals diseases with their prevention and control ✓ take measures to prevent and control of goat, sheep, pig & other small animals diseases in the farms	**Goat, sheep, pig & other small animals health and hygiene:** Diseases of goat, sheep, pig & other small animals; signs of good and ill-health of a goat, sheep, pig & other small animals. Bio-security/bio-safety of a goat, sheep, pig & other small animals farm	Lecture Discussion Visual presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ draw and planning of goat, sheep, pig &other small animals farm ✓ calculate different expenditure and income of goat, sheep, pig & other small animals farms	**Farm planning:** Planning, expenditure and income of goat, sheep, pig & other small animal farms	Lecture Visual presentation Brain storming Feedback Interactive discussion	Quiz Short answer Broad answer Class attendance
✓ achieve the latest research findings and information on goat, sheep, pig & other small animal	**Latest research findings:** Information about latest goat, sheep, pig & other small animal production technology and innovations	Assignment	Report

Reference Books

1. A.B. Carles. 1983. Sheep Production in the Tropics. English Language Book Society. Oxford University Press, U.K.
2. A.W. Speedy. 1980. Sheep Production: Science into practice. Longman Group Ltd.
3. C. Chakraborty. 2012. Goat Production & Health Management. Agrotech Press.
4. C. Devendra and G.B. McLeroy. 1982. Goat and Sheep Production in the Tropics. International Tropical Agriculture Series. Longman Group Ltd. UK.
5. C. Devendra and M. Burns. 1983. Goat Production in the Tropics. Commonwealth Agriculture Bureax, Farnham Royal Bucks, UK.
6. I.E. Coop. 1982. Sheep and Goat Production. Elsevier Scientific Publishi8ng Co. Amsterdam, Oxford, New York.
7. M. K. A. Das 2013. Handbook of Pig Husbandry. Today Pub.
8. M.E. Ensminger 1964. Sheep and Wool Science. The Interstate Printers and Publishers. Inc. Danville, Illinois, USA.
9. O.B. Smith. and H.G. Bosman. 1988. Goat Production in the Humid Tropics. Pudoc. Wageningen, Netherlands.
10. P.K. Tripathi, Goel. 2013. Small Ruminant Production and Health. Satish Serial Pub.
11. P. Morand-Fehr. 1991. Goat Nutrition, EAAP Publication no. 46, Pudoc, Wageningen, Netherlands.
12. R.M. Getenby. 1986. Sheep Production in the Tropics and Sub-Tropics. Tropical Agriculture Series, Longman, UK.
13. T.N. Edey. 1983. Tropical Sheep and Goat Production. AUIDP, Canberra, Australia.

Course Code: APMA 352 **Course Title: Goat, Sheep and Small Animal Production (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is designed to provide applied knowledge on elementary animal production and to apply the practical knowledge in different farm animals.			
Course Learning Outcomes: The prime objectives of this course are to- ✓ obtain practical knowledge on goat, sheep & small animal production and management ✓ understand applied goat, sheep & small animal production farming techniques ✓ acquire practical knowledge on the uses of goat, sheep & small animal products and by-products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ apply safety techniques ✓ approach and handle of goat, sheep & other small animals	Approaching and handling of goat, sheep & other small animals	Lecture Interactive discussion Demonstration Practical note book preparation	Quiz Performance Viva-voce Practical note book Class attendance
✓ identify different external body points of goat, sheep & other small animals ✓ characterize different species of animal	External body parts of goat, sheep & other small animals	Lecture Interactive discussion Visual presentation Hand on practice Group exercise Practical note book preparation	Performance Viva-voce Identification Practical note book Class attendance
✓ identify different breeds of goat, sheep & other small animals ✓ describe different breeds of goat, sheep and others small animal	Identification of breeds of goat, sheep & other small animals	Lecture Visual presentation Practical note book preparation	Quiz Viva-voce Identification Practical note book Class attendance
✓ describe the ageing methods ✓ determine the ages of goat, sheep, pig & other small animals	Dentition and ageing of goat, sheep, pig & other small animals	Lecture Interactive discussion Visual presentation Hand on practice Group exercise Practical note book preparation	Quiz Performance Viva-voce Identification Practical note book Class attendance
✓ apply different management practices ✓ exercise different management practices of goat, sheep, pig & other small animals	Study on marking, castration, docking, dipping, clipping, shearing, bedding, clothing, grooming and washing of goat, sheep, pig & other small animals	Lecture Interactive discussion Visual presentation Demonstration Group exercise Practical note book preparation	Short answer Performance Viva-voce Practical note book Class attendance
✓ explain different steps of ration formulation ✓ discuss feeding standard ✓ calculate nutrients for different animals ✓ formulate rations for goat, sheep, pig & other small animals	Study on feeds and ration formulation for goat, sheep, pig & other small animals	Lecture Interactive discussion Visual presentation Group exercise Practical note book preparation	Short answer Performance Viva-voce Identification Practical note book Class attendance

✓ justify modern practices using in the goat, sheep, pig & other small animals farm	Visit to goat, sheep, pig & other small animals farm for practical experience	Extension tour Report writing	Viva-voce Report
✓ design & plan of small ruminants farms	Design of small scale and commercial small animal farms	Lecture Interactive discussion Visual presentation Demonstration Group exercise Practical note book preparation	Short answer Performance Viva-voce Practical note book Class attendance

Reference Books

1. C. Chakraborty. 2012. Goat Production & Health Management. Agrotech Press.
2. C. Devendra, and G.B. McLeroy. 1982. Goat and Sheep Production in the Tropics. International Tropical Agriculture Series. Longman Group Ltd. U.K.
3. G. Sandra. 2010. Goat Science and Production. Wiley-Blackwell.
4. M. K. A. Das 2013. Handbook of Pig Husbandry. Today Pub.
5. M.E. Ensminger. 1964. Sheep and Wool Science. The Interstate Printers and Publishers. Inc. Danville, Illinois. U.S.A.
6. P. K. Tripathi, Goel. 2013. Small Ruminant Production and Health. Satish Serial Pub.
7. T.N. Edey. 1983. Tropical Sheep and Goat Production. A.U.I.D.P. Canberra, Australia.

Course Code: APMA 451 **Course Title: Wild life, Zoo, Pet, Lab. & Aquatic Animal Management (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**
Rationale: This course is designed to provide details concept, importance, management of wild life, zoo, pet, lab. & aquatic animal management with their conservation.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquaint with wild life, zoo, pet, lab. & aquatic animal ✓ obtain knowledge on wild life, zoo, pet, lab. & aquatic animal management			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ get acquaintance with the basic concept of wildlife ✓ express the importance of wild life ✓ compare distribution and habitat requirements of wild animals ✓ illustrate conservation of wildlife ✓ recognize causes of extinction of wild animals	**General wildlife:** Concepts of some terminologies related to wildlife; importance of wildlife. Zoogeographical regions and wildlife distribution in Bangladesh; habitat requirements of wild animals; conservation of wildlife; causes of extinction of wild animals	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ elucidate biodiversity with importance ✓ threats and protection measures of biodiversity	**General biodiversity:** Terms and importance of biodiversity; threats to biodiversity; measures to protect biodiversity and sustainable development	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ classify common wild animals ✓ describe the characteristics of wild animals ✓ distinguish management of wild animals	**Wild animal management:** Zoological classification of common wild animals; salient features of selected wild animals; feeds and feeding, restraint, housing and other management of wild animals	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ comprehend the history and purposes of zoo and its establishment ✓ explicate the role of zoo and zoo education ✓ classify zoo animals ✓ discuss overall management of zoo and zoo animals ✓ acquaint staff position and precautions at zoo	**Zoos, zoo animals and their management:** History of zoo; purposes of zoo establishment; role of zoo and zoo education for conservation of wildlife; classification of zoo animals. Management of zoo; different housing, their requirements and specifications for zoo animals; feeds and feeding of zoo animals; restraint and management of zoo animals; staff position of a zoo; precautions at zoo	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ define pet & laboratory animal ✓ classify pet, lab. and aquatic animals ✓ outline the salient features of common pet, lab. and aquatic animals ✓ explain housing of pet, lab. and aquatic animals	**Pet, laboratory & aquatic animals:** Definition of lab. animals; classification of pet, lab. animals; categories of aquatic animals available at zoo; salient features of common lab and aquatic animals; different housing, their requirements and specifications for pet, lab. &	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer

✓ familiar with management of pet, lab. & aquatic animals	aquatic animals; feeding and management practices of selected pet, lab. and aquatic animals		
✓ describe the transportation of wild life, zoo, pet, lab. & aquatic animals ✓ narrate the care and precautions during shipment and transit ✓ identify the factors affecting transportation of different animals	**Transportation:** Transportation, care and precaution of different wild life, zoo, pet, lab. & aquatic animals during shipment and transit; factors affecting transportation of different animals	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ elucidate the threatened species of animals and birds in Bangladesh ✓ explain conservation of threatened species and breeding of them ✓ explicate factors related to breeding and reproduction of wild life, zoo, pet, lab. & aquatic animals	**Threatened species and their conservation:** Threatened species of animals and birds in Bangladesh; breeding of threatened species for conservation; factors related to breeding and reproduction of wild life, zoo, pet, lab. & aquatic animals	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ summarize the measures to prevent & control health hazards ✓ describe the health care of common wild life, zoo, pet, lab. & aquatic animals	**Preventive measures:** Preventive measures and health care of common wild life, zoo, lab. & aquatic animals	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ achieve the latest research findings and information on wild life, zoo, pet, lab. & aquatic animal	**Latest research findings:** Information about latest wild life, zoo, pet, lab. & aquatic animal production technology and innovations	Assignment	Report

Reference Books

1. J.A. John Wiley & Sons.1984. Principles of Wildlife Management. Bailey.
2. J.D. Black. 1954. Biological conservation with particular emphasis on Wildlife., MacGraw-Hill Book Company. New York.
3. J.S. Lucas & P.C. Southgate. 2012. Aquaculture: Farming Aquatic Animals and Plants. 2nd edition. Wiley-Blackwell.
4. M.F. Fowler, Oliver and Boyd. U.K.1989. Restraining and Handling of Wild and Domestic Animals.
5. Manual for care and management of laboratory animals.1st edition. 2009. Dhaka press. ICDDRB, Dhaka, Bangladesh.
6. Natural Resource Conservation- An Ecological Approach. 1980. O.S., MacMillan Publishing Company. New York.
7. Red book of threatened mammals of Bangladesh. 2000. IUCN- The world conservation union. 1st edition. Dhaka press.
8. World animal science: Laboratory Animal. 1985. Elsevier scientific publications New York.
9. World animal science: Zoo Animal. 1985. Elsevier scientific publications, New York.
10. Y.B. Rajeshwary & S. K. Satyannarayan. 2009. Handbook on Care and Management of Laboratory and Pet Animals.

Course Code: APMA 452 **Course Title: Wild life, Zoo, Pet, Lab. & Aquatic Animal Management and Conservation (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**

Rationale: This course is designed to provide practical knowledge on management and conservation of different wild life, zoo, pet, lab. & aquatic animals.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge on wild life, zoo, pet, lab. & aquatic animals management
- ✓ obtain applied wild life, zoo, pet, lab. & aquatic animals conservation techniques

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ assess the psychology of wild life, zoo, lab. &aquatic animals ✓ identify behavior of wild life, zoo, pet, lab. & aquatic animals	Psychology and behavior of common wild life, zoo, pet, lab. & aquatic animals	Lecture Discussion Feedback	Short answer Viva voce Practical note book
✓ discuss restraining tools for wild life, zoo, pet, lab. & aquatic animals ✓ apply restraining tools for wild life, zoo, pet, lab. & aquatic animals	Restraining tools for wild life, zoo, pet, lab. & aquatic animals	Lecture Visual presentation Discussion Demonstration Feedback Practical note book preparation	Quiz Short answer Identification Performance Viva voce Practical note book
✓ characterize different species of zoo and wild animals ✓ differentiate of zoo and wild animals	Identification and demonstration of different species of zoo & wild animals	Lecture Visual presentation Discussion Feedback Practical note book preparation	Short answer Identification Viva voce Practical note book
✓ familiar of different species of pet & lab. animals ✓ distinguish of different species of pet & lab. Animals	Identification and demonstration of common pet & laboratory animals	Lecture Visual presentation Discussion Practical note book preparation Feedback	Quiz Short answer Identification Practical note book Viva voce
✓ identify different species of aquatic animals ✓ demonstrate common aquatic animals	Identification and demonstration of common aquatic animals	Lecture Visual presentation Discussion Practical note book preparation Feedback	Quiz Short answer Identification Practical note book Viva voce
✓ express biodiversity of Sundarban ✓ justify conservation of Sundarban	Study on biodiversity & conservation of Sundarban	Lecture Visual presentation Discussion Feedback Practical note book preparation	Short answer Practical note book Viva voce
✓ illustrate breeding of zoo, pet, lab. and aquatic animals ✓ apply breeding of zoo, pet, lab. and aquatic animals ✓ explain feeding, care and management systems of zoo, pet, laboratory and aquatic animals ✓ operate of feeding, care and management systems of zoo, pet, laboratory and aquatic animals	Demonstration of breeding, feeding, care and management systems of zoo, pet, laboratory and aquatic animals through the field visit to respective organization	Demonstration Group work Field visit to zoo and laboratory animal's houses Feedback Report writing	Performance Short answer Report

Reference Books

1. C.T. Robbins. 1993. Wildlife feeding and Nutrition. 2nd edn.
2. Guide for the Care and Use of Laboratory Animals. 1996. National Academy Press. Washington D. C.
3. J.S. Lucas & P. C. Southgate. 2012. Aquaculture: Farming Aquatic Animals and Plants. 2nd edition. Wiley-Blackwell.
4. J.V. Cheeran. 2008. Text Book of Wild and Zoo Animals: Care and Management. International Book Distribution Co.
5. J.A. John Wiley & Sons.1984. Principles of Wildlife Management. Bailey.
6. M.F. Fowler, Oliver and Boyd. U.K.1989. Restraining and Handling of Wild and Domestic Animals.
7. Y.B. Rajeshwary & S. K. Satyannarayan. 2009. Handbook on Care and Management of Laboratory and Pet Animals.

Course Code: APMA 511 **Course Title: Meat and Wool Technology & Animal By-products Management (Theory)**	**Credit Hour: 2**	**Level: 5**	**Semester: I**
Rationale: This course is designed to provide meat, wool technology and animal by-products management and their practices involved in animal sciences.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about meat and wool industry ✓ obtain knowledge on meat and wool producing domestic animal management ✓ operate meat and wool animals farming techniques ✓ gather knowledge for uses of animal products and their by-products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ elucidate some terms related to meat science and technology ✓ disseminate the prospects of meat production in Bangladesh ✓ identify the constraints of meat production in Bangladesh	**Introduction:** Glossary on meat science and technology; prospects, potentials and constraints of meat industry in Bangladesh	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ demonstrate the constituents of muscle ✓ narrate the nutritive value of edible meat and meat products ✓ develop principles and different methods of meat preservation technique ✓ identify post mortem changes in muscle ✓ evaluate environmental impact on meat production & quality	**Meat science:** Structure, characteristics and growth of muscle of different farms animals; **nutritive value of meat and meat products, spoilage of meat;** principles and methods of meat preservation. Post mortem changes in muscle; environmental impact on meat production & quality	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ compare management principles before and after slaughtering ✓ follow the slaughter act for slaughtering animal ✓ know the dressing, processing and preservation of meat ✓ categorize different meat products and by-products of animals ✓ acquire knowledge on packaging and serving meat and meat products ✓ acquaint the disposal and utilization of packing farm by-products	**Meat processing technology:** Pre-slaughter management and animal handling in abattoir; slaughter act in Bangladesh, slaughtering, dressing and processing of animals. Cooking methods of meat and meat products; processing and preservation of meat; different meat products available in the world; packaging and serving meat and its products; disposal and utilization of packing house by products	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ evaluate quality and grading of meat and meat products in respect of markets ✓ modify different preventive measures of meat spoilage agents ✓ describe factors that affect quality & quantity of meat	**Meat quality and other attributes:** Quality parameters of meat; grading of meat; categories of meat products; marketing of meat and meat products; preventive measures of meat spoilage agents; factors affecting quality & quantity of meat	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ elucidate different terms related to wool science ✓ describe properties of wool ✓ compare wool on the basis of quality ✓ illustrate making wool into yarn ✓ construct wool yarn	**Wool technology:** Glossary of wool science & technology; structure, properties and types of wool; virtues of wool. Specialty of hair fiber and their uses; factors affecting wool & hair growth; quality assessment and judging of wool; making wool into	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer

✓ discriminate application and marketing of wool ✓ measure economic importance of wool and hair	yarn; types of wool yarn: woolen & worsted; application and marketing of wool; economic importance of wool & hair		
✓ express different terms related to hides and skins ✓ describe properties of hides and skin ✓ formulate different production, preservation and processing procedures of hides and skins ✓ select factors that make hamper in the quality of hides & skins ✓ recognize different leather products	**Hides & skin technology:** Glossary of hides & skin technology; properties of hides and skins; production, preservation processing, damage and defects of hides and skins; factors affecting the quality of hides & skins; leather and its products	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ formulate different slaughter house by-products ✓ design the knowledge of using animal by-products ✓ manage waste and odor for economic importance ✓ develop biogas plant and different recycle methods ✓ measure animal wastes as livestock feed and other purposes	**Other by-products:** Utilization of slaughterhouse by products; animal wastes and their nutritional values; farm animal wastes, wastes from tanneries and slaughterhouses; manure handling and storage; odour management in barns and storage area; economics of animal waste management; recycling and treatment of animal wastes; use of animal wastes in bio-gas plant; animal wastes as livestock feed and other purposes	Lecture Visual presentation Interactive discussion Feedback	Quiz Short answer Broad answer
✓ use the latest research findings and information of meat and wool technology & animal by-products management	**Latest research findings:** Information about latest meat and wool technology & animal by-products management and innovations	Assignment	Report

Reference Books

1. A. Alen, R. Faraday and E. Knew. 2001. Flaying and curing of hides and skins as a rural industry. 3rd edition. FAO. Rome, Italy.
2. E.D. Aberle, F.C. Johe and G.E. David. 2001. Principles of meat science. 5th edition. Kendall and Hunt publisher, USA.
3. F. Toldra. 2010. Hand book of meat processing. 1st edition. Blackwell publishing. USA.
1. F. Toldra. 2010. Hand book of Meat Processing. Wiley-Blackwell.
4. G.H. Crawshaw and W.S. Simpson. 2002. Wool: Science and Technology. Woodhead Publishing.
5. H.W. Ockerman & C.L. Hansen. 2000. Animal By-product Processing and Utilization. Technomic Publishing Co.
6. Hand book of food products manufacturing. 2007. Hui Y.H.3rd edition. John Wiley and sons. USA.
7. J.F. Gracy. 1986. Meat Hygiene. Eighth edition. English Language Book Society; Bailliere Tindall.
8. K.T. Sarkar. 1997. Theory and Practices of Leather Manufacture. Madras, India.
9. L.J. Flaherty F. 2011. Skins, Hides & Leather defects. 1st edition. Tanner's council laboratory. University of Chincinnati. USA.
10. P. Ziegler. 1968. The Meat We Eat. Thomas The Interstate Printers and Publishers, Inc. Danville, Illinois. 1968.
11. P.D. Warriss. 2005. Meat science- an introductory text. 3rd edition. IBH publishing. UK.
12. R.A. Lawrie and D. Ledward. 2006. Meat Science. 7th edition. Pergamon Press.
13. R.A. Lawrie. 1985. Meat science. 2nd edition. Pergamon press. Oxford, UK.
14. V.P. Singh and N. Sachan. Principles of meat technology. 4th edition, New India Publishing agency, India.

Course Code: APMA 512 **Course Title: Meat and Wool Technology & Animal By-products Management (Practical)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**
Rationale: This course is designed to provide applied knowledge and skill of meat, wool and animal by-products management and to apply the practical knowledge in meat, wool production and uses of by-products.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ demonstrate practical knowledge on meat science and technologies ✓ perform applied wool producing and processing techniques ✓ assess practical knowledge on the uses of animal products and by-products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ show physical inspection of meat animals prior to slaughter ✓ inspect meat animals physically prior to slaughter	Inspection of meat animals prior to slaughter: Anti-mortem and Post-mortem	Lecture Visual presentation Demonstration Feedback Practical note book preparation	Short answer Identification Performance Practical note book Viva voce
✓ practice slaughtering of animals ✓ explain different methods of animal slaughtering- halal slaughter	Methods of slaughtering of animals	Visual presentation Discussion Feedback Practical note book preparation	Short answer Practical note book Viva voce
✓ compare of carcass of different animals ✓ identify carcass of meat animals	Demonstration & comparison of carcass of meat animals and meats	Lecture Visual presentation Discussion Demonstration Practical note book preparation	Short answer Identification Performance Viva voce Practical note book
✓ distinguish edible and inedible portions of the carcass ✓ separate of edible & in edible portion of the carcass and slaughterhouse by by-products	Isolation of edible & in edible portion of the carcass and slaughterhouse by by-products	Discussion Demonstration Feedback Practical note book preparation	Quiz Identification Performance Practical note book Viva voce
✓ identify meat of different species of animals ✓ differentiate meat of different animal species	Identification and differentiation of meat from different species of animals	Lecture Visual presentation Demonstration Feedback Practical note book preparation	Quiz Short answer Identification Performance Viva voce Practical note book
✓ select meat cuts for different species of animal ✓ distinguish of meat cuts for different species of animal	Demonstration of meat cuts for different species of animal	Lecture Visual presentation Discussion Demonstration Practical note book preparation Feedback	Quiz Short answer Identification Performance Practical note book Viva voce
✓ demonstrate cooking methods of meat ✓ practice cooking methods of meat	Cooking methods of meat	Visual presentation Discussion Demonstration Feedback Practical note book preparation	Short answer Performance Viva voce Practical note book
✓ verify value added meat products by processing ✓ select value added meat products	Processing/ preparation of value added popular meat products	Visual presentation Discussion Demonstration Practical note book preparation Feedback	Short answer Performance Practical note book Viva voce

✓ prepare planning & design of abattoir ✓ demonstrate small-scale slaughterhouse and meat processing plant	Planning & design of abattoir, small-scale slaughterhouse and meat processing plant	Lecture Visual presentation Discussion Feedback Practical note book preparation	Short answer Performance Practical note book Viva voce
✓ examine wool & hair microscopically ✓ differentiate of wool and hair	Microscopic structure of wool & hair	Lecture Visual presentation Discussion Demonstration Practical note book preparation Feedback	Quiz Short answer Identification Demonstration performance Viva voce Practical note book
✓ determine to measurement of wool staple length ✓ compare wool staple length	Measurement of wool staple length	Lecture Visual presentation Discussion Demonstration Feedback Practical note book preparation	Quiz Performance Practical note book Viva voce
✓ explain structure of raw hides and skins ✓ assess processed hides and skins	Structure of raw and processed hides and skins	Visual presentation Discussion Demonstration Practical note book preparation	Quiz Short answer Identification Performance Viva voce Practical note book
✓ show common leather processing techniques ✓ apply common leather processing techniques	Common leather processing techniques	Visual presentation Discussion Feedback Practical note book preparation	Quiz Short answer Performance Practical note book Viva voce
✓ show how to prepare biogas plant	Preparation of biogas plant	Lecture Visual presentation Feedback Practical note book preparation	Quiz Short answer Viva voce Practical note book
✓ make compost manure from farm animal wastes ✓ characterize compost manure from farm animal wastes	Management practice to prepare compost manure from farm animal wastes	Lecture Visual presentation Discussion Practical note book preparation Feedback	Quiz Short answer Performance Practical note book Viva voce
✓ justify modern practices using in the meat processing plant ✓ acquaint with tannery industry ✓ compare of biogas plant	Visit to meat processing plant, tannery industry and biogas plant	Demonstration Report writing Extension tour	Viva voce Report

Reference Books

1. F. Toldra. 2010. Hand book of Meat Processing. Wiley-Blackwell.
2. G.H. Crawshaw and W.S. Simpson. 2002. Wool: Science and Technology. Woodhead Publishing.
3. H.W. Ockerman & C.L. Hansen. 2000. Animal By-product Processing and Utilization. Technomic Publishing Co.
4. K.T. Sarker. 1997. Theory and Practices of Leather Manufacture. Madras, India.
5. Manual on simple methods of meat preservation. 1990. FAO, Animal Production and health paper 79.
6. Welfare of red meat animals at slaughters. 1992. Ministry of Agriculture. Fisheries and food. Crown copyright.

Department of Dairy Science (DASC)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	DASC 151: Fundamental Dairy Science and Market Milk (Theory)	3	1	II
2.	DASC 152: Fundamental Dairy Science and Market Milk (Practical)	1	1	II
3.	DASC 213: Dairy Chemistry and Microbiology (Theory)	2	2	I
4.	DASC 214: Dairy Chemistry and Microbiology (Practical)	1	2	I
5.	DASC 353: Dairy Cattle and Buffalo Production (Theory)	1	3	II
6.	DASC 354: Dairy Cattle and Buffalo Production (Practical)	1	3	II
7.	DASC 411: Dairy Food Technology (Theory)	1	4	I
8.	DASC 412: Dairy Food Technology (Practical)	1	4	I
Total (Theory + Practical) 7 + 4 = 11				

Total Credit Hour	
Theory	7
Practical	4
Total	**11**

Course Code: DASC 151 **Course Title: Fundamental Dairy Science & Market Milk (Theory)**	**Credit Hour: 3**	**Level:1**	**Semester: II**
Rationale: This course is designed to provide knowledge about fundamental concept of dairy science and milk.			
Course Learning Outcome: The major learning outcomes of the course are to- ✓ acquire knowledge of basic concept of dairy science ✓ enrich knowledge of dairy breeds and management ✓ gather knowledge of milk and colostrum ✓ develop knowledge on milk production & processing technique			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define dairy science, dairy animal, dairy cow, heifer, calf , dry cow, lactation period, calving interval ✓ describe the chronological development of dairying ✓ present status of milk production in the world ✓ discuss the cattle population of the Bangladesh, South Asia and world ✓ explain the scope of dairy science	**Introduction:** Terms related to dairy science, early history of dairying, dairy animal and milk production statistics, scope of dairy science	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define breed ✓ list the dairy breeds ✓ classify breeds of dairy animal ✓ describe the characteristics and utility of cattle, buffalo, sheep and goat dairy breeds ✓ distinguish among the important dairy breeds	**Breed:** Definition of breed, characteristics of important breeds of dairy animal	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define dairy farm, dairy farming, organic dairy farming ✓ describe the objectives of farming ✓ illustrate the criteria of site selection ✓ identify the factors of development of dairy industry ✓ understand the recent development of dairying	**Dairy farming:** Definition & objectives of dairy farm, organic dairy farming, selection of site of a dairy farm, factors responsible for the development of dairy industry, recent development of dairy farming	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define housing ✓ classify the houses of a dairy farm ✓ criticize the dairy housing system ✓ measure the floor space required for dairy calf, heifer, cow, pregnant cow, bull	**Housing:** Definition, classification of dairy house, floor space requirement of dairy animal	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define feed, ration and balanced ration ✓ classify common feeds of dairy animal ✓ explain the importance of improved diets for dairy animal ✓ illustrate the balanced diets of dairy animal-processed roughage, concentrate	**Feeds and ration:** Definition, classification of feeds for dairy animal, balanced diets for dairy animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ explain the importance of calf rearing ✓ describe the methods of calf rearing ✓ illustrate the calf feeding schedule	**Calf rearing:** Importance & methods of calf raising, calf feeding schedule	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define milk and colostrum ✓ distinguish between milk & colostrum ✓ discuss the physical properties of milk ✓ explain the food value of milk ✓ describe the necessity of feeding colostrum to newborn calf	**Milk:** Definition, composition of milk and colostrum, physical properties of milk, food value of milk and colostrum	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ list the grades of milk ✓ describe the ways of grading milk ✓ Explain the classes of milk ✓ Interpret the price of milk	**Milk standard:** Grades of milk, classes of milk, pricing of milk.	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the sources of contamination in dairying ✓ suggest the hygienic way of milking ✓ explain the rules of milking	**Quality milk production & sanitation:** Sources of contamination in dairying, hygienic way of milking, rules for milking	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define chilling, pasteurization, sterilization, homogenization, UHT ✓ describe milk chilling process ✓ describe the principle of pasteurization ✓ discuss the methods of pasteurization ✓ explain the UHT and sterilization of milk ✓ discuss the methods of homogenization ✓ discuss homogenization technique	**Processing of milk:** Chilling, pasteurization, sterilization, UHT, homogenization	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define special milk ✓ explain the importance of special milk ✓ reconstituted milk, recombined milk, toned milk, double toned milk, humanized milk, filled milk, vitaminized milk, flavored milk, imitation milk	**Special milk:** Definition, importance of special milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Roy, S. Ghosh. 2015. Dairy Animal Production. New India Publishing Agency, New Delhi, India
2. ELRI Board of Consultants & Engineers. 2005. Hand-Book of Dairy Farming. Engineers India Research Institute. New Delhi. India.
3. G.C. Banerjee. 1998. A Textbook of Animal Husbandry. Oxford & IBH Publishing Company Pvt. Limited. India.
4. G.H. Schmidt, L.D. Van Vleck and M.F. Hutjens. 1998. Principles of Dairy Science. Kalyani Publishers. New Delhi. India.
5. J. Prasad. 1992. Animal Husbandry and Dairy Science. Kalyani Publishers. New Delhi. India
6. J. Prasad. 2004. Principles and Practices of Dairy Farm Management. Kalyani Publishers. New Delhi. India.
7. M. Kango. 2006. Milk & Milk Products. RBSA Publishers. Chaura Rasta. Jaypur. India.
8. S. Singh. 2014. Dairy Technology. Vol. 1 Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.

Course Code: DASC 152 **Course Title: Fundamental Dairy Science & Market Milk (Practical)**	**Credit Hour: 1**	**Level:1**	**Semester: II**
Rationale: This course is designed to provide a practical concept of dairy science and milk.			
Course Learning Outcome: The major learning outcomes of the course are to- ✓ acquire basic practical knowledge about dairy science ✓ attain knowledge on dairy farm ✓ obtain knowledge on milk ✓ achieve milk component determination techniques			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe the component of a modern dairy farm ✓ outline a modern dairy farm	Acquaintance with a modern dairy farm	Lecture Interactive discussion Visual presentation Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ identify different dairy houses ✓ design a dairy farm	Identifications of different dairy houses	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ identify breeds of cattle, buffalo, goat and sheep ✓ select the dairy breed for farming	Identification of different dairy breeds	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Identification Practical note book Viva voce Class attendance
✓ identify the dairy equipment and utensils ✓ describe the uses of dairy equipment and utensils	Identification of utensils and equipment of a dairy farm	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Identification Practical note book Viva voce Class attendance
✓ differentiate milk of cow, buffalo, goat ✓ identify milk of different dairy species	Identification of milk of different species	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ perform sampling of milk for analysis ✓ compare different sampling methods	Sampling of milk for physical and chemical analysis	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

✓ describe milk component determination technique ✓ determination of total solids, SNF, fat and ash present in milk	Determination of milk component - total solids, solids-not-fat, fat. ash	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Identification Practical note book Viva voce Class attendance
✓ describe the principle of determination of specific gravity in milk ✓ determination of specific gravity of milk	Determination of specific gravity of milk	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance Identification
✓ explain the acidity of milk ✓ determine the acidity of milk	Test for fitness of milk for heat treatment	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance Identification
✓ describe the clot-on-boiling test & alcohol test ✓ perform COB & alcohol test for milk	Fitness of milk for pasteurization	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance Identification
✓ describe the phospatase test ✓ perform phospatase test	Test for properly pasteurized milk	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. B. Roy, S. Ghhosh. 2015. Dairy Animal Production. New India Publishing Agency, New Delhi, India.
2. D.K. Thompkinson. 2012. Quality Assessment of Milk and Milk Products. New India Publishing Agency, New Delhi, India.
3. ELRI Board of Consultants & Engineers. 2005. Hand-Book of Dairy Farming. Engineers India Research Institute. New Delhi. India.
4. G.C. Banerjee. 1998. A Textbook of Animal Husbandry. Oxford & IBH Publishing Company Pvt. Limited. India.
5. G.H. Schmidt, L.D. Van Vleck and M.F. Hutjens. 1998. Principles of Dairy Science. Kalyani Publishers. New Delhi. India.
6. J. Prasad. 1992. Animal Husbandry and Dairy Science. Kalyani Publishers. New Delhi. India
7. J. Prasad. 2004. Principles and Practices of Dairy Farm Management. Kalyani Publishers. New Delhi. India.
8. J.D. Leaver. 1987. Milk Production and Practices. Longman Group. United Kingdom.
9. M. Kango. 2006. Milk & Milk Products. RBSA Publishers. Chaura Rasta. Jaypur. India.

Course Code: DASC 213 **Course Title: Dairy Chemistry and Microbiology (Theory)**	**Credit Hour: 2**	**Level:2**	**Semester: I**
Rationale: This course is designed to provide knowledge about chemistry and microbiology of milk & milk products.			
Course Learning Outcome: The major learning outcome of the course are to- ✓ acquire knowledge of milk chemistry ✓ enrich knowledge of milk protein, fat, carbohydrate and other milk component ✓ gather knowledge of microorganisms related to milk and milk products ✓ develop knowledge about quality control of milk and milk products			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define dairy chemistry ✓ explain the importance of dairy chemistry ✓ discuss the chemical properties of milk ✓ explain the factors affecting chemical composition of milk	**Dairy Chemistry:** Definition, importance of dairy chemistry, chemical properties , factors affecting chemical composition of milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify the milk lipid ✓ describe the composition of milk lipid ✓ explain the nature of milk lipid ✓ categorize the fatty acids of milk ✓ illustrate the properties of milk fat ✓ measure milk fat constant – acid value, peroxide value, saponification number, RM value	**Milk Fat:** Milk lipid, classification, composition, nature, fatty acids, properties of fatty acids in milk, fat globules, rancidity of milk fat and constants of milk fat	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify the milk proteins ✓ explain the properties of casein and whey ✓ describe the use of casein and whey	**Milk Proteins:** Nature, classifications, properties of milk protein, casein, whey and their uses	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the properties of lactose ✓ explain the lactose fermentation ✓ discuss the industrial use of lactose	**Lactose:** Properties of lactose, lactose fermentation and commercial uses of lactose	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ name the vitamins, minerals and enzymes of milk ✓ describe the function of vitamins, minerals and enzymes in milk	**Vitamins, Minerals & Enzyme:** Vitamins, minerals and enzymes in milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain the milk spoilage mechanism ✓ plan for milk preservation in industrial and smallholder farmers and industrial level of Bangladesh	**Milk Spoilage and Preservation:** Mechanism of milk spoilage, techniques of milk preservation	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the importance of dairy microbiology ✓ list the micro-organisms in milk ✓ describe the biological properties of micro-organisms ✓ explain the associated action of micro-organisms	**Dairy Microbiology:** Definition, biological properties of micro-organisms in milk, associated action of microorganisms in milk, HACCP	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ write about HACCP			
✓ name different types of bacteria in milk ✓ classify bacteria on the basis of temperature ✓ describe the characteristics and importance of coliform bacteria ✓ classify the bacteria on the basis of bio-chemical action in milk	**Classification of bacteria in milk:** Importance of different types of bacteria in milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ outline the zoological classification of bacteria in milk ✓ classify bacteria present in milk ✓ describe characteristics and importance of different families of bacteria in milk ✓ list the diseases spread through milk	**Bacteria in milk:** Zoological classification of bacteria in milk, characterization of important families of bacteria in milk, milk borne disease	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain the control measure of milk micro-organisms ✓ describe the destruction of micro-organisms by physical and chemical agents ✓ discuss the methods of removal of microorganisms in milk ✓ compare the destruction and removal methods of milk micro-organisms	**Destruction & Removal of Microorganism:** Methods of controlling growth of micro-organism in milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define starter culture ✓ classify starter culture ✓ describe the characteristics of starter culture bacteria	**Starter culture:** Definition, classification, characteristics of starter culture bacteria/ organism	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B.W. Webb and A.H. Johnson. 1965. Fundamentals of Dairy Chemistry. The Asia Publishing Company INC.
2. E.M. Foster. M.L. Speck. F.E. Nelson and R.N. Doetch. 1958. Dairy Microbiology. Printed Hall. INC. USA.
3. G.C. Banerjee. 1998. A Textbook of Animal Husbandry. Oxford & IBH Publishing Company Pvt. Limited. India.
4. K Singh. 2012. Dairy Microbiology. Oxford Book Company. Jaipur. India.
5. Mangala Kango. 2006. Milk & Milk Products. RBSA Publishers. Chaura Rasta. Jaypur. India.
6. N.Y. Robert Jenes and Stuart Patton. 1959. Principles of Dairy Chemistry. John Wiley and Sons. INC. New York. USA.
7. P.F. Fox and P.L.H. Mcsweenley. 2003. Advanced Dairy Chemistry. Kluwer Academic/Plenum Publisher. New York. USA.
8. R.K. Robinson. 2002. Dairy Microbiology Handbook. John Wiley and Sons Inc. Publication. USA.
9. S. Singh. 2014. Dairy Technology. Vol 1 Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.
10. S. Singh. 2014. Dairy Technology. Vol. 2 Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.

Course Code: DASC 214 **Course Title: Dairy Chemistry and Microbiology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide practical knowledge about chemistry and microbiology of milk & milk products.			
Course Learning Outcome: The major learning outcome of this course are to- ✓ acquire practical knowledge of milk chemistry ✓ enrich practical knowledge of milk protein, fat, carbohydrate and other milk component ✓ gather practical knowledge of milk microbiology ✓ develop practical knowledge on quality control of milk and milk products			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe the safety measures of a dairy laboratory	Safety measures for working in a diary laboratory	Lecture Interactive discussion Visual presentation Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ perform sampling of milk products for chemical analysis	Sampling of milk products for chemical analysis	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ determine the protein of milk and milk products	Test for protein in milk and milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ measure the lactose of milk and milk products	Test for lactose in milk and milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ detect the adulteration of milk	Determination of adulteration in milk (flour, cane sugar, gelatin, urea)	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ detect the presence of salt and neutralizer in milk	Test for salt, neutralizer in milk	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ execute the detection technique of preservatives in milk	Test for preservatives in milk	Lecture Interactive discussion Visual presentation Lab work Brain storming	Quiz Short answer Skill test Practical note book Viva voce

		Feedback	Class attendance
✓ evaluate the fat quality of milk	Test for quality of milk fat	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ measure the microbial quality of milk & milk products	Methylene blue and resaurin reduction test of milk & milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ determine the bacteria in milk & milk products using microscope	Direct microscopic count (DMC) in milk & milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ perform specific plate count for milk & milk products	Standard plate count (SPC) in milk & milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ execute the techniques of coliform count technique in milk & milk products	Coliform count in milk & milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ apply technique for isolation of lactic acid bacteria	Isolation of lactic acid bacteria in milk & milk products	Lecture Interactive discussion Visual presentation Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. B.W. Webb and A.H. Johnson. 1965. Fundamentals of Dairy Chemistry. The Asia Publishing Company INC.
2. D.K. Thompkinson. 2012. Quality Assessment of Milk and Milk Products. New India Publishing Agency, New Delhi, India.
3. E.M. Foster. M.L. Speck. F.E. Nelson and R.N. Doetch. 1958. Dairy Microbiology. Printed Hall. INC. USA.
4. K Singh. 2012. Dairy Microbiology. Oxford Book Company. Jaipur. India.
5. M. Kango. 2006. Milk & Milk Products. RBSA Publishers. Chaura Rasta. Jaypur. India.
6. N.Y. Robert Jenes and Stuart Patton. 1959. Principles of Dairy Chemistry. John Wiley and Sons. INC. New York. USA.
7. R. K. Robinson. 2002. Dairy Microbiology Handbook. John Wiley and Sons Inc. Publication. USA.
8. S. Singh. 2014. Dairy Technology. Vol.1. Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.

Course Code: DASC 353 **Course Title: Dairy Cattle and Buffalo Production (Theory)**	**Credit Hour: 1**	**Level:3**	**Semester: II**
Rationale: This course is designed to provide knowledge about dairy cattle production and management.			
Course Learning Outcome: The major learning outcomes of the course are to- ✓ acquire knowledge of dairy development ✓ gather knowledge of dairy farm planning ✓ develop knowledge of milk synthesis and production ✓ enrich knowledge on dairy animal management			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ compare the development of dairying among the countries ✓ identify the problems of dairy development of Bangladesh ✓ predict the possible solution to overcome the constraint of dairy development in Bangladesh	**Introduction:** Dairy development in different countries of the world**,** problems of dairy farming in Bangladesh and their possible solutions	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss the history of milk vita ✓ describe the co-operative model for dairy development ✓ recommend the factors for successful dairy farm operation ✓ propose the guidelines for increase the quality milk production	**History of milk cooperative society:** History of milk vita factors affecting the success of dairy farm operation, quality & quantity of milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ design of a modern dairy farm ✓ propose a plan for established a dairy farm ✓ formulate the year-round fodder production strategies for a dairy farm	**Dairy farm planning & designing:** Details plan and prospectus of a dairy farm, year-round fodder production strategies	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the care and management for dam, newborn calf, heifer, dry cow and lactating cow ✓ care of animal before and after calving	**Management of dairy animal:** Care and management of dam new born calves, heifers, dry and lactating cows	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the scope and limitations of dairy buffalo production ✓ discuss the characteristics of dairy buffalo breed ✓ describe the feeding and housing of dairy buffalo	**Dairy buffalo production:** Scope, limitations, breed characteristics, management of dairy buffalo	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ define milking ✓ classify milking technique ✓ criticize different milking methods ✓ suggest rules for milking ✓ describe the structure of udder ✓ explain the milk biosynthesis	**Milking & Mammary gland:** Definition, methods, rules for good milking structure of udder, milk biosynthesis	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the criteria for judging the dairy cow, dairy goat and dairy buffalo ✓ evaluate the score card of dairy cow, dairy buffalo, dairy goat and dairy sheep	**Judging:** Judging of dairy cow, dairy buffalo, dairy goat and dairy sheep	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the feeding methods & management of dairy cow, heifer and calf ✓ explain supplementation strategies for milk production in smallholder dairy farming ✓ measures the feeding status through blood metabolites	**Feeding of dairy cattle:** Methods of feeding and management of dairy animal, supplementation strategies, blood metabolites for prediction of dairy cattle feeding status	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define record and record keeping ✓ classify records of dairy farm ✓ explain the importance of record keeping ✓ describe the different types of record keeping in a dairy farm	**Record keeping:** Definition, types, importance	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B. Roy and S. Ghosh. 2015. Dairy Animal Production. New India Publishing Agency, New Delhi, India.
2. ELRI Board of Consultants & Engineers. 2005. Hand-Book of Dairy Farming, Engineers India Research Institute. New Delhi. India.
3. G.C. Banerjee. 1998. A Textbook of Animal Husbandry. Oxford & IBH Publishing Company Pvt. Limited. India.
4. J. Padgham. 2006. Organic Dairy farming. Orag-Utan Press. India.
5. J.D. Leaver. 1987. Milk Production and Practices. Longman Group. United Kingdom.
6. J. Prasad. 1991. Animal Husbandry and Dairy Science. Kalyani Publishers. New Delhi. India.
7. J. Prasad. 2004. Principles and Practices of Dairy Farm Management. Kalyani Publishers. New Delhi. India.
8. R.M. Acharya and P. Umar. 2013. Dairy Production and Business Management. Satish Serial Publishing House. New Delhi. India.
9. W.M. Etgen and P.H. Reaves. 1975. Dairy Cattle Feeding and Management. John Wiley and Sons. New York.
10. W.W. Yapp and W. B. Nevens. 2011. Dairy Cattle Selection: Feeding and Management. Biotech Books. New Delhi. India.

Course Code: DASC 354 **Course Title: Dairy Cattle and Buffalo Production (Practical)**	**Credit Hour: 1**	**Level:3**	**Semester: II**

Rationale: This course is designed to provide practical knowledge of dairy cattle production and management.

Course Learning Outcome: The major learning outcomes of the course are to-

- ✓ gather knowledge of dairy farm planning
- ✓ gain knowledge of milk production
- ✓ enrich knowledge on dairy animal management

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ plan the routine works of dairy farm	Routine works in dairy farm	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ formulate the ration for dairy animals	Computation of balanced ration for dairy cows, heifers & calves	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ scoring the dairy animals	Judging of dairy cows, buffaloes and dairy bulls	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ selection and culling of dairy animal	Selection and culling of dairy cows	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ sketch and design a dairy farm ✓ plan a dairy farm	Dairy farm plan, layout & prospectus	Lecture, Interactive discussion, Visual presentation, Farm/ lab. Work, Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ develop a year-round fodder production plan	Planning for year-round feeds & fodder supply in a dairy farm	Lecture, Interactive discussion, Visual presentation, Farm/ lab. Work, Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ perform hand and machine milking ✓ criticize among milking methods	Methods of milking-Hand milking & Machine milking	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ detect mastitis at farm level	Rapid tests of abnormal milk and mastitis	Lecture, Interactive discussion Visual presentation, Farm work Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ compose dairy farm records	Use of dairy records	Lecture, Interactive discussion, Visual presentation, Farm/ lab. Work, Brain storming, Feedback	Quiz, Short answer Skill test, Practical note book Viva voce, Class attendance
✓ design a dairy farm layout	Visit to dairy farm	Lecture, Discussion, Field visit, Feedback, Report writing	Report evaluation, Viva voce, Report, Class attendance

Reference Books

1. B. Roy, S. Ghosh. 2015. Dairy Animal Production. New India Publishing Agency, New Delhi, India.
2. ELRI Board of Consultants & Engineers. 2005. Hand-Book of Dairy Farming, Engineers India Research Institute. New Delhi. India.
3. G.C. Banerjee. 1998. A Textbook of Animal Husbandry. Oxford & IBH Publishing Company Pvt. Limited. India.
4. J. Prasad. 1991. Animal Husbandry and Dairy Science. Kalyani Publishers. New Delhi. India.
5. R.M. Acharya and P. Umar. 2013. Dairy Production and Business Management. Satish Serial Publishing House. New Delhi. India.
6. W.M. Etgen and P.H. Reaves. 1975. Dairy Cattle Feeding and Management. John Wiley and Sons. New York.
7. W.W. Yapp and William Barbour Nevens. 2011. Dairy Cattle Selection: Feeding and Management. Biotech Books. New Delhi. India.

Course Code: DASC 411 **Course Title: Dairy Food Technology (Theory)**	**Credit Hour: 1**	**Level:4**	**Semester: I**
Rationale: This course is designed to provide knowledge about technology of dairy food products.			
Course Learning Outcome: The major learning outcomes of the course are to- ✓ gather knowledge of different dairy products ✓ enrich knowledge of production technology of dairy products ✓ acquire knowledge on quality control of dairy products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ classify & categorize the cream ✓ explain the principle of cream separation ✓ standardization of cream	**Cream:** Classification, grading, objectives, principles and methods of cream separation, standardization and uses of cream	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the nutritive value of butter ✓ state the butter making process ✓ explain the overrun	**Butter:** Composition and nutritive value. Steps of butter making, overrun in butter	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ state the composition of ghee ✓ explain the nutritive value of ghee ✓ describe the manufacturing technique of ghee	**Ghee/Butter oil:** Composition and food value, methods of manufacturing	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the composition and food value of ice-cream ✓ calculate the ice-cream mix ✓ describe the manufacturing technology of ice-cream-pasteurization, homogenization and ageing of mix, freezing, packaging and hardening	**Ice-cream:** composition, food value and classification, ice-cream ingredients, calculation of mix, ice cream manufacturing technology overrun in ice-cream	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss the composition and food value of cheese ✓ explain the principle of cheese making ✓ describe the manufacturing technology of cheese	**Cheese:** Composition, nutritive value and classification of cheese, principles of cheese making, coagulants and their properties	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ classify dahi ✓ describe the composition and food value of dahi ✓ explain the principle of dahi making ✓ describe the manufacturing technology of sweet, sour and fruit dahi ✓ evaluate the good quality dahi	**Dahi/Yoghurt/Labang:** Composition, food value, types, characteristics of good quality dahi, mechanism of milk coagulation, defects of dahi and their remedies	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the composition and food value of condensed milk ✓ describe the manufacturing technology of condensed milk	**Condensed milk:** Composition, food value, manufacturing process of condensed milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ describe the composition and food value of dry milk ✓ classify the dry milk ✓ describe the manufacturing technology	**Dry milk:** Composition, food value, classification, manufacturing process, properties and uses of dry milk	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ list the indigenous dairy products ✓ explain the importance of indigenous dairy products ✓ discuss the manufacturing technology of chhana, rossogolla, malaikari, monda, sondesh, rasamalai, chamcham ✓ illustrate the manufacturing technology of pudding, custard, kefir	**Indigenous of milk based products:** Importance and manufacturing process of indigenous and milk based products	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss the milk and milk products standard of BSTI, PFA and ISI ✓ describe the food safety act, 2013	**Milk and milk product standard:** Standard of BSTI, PFA, ISI, Food Safety Act-2013	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. E. Spreer. 1998. Milk and Dairy Products Technology. Marcel Dekker Inc. New York. USA.
2. J.C.T. Venden Ber. 1998. Dairy Technology in the Tropics and Sub Tropics. Pudoc Wageningen. Netherlands.
3. K.S. Rangappa and K.T. Achraya. 2005. Indian Dairy Products. Asia Publishing House. India.
4. L. Andrew. 2004. Milk and Milk Products. Kate Barber Winton. Agrobios. India.
5. L.M. Lampert. 1965. Modern Dairy Products. Lampert Chemical Publishing Company. New York. USA.
6. S. Tomar. 2013. An Introduction to Dairy Technology. Oxford Book Company. Jaipur. India.
7. S. Singh. 2014. Dairy Technology. Vol.1. Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.
8. S. Singh. 2014. Dairy Technology. Vol.2. Dairy Products and Quality Assurance. New India Publishing Agency, New Delhi, India.
9. S. De. 2013. Outlines of Dairy Technology. Oxford University Press. New Delhi. India.
10. W.L. Davis. 1993. Indian Indigenous Milk products. Spink and Company Private limited. Kolkata. India.

Course Code: DASC 412 **Course Title: Dairy Food Technology (Practical)**	**Credit Hour: 1**	**Level:4**	**Semester: I**
Rationale: This course is designed to provide practical knowledge about technology of dairy food products.			
Course Learning Outcome: The major learning outcomes of the course are to- ✓ gather practical knowledge of different dairy products ✓ enrich practical knowledge of production technology of dairy products ✓ acquire practical knowledge on quality control of dairy products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify the parts of a cream separator machine ✓ assemble a cream separator machine	Identification and function of different parts of a cream separator	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ perform cream separation using modern cream separator	Separation of cream by modern centrifugal cream separator	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ evaluate the quality of cream ✓ grade & standardize the cream	Organoleptic evaluation, grading & standardization of cream	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ prepare butter ✓ develop butter manufacture technique	Manufacture of butter, butter oil/ghee	Lecture Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ perform manufacture of condensed milk	Manufacture of condensed milk	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ execute manufacturing process of cheese	Manufacture of cheese	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance

✓ implement the manufacture technique of dahi/ yoghurt, labang, cultured milk and cultured butter milk (matha),lachhi	Manufacture of fermented dairy product	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ perform the manufacturing technique of chhana, rossogolla, sandesh, monda, rasaamalai, chamcham and malaikari)	Manufacture of Indigenous dairy product	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ carry out the manufacturing technique of ice-cream, sherbets, water ices and novelties	Manufacture of Frozen dairy products	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ apply the manufacturing technique of milk based dairy products-Pudding and Custard	Manufacture of milk-based product	Lecture Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva voce Class attendance
✓ judge different dairy products	Judging of dairy products	Lecture Discussion Multimedia presentation Lab work Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ design a dairy plant layout ✓ plan a dairy plant	Visit in different dairy plants	Lecture Discussion Field visit Report writing Feedback	Report evaluation Viva voce Report Class attendance

Reference Books

1. D.K. Thompkinson. 2012. Quality Assessment of Milk and Milk Products. New India Publishing Agency, New Delhi, India.
2. E. Spreer. 1998. Milk and Dairy Products Technology. Marcel Dekker Inc. New York. USA.
3. K.S. Rangappa and K.T. Achraya. 2005. Indian Dairy Products. Asia Publishing House. India.
4. L.M. Lampert. 1965. Modern Dairy Products. Lampert Chemical Publishing Company. New York. USA.
5. S. Tomar. 2013. An Introduction to Dairy Technology. Oxford Book Company. Jaipur. India.
6. S. Singh. 2014. Dairy Technology. Vol.1. Milk and Milk Processing. . New India Publishing Agency, New Delhi, India.
7. S. Singh. 2014. Dairy Technology. Vol.2. Dairy Products and Quality Assurance. New India Publishing Agency, New Delhi, India.
8. S. De. 2013. Outlines of Dairy Technology. Oxford University Press. New Delhi. India.
9. W.L. Davis. 1993. Indian Indigenous Milk products. Spink and Company Private limited. Kolkata. India.

Department of Medicine and Public Health (MEPH)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
Discipline- **Medicine**				
15.	MEPH 329: General & Systemic Medicine (Theory)	2	3	I
16.	MEPH 330: General & Systemic Medicine (Practical)	1	3	I
17.	MEPH 365: Farm Animal Medicine (Theory)	2	3	II
18.	MEPH 366: Farm Animal Medicine (Practical)	1	3	II
19.	MEPH 423. Pet Animal Medicine (Theory)	2	4	I
20.	MEPH 424. Pet Animal Medicine (Practical)	1	4	I
21.	MEPH 431. Avian Medicine (Theory)	2	4	I
22.	MEPH 432. Avian Medicine (Practical)	1	4	I
23.	MEPH 461. Zoo, Lab, Wild & Aquatic Animal Medicine (Theory)	1	4	II
24.	MEPH 462. Zoo, Lab, Wild & Aquatic Animal Medicine (Practical)	1	4	II
25.	MEPH 471: Forensic Medicine, Jurisprudence & Ethics (Theory)	1	4	II
26.	MEPH 520: Clinical Medicine (Practical)	2	5	I
Total (Theory + Practical) 10+7= 17				
Discipline- Public Health				
27.	MEPH 521: Epidemiology and Preventive Medicine (Theory)	1	5	I
28.	MEPH 531: Zoonoses and Public Health (Theory)	1	5	I
29.	MEPH 532: Zoonoses and Public Health (Practical)	1	5	I
Total (Theory + Practical) 2+1= 3				

Total Credit Hour	
Theory	12
Practical	8
Total	**20**

Course Code: MEPH 329 **Course Title: General & Systemic Medicine (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: I**
Rationale: This course is designed to offer the fundamental concept of veterinary medicine.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on the basics of veterinary medicine ✓ obtain knowledge on the fundamental issues of diseases, health & their management ✓ develop basic understanding on determinants of diseases and their progression ✓ comprehend the principles of etiology, clinical manifestations, diagnoses, treatment, control & prevention of different general & systemic diseases			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain different medical & veterinary terms ✓ describe basic facts and concepts of medicine ✓ compare concepts of health and diseases in animals	**Introduction:** Definition, aim, objective, scope and history of veterinary medicine and its relationship with other field and laboratory disciplines; concepts of health and disease; causes of disease; direct and indirect, biological and non-biological causes; definition of common clinical and diagnostic terms	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignments	Quiz Short answer Broad answer Class attendance Report
✓ explain different techniques/methods of clinical examination of animals ✓ summarize different methods of clinical examination in various animal species ✓ interpret on findings of clinical examination	**Clinical examination:** Introduction to different techniques/methods (general and special) of clinical examination of animals; history taking; examination of the environment and animal; general examination; distant and close examination; physical examination of body regions and systems	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignments	Quiz Short answer Broad answer Class attendance Report
✓ explain different diagnostic methods & principles ✓ infer diagnostic methods and principles in various animal species ✓ predict and interpret diagnostic findings	**Diagnosis:** Definition and types of diagnosis; principles of diagnosis; principles and basis of different types of diagnosis; methods and steps of diagnosis; indications and limitations of field and laboratory diagnosis	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignments	Quiz Short answer Broad answer Class attendance Report
✓ describe different treatment methods & principles ✓ employ methods and principles of treatment in various animal species ✓ explain treatment regimen and choice in different condition	**Treatment:** General principles of treatment; definition and scope of different types of treatment; factors of consideration in the treatment of food and non-food animals; principles of selection of drugs and determination of dose, route, frequency and duration of treatment; alternative medicine used in clinical and population veterinary practices	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignments	Quiz Short answer Broad answer Class attendance Report
✓ recognize different general systemic states ✓ describe diseases & disorders related to different body systems in various animal species	**General systemic states**: Disturbances of appetite; food intake and nutritional states-ill thrift, pica, etc.; stress; septicemia; hypothermia; hyperthermia; fever; toxemia; shock; dehydration; electrolyte and acid-base imbalance;	Lecture Interactive discussion Multimedia presentation Brain storming	Quiz Short answer Broad answer Class attendance Report

✓ plan curative and preventive management for different systemic states	diseases & disorders related to different body systems in various animal species	Feedback Assignments	

Reference Books

1. A. Chakrobarti.2007. A Textbook of Clinical Veterinary Medicine. 2nd Edn. Kalyani Publishers, India.
2. E. Bourguignon. 2016. Veterinary Medicine. 1st Edn. Bio-Green. India.
3. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
4. O.M. Radostits, C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2006. Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats. 10th Edn. Elsevier, USA.
5. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 330 **Course Title: General & Systemic Medicine (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**

Rationale: This course is designed to offer hands on fundamental concept on veterinary medicine.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on the basic tools & instruments and their practical use in medicine
- ✓ develop basic understanding on different physical and clinical examination of animals
- ✓ comprehend the principles of diagnosis and their application
- ✓ solve common general and systemic clinical cases with their diagnosis, treatment, control & prevention

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify common clinical instruments used in veterinary practices ✓ discuss the principle of use of clinical, diagnostic and therapeutic instruments ✓ use clinical, diagnostic and therapeutic instruments in	Demonstration of clinical, diagnostic and therapeutic instruments	Lecture Demonstration Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ perform general and special physical examination techniques ✓ discuss the findings of general and special physical examination ✓ interpret the findings of general and special physical examination	Demonstration of general and special physical examination techniques used in different organ-systems of domestic animals (healthy)	Lecture Demonstration Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Identification Skill test Practical note book Oral test Class attendance
✓ perform general and special clinical examination techniques ✓ discuss the findings of clinical examination ✓ interpret the findings clinical examination	General principles and procedures of clinical examination in domestic animals	Lecture Demonstration Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ discuss the principles of history taking ✓ perform history taking ✓ correlate history with clinical findings	General principles and procedure of clinical history taking and distant inspection	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Oral test Class attendance

✓ identify normal and abnormal behavior in farm animals ✓ explain different physical conditions and body scoring ✓ explain behavior and body condition with clinical findings	Demonstration of demeanour and physical condition of animals	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ describe clinical history taking of sick animal ✓ demonstrate of methods and procedures of diseases detection ✓ identify and interpret of clinical findings in making presumptive diagnosis, prognosis and clinical advice	Clinical investigation of disease in individual sick animals	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Oral test Class attendance
✓ perform clinical investigation on record forms ✓ plan follow-up treatment	Procedure of filling up of clinical investigation record forms	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ criticize practices at different placement ✓ compare clinical practice in field level ✓ write and interpret clinical report	Trip to different veterinary hospitals and clinics and report writing	Field study Interactive discussion Clinical work Brain storming Feedback Assignment	Skill test Class attendance Report

Reference Books

1. A. Chakrobarti.2007. A Textbook of Clinical Veterinary Medicine. 2nd Edn. Kalyani Publishers, India.
2. E. Bourguignon. 2016. Veterinary Medicine. 1st Edn. Bio-Green. India.
3. O.M. Radostits, C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2006. Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats. 10th Edn. Elsevier, USA.
4. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 365 **Course Title: Farm Animal Medicine (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: II**
Rationale: This course is designed to offer comprehensive understanding of farm animal medicine specially in terms of diagnosis, treatment, control and prevention.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ achieve knowledge on the basics of farm animal medicine ✓ develop understanding on the essential issues of diseases, health & their management in farm animals ✓ acquire comprehensive knowledge on determinants of diseases and their progression in farm animals ✓ comprehend etiology and clinical manifestations of different diseases of farm animals ✓ develop understanding on the principles of diagnosis, treatment, control & prevention of different diseases in farm animals			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe basic facts and concepts of farm animal medicine ✓ interpret terms related to diseases of different organs and systems of farm animals	**Introduction:** Definition and scope of farm animal medicine, determinants, principles of dysfunction and treatment of diseases of different organs and systems of cattle, buffaloes, sheep, goats and horses	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with biological agents such as bacteria, viruses, mycoplasma, chlamydia, rickettsia, algae, fungi, protozoa, helminths and arthropod parasities in cattle, buffaloes, sheep, goats and horses	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Non-infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in cattle, buffaloes, sheep, goats and horses	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Metabolic disorders:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with metabolic disorders in cattle, buffaloes, sheep, goats and horses	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and	**Nutritional Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with nutritional imbalance in cattle, buffaloes, sheep, goats and horses	Lecture Interactive discussion Multimedia presentation	Quiz Short answer Broad answer Class attendance Report

prognosis ✓ sketch treatment, control & prevention of specific diseases		Brain storming Feedback Assignment	

Reference Books

1. B. P. Smith. 2008. Large Animal Internal Medicine. 4th Edn. Mosby, USA.
2. E. Bourguignon. 2016. Veterinary Medicine Published. 1st Edn. Bio-Green. India.
3. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
4. G.R. Duncanson. 2013. Farm Animal Medicine and Surgery: For Small Animal Veterinarians. 1st Edn. CABI, UK.
5. O.M. Radostits, C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2006. Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats (Radostits, Veterinary Medicine) 10th Edn. Saunders Ltd. (Elsevier) USA.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 366 **Course Title: Farm Animal Medicine (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**

Rationale: This course is designed to offer hands-on experience on farm animal medicine specially in terms of diagnosis, treatment, control and prevention of diseases.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on the identification and recognition of diseases of farm animals based on clinical signs
- ✓ develop basic understanding on different physical and clinical examinations of farm animals
- ✓ comprehend the principles of field-based presumptive diagnosis, confirmatory diagnosis and their application
- ✓ solve clinical cases with their diagnosis, treatment, control & prevention.

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ perform general and special physical examination techniques in farm animals ✓ demonstrate of methods and procedures of diseases detection ✓ identify and interpret of clinical findings in making presumptive diagnosis, prognosis and clinical advice	Clinical and physical examination of clinical cases	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance
✓ perform presumptive diagnosis of farm animal diseases ✓ explain and interpret non-laboratory field-based findings ✓ correlate non-laboratory field-based to disease diagnosis	Non-laboratory field-based presumptive diagnosis	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance
✓ predict & explain fate of different animal diseases ✓ demonstrate relationship among diseases and prognosis	Prognosis & interpretation of important diseases	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance
✓ explain conservative treatment regimen ✓ apply clinical management of diseases	Conservative curative treatment of general diseases	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance
✓ discuss health condition ✓ perform health management	Health restoration in sick farm animals	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance
✓ express clinical cases ✓ write and discuss clinical report	Clinical cases; preparation of clinical case reports	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Essay Case report Assisgnment
✓ perform clinical investigation ✓ interpret diagnosis ✓ schedule treatment	Hands on training at Mobile veterinary clinics	Lecture, Discussion Multimedia presentation Demonstration Farm/Lab work, Feedback	Quiz, Short answer Skill test Practical note book Oral test, Class attendance

Reference Books

1. A.H. Anderews. 1990. Outline of Clinical Diagnosis in Cattle. 1st Edn. Butterworths and Company, UK.
2. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
3. G.R. Duncanson. 2013. Farm Animal Medicine and Surgery: For Small Animal Veterinarians. 1st Edn. CABI, UK.
4. P.J.N. Pinsent and C.J. Fuller. 1997. Outline of Clinical Diagnosis in Horse. 1st Edn. Blackwell Science, Oxford, U.K.
5. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 423 **Course Title: Pet Animal Medicine (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: I**
Rationale: This course is designed to offer comprehensive understanding of pet animal medicine specially in terms of diagnosis, treatment, control and prevention.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ achieve knowledge on the basics of pet animals medicine ✓ develop understanding on the essential issues of diseases, health & their management in pet animals ✓ acquire comprehensive knowledge on determinants of diseases and their progression in pet animals ✓ comprehend etiology and clinical manifestations of different diseases of pet animals ✓ describe the principles of diagnosis, treatment, control & prevention of different diseases of pet animals			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe basic facts and concepts of pet animals medicine ✓ interpret diseases related to different organs and systems of different diseases of pet animals	**Introduction:** Definition and scope of pet animal medicine, determinants, principles of dysfunction and treatment of diseases of different organs and systems of dogs, cats, rabbits and other important pet animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with biological agents such as bacteria, viruses, mycoplasma, chlamydia, rickettsia, algae, fungi, protozoa, helminths and arthropod parasities in dogs, cats, rabbits and other important pet animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Non-infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in dogs, cats, rabbits and other important pet animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Metabolic disorders:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with metabolic disorders in dogs, cats, rabbits and other important pet animals .	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Nutritional Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with nutritional imbalance in dogs, cats, rabbits and other important pet animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. Aubrey Manning Marian Stamp Dawkins. 2012. An Introduction to Animal Behaviour. 6th Edn. Cambridge University Press. UK.
2. C. G. Couto and R.W. Nelson. 2016. Small Animal Internal Medicine. 5th Edn. Elsevier. USA.
3. D.H. Shaw, and S.L. Ihle. 2013.Small Animal Internal Medicine. 1st End. Wiley-Blackwell, USA.
4. E. Cote, K.A. MacDonald, K. M. Meurs, M.M. Sleeper. 2011. Feline Cardiology. 1st Edn. Wiley-Blackwell. USA.
5. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
6. K.J. Drobatz, K. Hopper, E.A. Rozanski, D. Silverstein. 2018. Textbook of Small Animal Emergency Medicine. 1st Edn, Wiley-Blackwell, USA.
7. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 424 **Course Title: Pet Animal Medicine (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: I**

Rationale: This course is designed to offer hands-on learning of clinical pet animal medicine and application at practice.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on the identification and recognition of diseases of pet animals based on clinical signs
- ✓ develop basic understanding on different physical and clinical examination of pet animals
- ✓ develop knowledge on the principles of field-based presumptive diagnosis, confirmatory diagnosis and their application in pet animal diseases
- ✓ solve clinical cases with their diagnosis, treatment, control & prevention in pet animals

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ discuss the significance of clinical restraining ✓ perform clinical restraining of pet animals for physical and clinical examination	Clinical restraining of dogs, cats, rabbits and other pet animal	Lecture Interactive discussion Demonstration Visual presentation Brain storming, Feedback	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ perform general and special physical examination techniques in pets ✓ interpret clinical and physical findings to conclude diagnosis ✓ explain relationship among findings and diseases	Clinical diagnosis of pet animal diseases; history taking, distant inspection and physical techniques, clinical examination of different body regions and different systems and organs of pet animals	Lecture Interactive discussion Demonstration Visual presentation Brain storming Feedback	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ use different methods drug administration in individual pet animals ✓ schedule drug administration protocol ✓ explain treatment regimen & protocol	Demonstration and dispensing of drugs and their doses, route of administration, duration of treatment and adverse drug reactions in pets	Lecture, Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ express clinical cases ✓ write and discuss clinical report	Clinical cases; preparation of clinical case reports	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming, Feedback Follow up planning	Case report Skill test Viva-voce
✓ perform clinical investigation ✓ predict diagnosis ✓ schedule treatment	Hands on training at mobile veterinary clinics	Lecture, Discussion Demonstration Feedback Assignment	Prescription writing Report Skill test
✓ criticize practices at different placement ✓ compare clinical practice in field level	Study tour to the central veterinary hospital, Dhaka and other private small animal clinic for practical classes	Interactive discussion Clinical work Brain storming Feedback Assignment	Skill test Class attendance Report

Reference Books

1. Aubrey Manning Marian Stamp Dawkins. 2012. An Introduction to Animal Behaviour. 6th Edn. Cambridge University Press. UK.
2. C. G. Couto and R.W. Nelson. 2016. Small Animal Internal Medicine. 5th Edn. Elsevier. USA.
3. E. Cote, K.A. MacDonald, K. M. Meurs, M.M. Sleeper. 2011. Feline Cardiology. 1st Edn. Wiley-Blackwell. USA.
4. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
5. K.J. Drobatz, K. Hopper, E.A. Rozanski, D. Silverstein. 2018. Textbook of Small Animal Emergency Medicine. 1st Edn, Wiley-Blackwell, USA.
6. V. Aspinall and R. Aspinall. 2013. Clinical Procedures in Small Animal Veterinary Practice. 1st Edn. Saunders. USA.

Course Code: MEPH 431 **Course Title: Avian Medicine (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: I**
Rationale: This course is designed to offer comprehensive understanding of avian medicine specially in terms of diagnosis, treatment, control and prevention.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on the basics of avian medicine ✓ obtain familiarity with the fundamental issues of diseases, health & their management in avian species ✓ develop basic understanding on determinants of diseases and their progression in avian species ✓ comprehend etiology and clinical manifestations of different avian diseases ✓ describe the principles of diagnosis, treatment, control & prevention of different avian diseases			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe basic facts and concepts of avian medicine ✓ explain terms related to diseases of different organs and systems	I**ntroduction:** Definition and scope of avian medicine, determinants, principles of dysfunction and treatment of diseases of different organs and systems of birds	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, treatment and control of specific diseases associated with biological agents such as bacteria, viruses, mycoplasma, chlamydia, rickettsia, algae, fungi, protozoa, helminths and arthropod parasites in important avian species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Assignment Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Non-infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in important avian species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Assignment Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Metabolic disorders:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with metabolic disorders in important avian species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Nutritional Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with nutritional imbalance in important avian species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Environmental Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with environmental factors in important avian species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. I. Dinev. 2010. Diseases of Poultry, A color Atlas. 2010. 2nd Edn.CEVA, France.
2. I. Dinev. 2014. CEVA Hand Book of Poultry Diseases. 1st Edn.CEVA, France.
3. J. Samour. 2015. Avian Medicine. 3rd Edn. Elsevier, USA.
4. J.B. Picoux, J.P. Vaillancourt, H.L. Shivaprasad, D. Venne, M. Bouzouaia. 2015. Manual of poultry diseases. 7th Edn. AFAS, France.
5. M. Boulianne. 2013. Avian Disease Manual. 7th Edn. AAAP, USA.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 432 **Course Title: Avian Medicine (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: I**
Rationale: This course is designed to offer hands-on experience on avian medicine specially in terms of diagnosis, treatment, control and prevention.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on the identification and recognition of avian diseases based on clinical signs ✓ develop basic understanding on different physical and clinical examination of avian species ✓ illustrate the principles of post-mortem diagnosis and their application ✓ solve clinical cases with their diagnosis, treatment, control & prevention			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify and interpret clinical manifestations of various diseases of poultry	Clinical signs of poultry diseases in individual and population level	Lecture Interactive discussion Visual presentation Demonstration Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ perform general and special physical examination techniques in pets ✓ interpret clinical and physical findings to conclude diagnosis ✓ explain relationship among findings and diseases	Clinical and physical examination of clinical cases	Lecture Discussion Hands-on practice Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ perform presumptive diagnosis of farm animal diseases ✓ explain and interpret non-laboratory field-based findings ✓ correlate non-laboratory field-based to disease diagnosis	Non-laboratory field-based presumptive diagnosis	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ Explain mass diagnosis of avian diseases ✓ Perform history taking and recording.	Methods of mass diagnosis using clinical signs and history of disease in population	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ explain conservative treatment regimen ✓ apply clinical management of diseases	Conservative curative treatment of general diseases	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ use different methods drug administration in individual and flock ✓ schedule drug administration protocol ✓ explain treatment regimen & protocol	Methods of administration of drugs in individual and mass treatment	Lecture Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ Predict and explain fate of different avian diseases	Prognosis & interpretation of	Lecture Interactive discussion	Quiz Short answer

	important avian diseases	Visual presentation Farm/Lab work Brain storming Feedback	Skill test Practical note book Oral test Class attendance
✓ use different methods vaccine administration in individual and flock ✓ schedule vaccination protocol	Methods of administration of vaccine in individual and group	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ outline vaccination schedule in smallholder and commercial poultry farming ✓ perform vaccination	Preparation of vaccination schedule	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ discuss field cases ✓ write and interpret clinical report	Clinical case study; preparation of clinical case reports	Lecture Interactive discussion Visual presentation Brain storming Feedback	Essay Oral test Class attendance Skill test
✓ explain risk factors in diseases ✓ describe risk factor management in commercial poultry farms	Methods of management of risk factors in subsistence and commercial poultry flocks	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ discuss disease control programs ✓ state disease control programs in subsistence and commercial poultry flocks	Development of disease control programs in subsistence and commercial poultry flocks: Planning, execution and evaluation of the programs	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ discuss existing health practices at field ✓ compare practical poultry farming in field level	Field trips to public and private poultry farms for practical exposure	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance

Reference Books

1. I. Dinev. 2010. Diseases of Poultry, A color Atlas. 2010. 2nd Edn. CEVA, France.
2. I. Dinev. 2014. CEVA Hand Book of Poultry Diseases. 1st Edn. CEVA, France.
3. J. Samour. 2015. Avian Medicine. 3rd Edn. Elsevier, USA.
4. J.B. Picoux, J.P. Vaillancourt, H.L. Shivaprasad, D. Venne, M. Bouzouaia. 2015. Manual of poultry diseases. 7th Edn. AFAS, France.
5. M. Boulianne. 2013. Avian Disease Manual. 7th Edn. AAAP, USA.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 461 **Course Title: Zoo, Lab, Wild & Aquatic Animal Medicine (Theory)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**

Rationale: This course is designed to offer the important understanding of zoo, lab, wild & aquatic animal medicine.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ develop understanding on the basics of zoo, lab, wild & aquatic animal medicine
- ✓ accomplish familiarities to the crucial issues of health, diseases & their management in zoo, lab, wild & aquatic animals
- ✓ obtain fundamental understanding on determinants of diseases and their progression in zoo, lab, wild & aquatic animal medicine
- ✓ comprehend etiology and clinical manifestations of different diseases of zoo, lab, wild & aquatic animals
- ✓ explain the principles of diagnosis, treatment, control & prevention of different diseases of zoo, lab, wild & aquatic animal

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe basic facts and concepts of zoo, lab, wild & aquatic animal medicine ✓ explain duties and responsibilities of zoo & wild life veterinarian	**Introduction:** Definition, importance and scope of zoo, wild and lab. animal medicine. duties and responsibilities of zoo veterinarian	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, treatment and control of specific diseases associated with biological agents such as bacteria, viruses, mycoplasma, chlamydia, rickettsia, algae, fungi, protozoa, helminths and arthropod parasites in important zoo, lab, wild & aquatic animal species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Non-infectious diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in important zoo, lab, wild & aquatic animal species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention	**Metabolic disorders:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with metabolic disorders in important zoo, lab, wild & aquatic animal species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

of specific diseases			
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Nutritional Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with nutritional imbalance in important zoo, lab, wild & aquatic animal species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Environmental Diseases:** Etiology, overview, clinical findings, diagnosis, prognosis, therapy and control of specific diseases associated with environmental factors in important zoo, lab, wild & aquatic animal species	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. Aubrey Manning Marian Stamp Dawkins. 2012. An Introduction to Animal Behaviour. 6th Edn. Cambridge University Press. UK.
2. E. Cote, K.A. MacDonald, K.M. Meurs and M.M. Sleeper. 2011. Feline Cardiology. 1st Edn. Wiley-Blackwell. USA.
3. E.M. Murray and E. Fowler. 2014. Fowler's Zoo and Wild Animal Medicine, Saunders. USA.
4. J. Fox, L. Anderson, G. Otto, K. P. Corning and M. Whary. 2015. Laboratory Animal Medicine, 3rd Edn. ACLM, USA.
5. M.D. Frances, G. Leslie, A. Dierauf, K.L. Whitman. 2018. CRC Handbook of Marine Mammal Medicine. 3rd Edn. CRC Press, Taylor & Francis Group, UK.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 462 **Course Title: Zoo, Lab, Wild & Aquatic Animal Medicine (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**

Rationale: This course is designed to offer hands-on learning of clinical practices in zoo, lab, wild & aquatic animal medicine.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on the identification and recognition of diseases of zoo, lab, wild & aquatic animals based on clinical signs
- ✓ develop basic understanding on different physical and clinical examination of zoo, lab, wild & aquatic animals
- ✓ comprehend the principles of field-based presumptive diagnosis, confirmatory diagnosis and their application in zoo, lab, wild & aquatic animal diseases
- ✓ solve clinical cases with their diagnosis, treatment, control & prevention in zoo, lab, wild & aquatic animal animals

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ discuss the significance of clinical restraining ✓ perform clinical restraining of zoo, wild, lab and aquatic animals and birds for physical and clinical examination	Clinical restraining of zoo, wild, lab and aquatic animals and birds	Lecture Interactive discussion Visual presentation Demonstration Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ perform general and special physical examination techniques in zoo, wild, lab and aquatic animals and birds ✓ explain findings in relation to diseases	Methods of physical and clinical examination of zoo, wild, lab and aquatic animals and birds	Lecture Interactive discussion Visual presentation Demonstration Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ interpret clinical and physical findings to conclude diagnosis ✓ predict and explain fate of different diseases in zoo, wild, lab and aquatic animals and birds	Clinical diagnosis and prognosis of zoo, wild, lab and aquatic animals and birds	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ use different methods drug administration diseases in zoo, wild, lab and aquatic animals and birds. ✓ explain treatment regimen & protocol diseases in zoo, wild, lab and aquatic animals and birds	Demonstration of drugs and vaccines used in zoo, wild, lab and aquatic animals and birds. with their dose and route of administration	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz Short answer Skill test Practical note book Oral test Class attendance

✓ write and discuss clinical report	Clinical cases; preparation of clinical case reports	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming Follow-up planning Assignment	Quiz Short answer Oral test Case report Skill test
✓ explain importance of disease prevention ✓ state disease control programs in zoo, wild, lab and aquatic animals and birds	Preventive procedures of the diseases of zoo, wild, lab and aquatic animals and birds	Lecture Interactive discussion Visual presentation Brain storming Feedback Assignment	Seminar presentation Report Quiz Short answer Oral test
✓ compare health management in zoo, wild, lab and aquatic animals and birds at practice	Visit to different public and private zoological gardens and report writing	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback Assignment	Seminar presentation Report Quiz Short answer Oral test

Reference Books

1. Aubrey Manning Marian Stamp Dawkins. 2012. An Introduction to Animal Behaviour. 6th Edn. Cambridge University Press. UK.
2. E. Cote, K.A. MacDonald, K.M. Meurs and M.M. Sleeper. 2011. Feline Cardiology. 1st Edn. Wiley-Blackwell. USA.
3. E.M. Murray and E. Fowler. 2014. Fowler's Zoo and Wild Animal Medicine, Saunders. USA.
4. J. Fox, L. Anderson, G. Otto, K.P. Corning and M. Whary. 2015. Laboratory Animal Medicine, 3rd Edn. ACLM, USA.
5. M.D. Frances, G. Leslie, A. Dierauf, K.L. Whitman. 2018. CRC Handbook of Marine Mammal Medicine. 3rd Edn. CRC Press, Taylor & Francis Group, UK.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 471 **Course Title: Forensic Medicine, Jurisprudence & Ethics (Theory)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**
Rationale: This course is designed to offer the comprehensive understanding of veterinary forensic sciences in crimes involving animals, including recognition of abuse, crime scene investigation, and interacting with the legal community. The course also offers the rules and regulations in veterinary practice and their application.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on the basics of veterinary forensic medicine ✓ obtain knowledge on the basic rules, regulations & their implementation in the country ✓ develop comprehensive understanding on ethical considerations and areas of work in veterinary practice ✓ comprehend the crimes involving animals, including recognition of abuse, crime scene investigation, and interacting with the legal community			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain basic facts and concepts of veterinary forensic medicine, jurisprudence and ethics ✓ discuss the application of forensic medicine in criminal cases ✓ interpret veterinary ethics and laws ✓ recommend different forensic science disciplines and their application to animal cases	**Introduction:** Definition, scope and importance of veterinary forensic medicine, jurisprudence and ethics, application of veterinary forensic medicine in criminal cases, ethical considerations on animal usage and treatment; liability, veterinary ethics and laws	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report
✓ identify, collect, and analyze evidence related to crimes involving animals ✓ recognize signs of abuse ✓ interpret causes of injury or death	**Common offences against animals:** Definition and identification of different types of common offences against animals; mischief, cruelty, bestiality etc. methods of examination of live animals in criminal cases	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report
✓ classify malacious causes of death in animals ✓ recognize signs of malicious death	**Malacious death in animals:** Ways of causing malacious death in animals; malacious poisoning, drowning, lightning, electrocution and other cause of death in animals	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report
✓ recognize veterolegal wounds, injury and deaths ✓ perform postmortem of veterolegal cases ✓ document all findings in an appropriate legal report	**Veterolegal cases:** Veterolegal aspects of wounds, injury and death. Post mortem examination of veterolegal cases, collection, preservation and dispatch of materials of suspected veterolegal cases to laboratory, writing of veterolegal reports and certificates	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report

✓ explain importance of insurance and registration in animal ✓ criticize legislations and their application in veterinary practice	**Insurance, registration and legislation:** Insurance of animals, registration of pet animals, legislation against animal diseases, common frauds in the sale of livestock and its products	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. D. Bailey. 2008. Practical Veterinary Forensics.1st Edn. CABI Publishing. UK.
2. K. Dua. 2003. Veterinary Ethics and Jurisprudence. Kalyani Publishers. India.
3. M.D. Merck. 2012. Veterinary Forensics: Animal Cruelty Investigations. 2nd Edn. Wiley-Blackwell. USA.
4. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 520 **Course Title: Clinical Medicine (Practical)**	**Credit Hour: 2**	**Level: 5**	**Semester: I**
Rationale: This course is designed to offer hands-on learning of veterinary clinical medicine and application at practice.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ obtain familiarity on the practice of veterinary clinical medicine ✓ acquire basic skill on the clinical examination, disease recognition and field-based diagnosis ✓ develop proficiency in treatment regimen, record keeping, and follow-up treatment ✓ describe the fate of disease & their forecasting ✓ develop comprehensive skill on control and prevention of diseases in farm and individual animal & birds			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ perform and interpret clinical examination & diagnosis of diseases ✓ compute, treatment, record keeping, and follow-up treatment of clinical cases	Clinical examination, diagnosis, treatment, record keeping, and follow-up treatment	Lecture Interactive discussion Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ translate the fate of the diseases based on the diagnosis ✓ draw conclusion on the fate of disease	Determination of prognosis of clinical cases	Lecture Interactive discussion Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ Sketch disease control program in animal and birds ✓ develop comprehensive skill on prevention of diseases in farm and individual animal & birds	Development of control and preventive measures for diseases of animals and birds	Lecture Interactive discussion Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ describe dysfunctions & abnormalities of different organs and systems ✓ compare clinical manifestations of dysfunctions	Identification of clinical manifestations of dysfunctions relating the abnormalities of different organs and systems	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ use different routes of medicine administrations in veterinary practice ✓ schedule clinical management of prescribed medicine and treatment	External and internal administration of medicine and their management	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report

✓ assess the degree of dehydration ✓ calculate the volume required to correct the dehydration ✓ perform fluid, electrolyte, & blood transfusion in farm and pet animals ✓	Transfusion techniques: clinical practice on fluid and electrolyte, blood transfusion in farm and pet animals	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ solve veterinary casualties ✓ use first-aid and life saving techniques	Handling of veterinary casualties; practice on emergency first-aid and life saving techniques	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Skill assessment Quiz Short answer Class attendance Case report
✓ criticize practices at different placement ✓ Compare clinical practice in field level	Visit to different veterinary hospitals, clinics, farms for clinical purpose	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Seminar presentation Skill assessment Quiz Short answer Class attendance Case report
✓ state clinical cases ✓ format scientific report	Case report writing	Lecture Interactive Discussion Demonstration Multimedia presentation Clinical work Feedback	Seminar presentation Skill assessment Quiz Short answer Class attendance Case report

Reference Books

1. A. Chakrobarti.2007. A Textbook of Clinical Veterinary Medicine. 2nd Edn. Kalyani Publishers, India.
2. A.H. Anderews. 1990. Outline of Clinical Diagnosis in Cattle. 1st Edn. Butterworths and Company, UK.
3. G.A. Conboy, A.M. Zajac. 2012. Veterinary Clinical Parasitology. Iowa State University Press, USA.
4. O.M. Radostits, C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2006. Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats (Radostits, Veterinary Medicine) 10th Edn. Saunders Ltd. (Elsevier) USA.
5. P.J.N. Pinsent and C.J. Fuller. 1997. Outline of Clinical Diagnosis in Horse. 1st Edn. Blackwell Science, Oxford, U.K.
6. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: MEPH 521 **Course Title: Epidemiology and Preventive Medicine (Theory)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**
Rationale: This course is designed to offer the essential concept of veterinary epidemiology & preventive medicine.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on the basics of veterinary epidemiology & preventive medicine ✓ obtain acquaintance with the concept of different epidemiological studies and clinical epidemiology ✓ develop basic understanding on herd health management, disease control strategies and screening ✓ comprehend the principles of epidemiology and their application in disease control strategies			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
Veterinary Epidemiology			
✓ explain basic facts and concepts of epidemiology ✓ paraphrase different epidemiological terms and measures	**Introductory Epidemiology:** Definition and scope of epidemiology, current development and application of epidemiology, measures of disease frequency, measures of exposures impact, measures of strength of association, measures of infectiousness and transmissibility	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ summarize types of different epidemiological studies ✓ discuss application of different epidemiological studies	**Epidemiological studies:** Types and application, surveillance and surveys and their application, sample and sampling. size, error, bias, precision etc.	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ state clinical epidemiology and their application ✓ report clinical epidemiology following standard format and style	**Clinical Epidemiology:** Inter-observer agreement, sensitivity, specificity, case definition, laboratory surveillance, outbreak investigation, principals of epidemiology and ecology applied to health management programs	Lecture Interactive discussion Multimedia presentation Group work Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
Preventive Medicine			
✓ express basic facts and concepts of preventive medicine ✓ summarize principles of control and eradication programs	**Introductory preventive medicine:** Definition and scope, classification of prevention, principles of disease control, control and eradication programs, environmental control	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report
✓ describe concept of profitable herd health program	**Herd health management:** Principles, objectives, component and requirements of planning and	Lecture Interactive discussion	Quiz Short answer Broad answer

✓ illustrate components of herd health programs ✓ schedule application of herd health programs	monitoring of profitable herd health program	Multimedia presentation Brain storming Feedback Assignment	Class attendance Report
✓ explain disease control strategies in farm animals ✓ schedule preventive medicine at farm levels	**Strategies of disease control:** Direct and indirect methods, methods of vaccination for preventive purpose, preventive schemes for major diseases affecting ruminants and non-ruminants	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ describe screening of diseases at individual and population level ✓ explain rapid diagnostic test ✓ illustrate screening for sub-clinical cases	**Screening:** Screening of diseases at individual and population level, rapid diagnostic test; sero-prevalence, tests for screening of sub-clinical cases under farm condition	Lecture Interactive discussion Multimedia presentation Group work Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. O.M. Sofi and T.A. Sofi. 2017. Handbook of Veterinary Preventive Medicine. 1st Edn. LAP Lambert Academic Publishing. USA.
2. R. Christley, M. Thrusfield. 2018. Veterinary Epidemiology. 4th Edn. John Wiley & Sons Inc. USA.
3. R.D. Smith. 2005. Veterinary Clinical Epidemiology., 3rd Edition. Taylor & Francis Inc. USA.
4. S. Greenland, K.J. Rothman,T.L. Lash. 2013. Modern Epidemiology. 1st Edn. Lippincott Williams and Wilkins. USA.

Course Code: MEPH 531 **Course Title: Zoonoses and Public Health (Theory)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**
Rationale: This course is designed to offer comprehensive knowledge and understanding on zoonoses and veterinary public health specially in terms of diagnosis, treatment, control and prevention of zoonotic diseases.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire demonstrable knowledge of zoonotic and non-zoonotic diseases of public health significance ✓ attain understanding of veterinarians' responsibilities & professional caring attitude towards the welfare of food producing animals from farm to slaughter ✓ develop understanding of surveillance programs for zoonotic diseases and laboratory techniques used for the diagnosis and surveillance of zoonotic and food-borne diseases ✓ solve clinical cases with their diagnosis, treatment, control & prevention of diseases with public health significance			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe basic facts and concepts of zoonoses and veterinary public health ✓ discuss public health administration & role of veterinarians in public health implementation	**Introduction:** Definition and importance of zoonoses and public health, veterinary interests in zoonoses and public health, principal functions and fields of activity of public health veterinarians, veterinary public health administration; organization, administration and implementation of veterinary public health services and programs, Roleof veterinarian in the public health team; veterinary public health agencies and institutions in Bangladesh and abroad	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ develop concept of causes & clinical manifestations ✓ explain clinical diagnosis and prognosis ✓ sketch treatment, control & prevention of specific diseases	**Zoonoses:** Etiology, host range, epidemiology, diagnosis and management of zoonotic diseases .Bacterial zoonoses: anthrax, brucellosis, tuberculosis, salmonellosis, leptospirosis, plague, etc. Viral zoonoses: influenza, rabies, FMD, dengue fever, .etcQ fever and other rickettsiosis. Fungal infections viz. dermatophytosis, aspergillosis, candidiasis, .etc Parasitic zoonoses; echinococcosis, taeniasis, toxoplasmosis, trichinellosis, leishmaniasis, trypanosomosis etc.	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ discuss the concept of emerging and re-emerging zoonoses ✓ explain clinical diagnosis and prognosis ✓ illustrate treatment, control & prevention of specific diseases	**Emerging and Re-Emerging Zoonoses**: Concept of emerging and re-emerging zoonoses; diagnostic and management planning; Euzoonoses, xenozoonoses, nosocomial zoonoses, newer zoonotic agents viz. cat-scratch disease, rat bite fever, ebola, nipah, Herpes B, SARS ,etc.	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Report

✓ explain hazard analysis critical control point system (HACCP) ✓ discuss occupational hazards and their management ✓ public healthpractices in laboratories, veterinaryhospitals, biological plants, .etc	**Current Topics in Veterinary Public Health**: Role of biotechnology in food hygiene, Hazard Analysis Critical Control Point System (HACCP). Health/diseases associated with various occupations: transportation, spread, maintenance and control of diseases affecting various occupational groups in contact with animals and their public health significance, public health regulations for safety in laboratories, veterinary hospitals, biological plants, etc.	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ report public health aspects of animal products and by products ✓ recognize welfare of food producing animals from farm to slaughter ✓ identify food safety issues	**Public Health Aspects of Animal Products and Byproducts:** Public health aspects of animal products (milk, meat, eggs) and by products (bone, skin, hides, wools, fur, hair, etc.) in relation to diseases and drug residues, public health aspects at different farm level management, public health issues relating food, water and air borne diseases, identification and screening of zoonotic diseases	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ identify relationship between agents, host and environmental factors ✓ illustrate epidemiological investigations of diseases of public health importance	**Epidemiological investigation of zoonotic diseases**: Concepts, Scope and objectives, causes of mass diseases. Inter-relation between agents, host and environmental factors, general methods of epidemiological investigations of diseases of public health importance	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report
✓ sketch plan for prevention and control of zoonoses ✓ illustrate eradication of zoonoses	**Prevention and control of zoonotic diseases:** Prevention, control and eradication of different bacterial, viral, parasitic and protozoal zoonotic diseases	Lecture Interactive discussion Multimedia presentation Brain storming Feedback Assignment	Quiz Short answer Broad answer Class attendance Report

Reference Books

1. C.W. Schwabe. 1984. Veterinary Medicine and Human Health. 3rd Edn. Williams & Wilkins, USA
2. H. Rahman. 2011. Veterinary Public Health: New Trends. 1st Edn. Biotech Books, India
3. J. Zinsstag, E. Schelling, D. W.Toews, M. Whittaker, and M. Tanner. 2015. One Health: The Theory and Practice of Integrated Health Approaches. 1st Edn. CABI, USA.
4. M.R. Adams, Ma.O. Moss, and P. McClure. 2015. Food Microbiology. Royal Society of Chemistry, UK
5. S.R. Palmer, L.Soulsby, P. Torgerson, and D.W. G. Brown. 2011. Oxford Textbook of Zoonoses: Biology, Clinical Practice, and Public Health Control. OUP Oxford, UK
6. Sava. 2006. Integrated food safety and veterinary public health. 1st Edn. CABI. UK
7. Sing. 2014. Zoonoses-Infections Affecting Humans and Animals: Focus on Public Health Aspects. 1st Edn. Springer. The Netherlands.

Course Code: MEPH 532 **Course Title: Zoonoses and Public Health (Practical)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**

Rationale: This course is designed to offer hands-on experience on zoonoses and public health practice at field.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge on the important issues related to public health organization, administration and implementation
- ✓ develop understanding of the principles of field-based presumptive diagnosis, confirmatory diagnosis and their application in zoonotic diseases management
- ✓ solve clinical cases of zoonotic diseases with their diagnosis, treatment, control & prevention
- ✓ accomplish fundamental requirements to ensure food safety for public health aspects
- ✓ comprehend occupational and environmental health hazards and their management

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify administrative, organizational framework of public health administration ✓ discuss implementation of public health programs & services	Organization, administration and implementation of veterinary public health services and programs	Lecture Interactive discussion Visual presentation Brain storming Feedback	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ identify occupational hazards ✓ discuss management of occupational hazards	Health status and diseases associated with various occupations	Lecture, Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ perform sampling from solid, liquid and surface samples ✓ detect & identify zoonotic organisms ✓ explain zoonoses caused by specific organisms	Sampling, detection and enumeration of zoonotic organisms	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Oral test Class attendance
✓ perform microbiological and chemical analysis of specific food ✓ detect & identify food borne zoonotic organisms ✓ explain zoonoses caused by specific food borne organisms ✓ illustrate food safety in relation to pathogenic organisms and chemicals	Microbiological and chemical analysis of specific food (meat, milk, eggs, fish and their products) to determine food safety related issues	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Assignment Feedback	Quiz Short answer Skill test Practical note book Oral test Report Class attendance
✓ perform residue analysis in food of animal origin ✓ explain public health issues related to animal products and by products ✓ illustrate hazards originating from animal products and by products	Determination of adulterants and drug residues in animal products (meat, milk, eggs, fish and their products) in relation to diseases and public health	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Assignment Feedback	Quiz Short answer Skill test Practical note book Oral test Report Class attendance
✓ discuss principles of HACCP analysis ✓ explain the significance of HACCP analysis ✓ illustrate the application of HACCP in food safety	Hazard Analysis and Critical Control Points (*HACCP)*	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz, Short answer Skill test Practical note book Oral test Class attendance
✓ explain epidemiological analysis of zoonoses ✓ illustrate methods of mass diagnosis	Methods of epidemiological investigation of zoonotic diseases: methods of mass diagnosis using clinical signs and history of disease in population	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz, Short answer Identification Skill test Practical note book Oral test Class attendance
✓ criticize public health practices at field level practices at different placement ✓ compare public health practices in field level	Field trips to public and private public health organization for practical exposure; preparation of reports	Field Trip Demonstration Group work Seminar presentation	Essay Presentation performance Report

Reference Books

1. C.W. Schwabe. 1984. Veterinary Medicine and Human Health. 3rd Edn. Williams & Wilkins, USA.
2. H. Rahman. 2011. Veterinary Public Health: New Trends. 1st Edn. Biotech Books, India.
3. J. Zinsstag, E. Schelling, D.W. Toews, M. Whittaker, and M. Tanner. 2015. One Health: The Theory and Practice of Integrated Health Approaches. 1st Edn. CABI, USA.
4. M.R. Adams, Ma.O. Moss, and P. McClure. 2015. Food Microbiology. Royal Society of Chemistry, UK.
5. S.R. Palmer, L.Soulsby, P. Torgerson, and D.W. G. Brown. 2011. Oxford Textbook of Zoonoses: Biology, Clinical Practice, and Public Health Control. OUP Oxford, UK.
6. Sava. 2006. Integrated food safety and veterinary public health. 1st Edn. CABI. UK.
7. Sing. 2014. Zoonoses-Infections Affecting Humans and Animals: Focus on Public Health Aspects. 1st Edn. Springer. The Netherlands.

Department of Microbiology & Parasitology (MIPA)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
Discipline- Microbiology				
1.	MIPA 117: General Microbiology (Theory)	2	1	I
2.	MIPA 118: General Microbiology (Practical)	1	1	I
3.	MIPA 219: Bacteriology (Theory)	2	2	I
4.	MIPA 220: Bacteriology (Practical)	1	2	I
5.	MIPA 257: Virology (Theory)	3	2	II
6.	MIPA 258: Virology (Practical)	1	2	II
7.	MIPA 319: Mycology, Mycoplasmology, Rickettsiology & Chlamydiology (Theory)	1	3	I
8.	MIPA 357: Immunology & Serology (Theory)	2	3	II
9.	MIPA 358: Immunology & Serology (Practical)	1	3	II
10.	MIPA 417: Animal Hygiene, Biosafety and Bio-security (Theory)	2	4	I
11.	MIPA 429: Molecular Microbiology (Theory)	1	4	I
12.	MIPA 457: Zoonotic Microbiology (Theory)	2	4	II
13.	MIPA 513: Food Microbiology, Hygiene & Safety (Theory)	2	5	I
14.	MIPA 514: Food Microbiology, Hygiene & Safety (Practical)	1	5	I
Total (Theory + Practical) 17+5= 22				
Discipline- Parasitology				
15.	MIPA 221: General Parasitology & Malacology (Theory)	2	2	I
16.	MIPA 222: General Parasitology & Malacology (Practical)	1	2	I
17.	MIPA 259: Nemathelminthes & Platyhelminthes (Theory)	3	2	II
18.	MIPA 260: Nemathelminthes & Platyhelminthes (Practical)	1	2	II
19.	MIPA 321: Veterinary Entomology & Aquatic Parasitology (Theory)	2	3	I
20.	MIPA 322: Veterinary Entomology & Aquatic Parasitology (Practical)	1	3	I
21.	MIPA 359: Protozoology (Theory)	2	3	II
22.	MIPA 360: Protozoology (Practical)	1	3	II
Total (Theory + Practical) 9+4= 13				

Total Credit Hour	
Theory	26
Practical	9
Total	**35**

Course Code: MIPA 117 **Course Title: General Microbiology (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: I**
Rationale: To provide fundamental knowledge about six types of micro-organisms, specially bacteria, viruses, fungus, rickettsia, chlamydia, mycoplasma and their basic features.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ obtain knowledge about different types of microorganism (viruses, bacteria, fungus, rickettsia, chlamydia, mycoplasma and their basic features) ✓ attain knowledge on definition of virus, bacteria and related terminology ✓ acquire knowledge about different structures of bacteria, viruses and other micro-organism ✓ achieve knowledge about Differentiation among six types of micro-organism, their reproduction, nutrition, growth factors, toxins etc.			

Intended Learning Outcomes (ILOS) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define bacteria, virus and related terms like virion, viriods, prion, satellite, entity ✓ differentiate among prokaryotes vs eukaryotes, ✓ compare among bacteria, virus, fungi, mycoplasma, rickettsia and chlamydia ✓ evaluate the important contribution of various scientist in the field of microbiology	**Introduction to Microbiology:** Definition and branches of microbiology, concept of microorganisms, historical introduction of microbiology including works of Pasteur, Koch, Lister and recent developments. prokaryotes vs eukaryotes, comparison among bacteria, virus, fungi, mycoplasma, rickettsia and chlamydia	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ gain knowledge about microscopic and ultramicroscopic structures of the bacterial cell ✓ acquire knowledge about composition and function of different bacteria	**Bacterial Structure:** Microscopic and ultramicroscopic structures of the bacterial cell (nuclear apparatus, bacterial cytoplasm, intracellular granules, cell wall and membrane, capsule, endospore, flagella, fimbriae or pili, etc.) including their composition and function	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ state the shape, size and the arrangement of different bacteria ✓ classify of bacteria on the basis of above mentioned parameters	**Bacterial morphology:** Shape, size, arrangement and differential staining of bacteria	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ outline nutritional, physic-chemical requirements of bacteria ✓ illustrate metabolism, reproduction, growth curve of bacteria	**Bacterial Growth and Multiplication:** Physico-chemical requirements (pH, temperature, light, gaseous and nutritional requirements, etc.) and metabolism of bacteria, bacterial multiplication and growth curves	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ perform about definition, differentiation of toxin, exotoxin, endotoxin ✓ execute the effect of different toxins in disease production ✓ interpret the role of anti-toxin to eliminate toxin ✓ sketch about different mode of bacterial reproduction ✓ predict the effect of mutation during transfer of gene	**Bacterial toxins:** Exotoxin, endotoxin and their effect on host tissues, role of antitoxin against toxins **Bacterial Genetics:** Bacterial gene transfer (transformation, conjugation, transduction), Grifith experiment for transformation of gene, mutation and their effects indifferent organism	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance

✓ recall various definitions of infection, disease and virulence ✓ describe the factors of virulence in disease production ✓ justify relationship of microorganisms to a disease (Koch's postulate)	**Microbial infection and Virulence:** Definition of infection, disease and virulence, relationship of microorganisms to a disease (Koch's postulate), general defense mechanism of the body, mechanism of infection, factors influencing microbial virulence	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ define bacteria, virus, and related terms ✓ differentiate virus from other microorganisms ✓ explain the composition and function of viral structures ✓ assess the physical, chemical and biological properties, replication of viruses	**Virus:** Definition of virus, virion, viroid, pseudo virus and prion, differentiation of virus from other microorganisms, composition and function of viral structures, physical, chemical and biological properties of viruses **Viral Genetics:** Viral DNA & RNA and their replication, viral genetic map and viral genome organization	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ achieve the latest research findings and information in the area of General microbiology	**Latest research findings:** Information about latest research innovations in field of general microbiology	Review of journals and articles	Assignment evaluation

Reference Books

1. Buxton and G. Frazer. 1977. Animal Microbiology. Vol.1. Blackwell Scientific Publication.
2. H.D. Kumar. 2000. Molecular biology. 2nd edition. Vikas Publishing House, Pvt. Ltd, India.
3. J.W. Dale. 1998. Molecular genetics of bacteria. 3rd edition. John Wiley and Sons Inc., New York.

Course Code: MIPA 118 **Course Title: General Microbiology (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**

Rationale: To provide fundamental knowledge about lab biosafety, safety rules, laboratory equipment's, chemicals, stains and their uses to identify different organism.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ impart knowledge on how to conduct practical classes, demonstration with maintaining maximum bio-safety measures to avoid any accidental incidents
- ✓ attain knowledge on different lab safety equipment's, instruments, chemicals, stains used in microbiology lab
- ✓ acquire knowledge to identify different types of bacteria, viruses by using different stains and culture media

Intended Learning Outcomes (ILOS) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquire knowledge about various bio-safety measures used for microbiological laboratory	Bio-Safety measures used for microbiological laboratory	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ identify the laboratory equipment's, their basic functions and handling	Demonstration of laboratory equipment's, their basic functions and handling	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ identify different parts of microscope & their functions	Microscope and microscopy	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ able to make laboratory equipment, instruments germ free by using sterilization & disinfection procedure ✓ identify sterilizing and disinfectant equipment's	Sterilization and Disinfection	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ prepare different types of media ✓ execute preparation procedure of various culture media	Preparation and demonstration of various bacterial culture media	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ illustrate the cultivation, growth of bacteria and their growth requirements	Cultivation and growth of bacteria	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ detect gram positive & gram-negative bacteria ✓ differentiate gram positive & gram-negative bacteria	Gram's staining of bacteria	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ identify acid fast bacteria(mycobacterium)	Acid fast staining of bacteria	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ determine special structure of bacteria like flagella & capsules	Flagella staining of bacteria; capsular staining of bacteria	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ detect endospore & their functions	Staining of bacterial endospore	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ apply the special stain for these organism ✓ identify these organism	Staining of fungi, mycoplasma, rickettsia and chlamydia	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book

Reference Books

1. A. Buxton and G. Frazer. 1977. Animal Microbiology. Vol.1. Blackwell Scientific Publication.
2. H. D. Kumar. 2000. Molecular biology. 2nd edition. Vikas Publishing House, Pvt. Ltd.
3. J. W. Dale. 1998. Molecular genetics of bacteria. 3rd edition. John Wiley and Sons Inc., New York.

Course Code: MIPA 219 **Course Title: Bacteriology (Theory)**	**Credit hour: 2**	**Level: 2**	**Semester: I**

Rationale: This course is designed to provide fundamental concept of bacteria, its classification & other properties.

Course Learning Outcome: The focal learning outcome of this course are to-

- ✓ acquire knowledge about Bacteria & its classification
- ✓ enrich knowledge on morphology & staining properties, cultural characteristics, biochemical activities, resistance to physic-chemical agents
- ✓ gain knowledge on antigenic properties, toxin and their association with animal diseases (pathogenicity)
- ✓ gather knowledge on transmission, laboratory diagnosis, immune-prophylaxis and antibiotic sensitivity of different bacteria

Intended Learning Outcomes (ILOs) Students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain taxonomy & nomenclature of bacteria ✓ outline systematic classification of bacteria ✓ represent the general concept of different kind of bacteria ✓ classify bacteria according to different morphology, topography, pathogenicity etc.	**Introduction:** Taxonomy, nomenclature and systematic classification of bacteria	Lecture Discussion Visual presentation Report writing	Quiz Short answers Essay type answers Report Class attendance
✓ recognize the Morphology of aerobic Gram (+ve) cocci ✓ list the staining properties of Gram (+ve) cocci ✓ investigate cultural characteristics & biochemical activities of aerobic Gram (+ve) cocci ✓ select physico-chemical agents to inactivate Gram (+ ve) cocci ✓ illustrate antigenic properties, toxins and their association with animal diseases (pathogenicity), ✓ justify diseases transmission of Gram (+ ve) cocci ✓ evaluate the laboratory diagnosis of Gram (+ ve) cocci ✓ explain immune-prophylaxis of Gram (+ ve) cocci ✓ express the level of antibiotic sensitivity of aerobic Gram (+ ve) cocci	**Aerobic Gram (+VE) positive Cocci:** Morphology & staining properties, cultural characteristics, biochemical activities, resistance to physico-chemical agents, antigenic properties, toxins and their association with animal diseases (pathogenicity), transmission, laboratory diagnosis, immune-prophylaxis and antibiotic sensitivity of following bacteria: aerobic Gram + vecocci: *Streptococcus* spp. *Staphylococcus* spp.	Lecture Discussion Visual presentation Report writing	MCQ Short answers Essay type answers Report Class attendance
✓ determine the morphology of Gram (-ve) rods ✓ list staining properties ✓ explain the cultural characteristics & biochemical activities of Facultative anaerobic Gram (-ve) rods ✓ select physico-chemical agents to inactivate the bacteria ✓ express antigenic properties toxins and their association with animal diseases (pathogenicity) ✓ recommend the laboratory diagnosis ✓ measure immuno-prophylaxis and antibiotic sensitivity of facultative anaerobic Gram (-ve) rods	**Facultative anaerobic Gram (-ve) rods:** *Escherichia coli, Salmonella* spp., *Shigella*, *Proteus, Klebsiella*, *Enterobacter*, *Yersinia*, *Vibrio*, *Pasteurella* spp. *Haemophilus paragallinarum* etc.	Lecture Discussion Visual presentation Report writing	MCQ Short answers Essay type answers Report Class attendance

✓ determine morphology of aerobic non-spore forming Gram (+ve) rods & acidfast bacteria ✓ list staining properties of Gram (+ve) rods & acidfast bacteria ✓ categorize cultural characteristics & biochemical activities of aerobic non-spore forming Gram (+ve) rods & acidfast bacteria ✓ select physico-chemical agent to inactivate Gram (+ve) rods & acidfast bacteria ✓ explain the antigenic properties, toxins and their association with animal diseases (pathogenicity) and transmission of Gram (+ve) rods & acidfast bacteria ✓ recommend laboratory diagnosis Gram (+ve) rods &acidfast bacteria ✓ measure the immuno-prophylaxis and antibiotic sensitivity of aerobic non-spore forming Gram (+ve) rods & acidfast bacteria	**Aerobic non-spore forming Gram (+ve) rods:** *Corynebacterium* spp. *Listeria monocytogenes, Erysiopilothrix incidiosa* **Acid fast acteria:** *Mycobacterium* spp., *M. johnei, M. leprae*, atypical *Mycobacteria, Nocardia*	Lecture Discussion Visual presentation Report writing	Quiz Short answers Essay type answers Report Class attendance
✓ determine the morphology of different bacteria of aerobic & anaerobic Gram (+ve) spore forming rods; Anaerobic Gram (-ve) rods & Aerobic & anaerobic spirochaetes ✓ list thee staining properties of aerobic & anaerobic Gram (+ve) spore forming rods; Anaerobic Gram (-ve) rods & aerobic & anaerobic spirochaetes ✓ categorize the cultural characteristics & biochemical activities of aerobic & anaerobic Gram (+ve) spore forming rods; anaerobic Gram (-ve) rods & aerobic & anaerobic spirochaetes ✓ select the physico-chemical agents to inactivate of aerobic & anaerobic Gram (+ve) sporeforming rods; Anaerobic Gram (-ve) rods and aerobic & anaerobic spirochaetes ✓ explain the antigenic properties, toxins and their association with ✓ detcct diseases (pathogenicity) and transmission of aerobic & anaerobic Gram (+ve) sporeforming rods; Anaerobic Gram (-ve) rods & Aerobic & anaerobic spirochaetes ✓ recommend laboratory diagnosis and measure immune-prophylaxis and antibiotic sensitivity	**Aerobic & anaerobic Gram (+ve) spore forming rods:** *Bacillus anthracis & anthracoides, Clostridium* spp. *Dermatophilus congolensis* etc. **Anaerobic Gram -ve rods:** *Bacteroides, Fusobacterium, Actinomyces bovis* etc. **Aerobic & anaerobic spirochaetes:** *Borrelia anserina, Leptospira, Treponema* & *Spirillum* species	Lecture Discussion Visual presentation Report writing	MCQ Short answers Essay type answers Report Class attendance
✓ determine morphology & staining properties aerobic/ Micro aerophilic Gram (-ve) helical rods & aerobic Gram (-ve) rods & cocci ✓ list cultural characteristics & biochemical activities of aerobic/ Micro aerophilic Gram(-ve) helical rods & Aerobic Gram (-ve) rods & cocci ✓ categorize the physico-chemical agents, antigenic properties, toxins and their association with animal diseases (pathogenicity) ✓ commend the laboratory diagnosis	**Aerobic/ Microaerophilic Gram -ve helical rods:** *Campylobacter* spp. **Aerobic Gram -ve rods & cocci:** *Actinobacillus lignieresi, Brucella, Francisella tularensis, Moraxella, Pseudomonas* spp. and *Boedetella*	Lecture Discussion Visual presentation Report writing	MCQ Short answers Essay type answers Report Class attendance

Reference books

1. B. Markey. 2013. Clinical Veterinary Microbiology 2nd Edition. Elsevier. Ireland.
2. B.S. Malik. 2006. Lab. Manual of Veterinary Microbiology. part-4. International book distributing Co., India.
3. B.S. Malik. 2010. General Bacteriology. 2nd edition. International book distributing Co., India.
4. B.S. Malik. 2014. Objectives and Short Answer Answers in Bacteriology and Mycology. International book distributing Co., India.
5. G.R. Carter and D. J. Wise. 2010. Essentials of Veterinary Bacteriology and Mycology .6th edition.Wiley, USA.
6. R.M. Atlas. 2015. Principles of Microbiology. 2nd McGrow-Hill, India.
7. V. Singh. 2010. Text Book of Bacteriology. International book distributing. Co., India.

Course Code: MIPA 220 **Course Title: Bacteriology (Practical)**	**Credit hour: 1**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide practical knowledge of sample collection, transportation, diagnosis of bacterial infections through different test & properties.			
Course Learning Outcome: The focal learning outcome of this course are to- ✓ acquire knowledge about bacterial sample selection, collection & transportation ✓ enrich knowledge on laboratory diagnosis of bacterial infections ✓ enrich knowledge on isolation, identification & preservation of bacteria ✓ acquire knowledge on different cultural & biochemical tests ✓ acquire knowledge on pathogencity & antibiotic sensitivity of different bacteria			
Intended Learning Outcomes (ILOs) Students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ predict the methods of sample collection ✓ perform collection of bacteriological samples ✓ perform the transportation of sample for laboratory diagnosis of bacterial infections	Selection, collection and transportation of sample for laboratory diagnosis of bacterial infections	Lecture Visual presentation Discussion Practical work Practical note book writing	Skill test Identification of sample Viva voce Practical note book Class attendance
✓ demonstrate the methods of bacterial isolation ✓ illustrate how to identify and preserve bacteria	Isolation, identification and preservation of bacteria	Lecture Discussion Visual presentation Practical work Practical note book writing	Short answers Skill test Viva voce Practical note book Class attendance
✓ determine bacterial motility ✓ identify the flagellated and non-flagellated bacteria	Determination of bacterial motility by hanging drop technique	Lecture Discussion Slide preparation Practical note book writing	Short answers Viva voce Skill test Practical note book Class attendance
✓ explain cultural characteristics of different bacteria ✓ differentiate among CHO fermenting and non-fermenting bacteria ✓ identify the gas, acid-forming bacteria	Biochemical characteristics of different bacteria	Lecture Discussion Practical note book writing Viva	Short answers Viva voce Skill test Practical note book Class attendance
✓ perform the process of carbohydrate fermentation test of bacteria ✓ differentiate different species in Enterobacteriaceae	Carbohydrate fermentation test of bacteria	Lecture Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva voce Practical note book Class attendance
✓ perform catalase test and coagulase test of bacteria ✓ identify hydrogen-per-oxide forming bacteria ✓ identify the bacteria influences in blood clotting	Catalase test and Coagulase test of bacteria	Lecture Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva-voce Practical note book Class attendance
✓ perform MR-VP test of bacteria ✓ identify bacteria that forms gas and acid by CHO fermentation	MR-VP test of bacteria	Lecture Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva-voce Practical note book Class attendance

✓ perform indole test and Citrate utilization test of bacteria ✓ identify indole production ✓ identify bacteria that degrade citrate to small element	Indole test and Citrate utilization test of bacteria	Lecture Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva-voce Practical note book Class attendance
✓ perform H_2S production test and Oxydase test of bacteria ✓ identify H_2S ✓ identify Oxydase reacting bacteria	H_2S production test and oxydase test of bacteria	Lecture Discussion Visual presentation Lab work Practical note book writing	Short answers Group discussion. Viva voce Practical note book Class attendance
✓ explain urease test and nitrate reduction test of bacteria ✓ identify bacteria that utilize urea ✓ identify bacteria that reduce nitrate to nitrite	Urease test and nitrate reduction test of bacteria	Lecture Discussion Visual presentation Lab work Practical note book writing Practical note book writing Viva-voce	Short answers Group discussion Viva voce Practical note book Class attendance
✓ explain pathogenicity test of bacteria	Pathogenicity test of bacteria	Lecture Discussion Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva voce Practical note book Class attendance
✓ discuss antibiotic sensitivity of different types of bacteria ✓ identify the antibiotic resistant bacteria ✓ select the perfect antibiotic against the infectious bacteria	Antibiotic sensitivity of different types of bacteria	Lecture Discussion Visual presentation Lab work Practical note book writing	Short answers Group discussion Viva voce Practical note book Class attendance

Reference Books

1. B.S Malik. 2006. Lab Manual of Veterinary Microbiology. Part-4. International book distributing Co., India.
2. B.S. Malik. 2010. General Bacteriology. 2nd edition. International book distributing Co., India.
3. B.S. Malik.2014. Objectives and Short Answer Answers in Bacteriology and Mycology. International book distributing Co., India.
4. G.R. Carter and D. J. Wise. 2010. Essentials of Veterinary Bacteriology and Mycology .6th edition. Wiley, USA.
5. Markey. 2013. Clinical Veterinary Microbiology. 2nd edition. Elsevier, Ireland.
6. R.M. Atlas. 2015. Principles of Microbiology. 2nd McGrow-Hill, India.
7. V. Singh. 2010. Text Book of Bacteriology. International book distributing. Co., India.

Course Code: MIPA 257 **Course Title: Virology (Theory)**	**Credit Hour: 3**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide fundamental concept of Virus, its Properties, disease production, diagnosis and prevention.			
Course Learning Outcome: The focal learning outcome of this course are to- ✓ acquire knowledge about fundamental concepts of virus, its structures, history and nomenclature ✓ explain virus and host factors interaction and how these interactions lead to disease ✓ acquire Knowledge to predict and apply in diagnosis of virological diseases ✓ operate how to prevent and perform management of these disease ✓ recommend different kinds of vaccine type against different diseases			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define Virology ✓ explain the origin of virus as an organism in history ✓ differentiate virus with other organism ✓ describe the difference between virus other organism and protein ✓ justification of virus as living and non-living ✓ explain viriod, virion, prions	**Introduction, History**, **Viral: entity:** Definition and history of Virology, entity of virus, difference of virus from other living organism, justification of virus as living and non-living organism	Lecture Interactive Discussion Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the nomenclature of virus ✓ classify viruses ✓ locate virus in different section ✓ differentiate virus according to its organ of affinity ✓ explain the name virus according to disease caused in host ✓ describe virus by symbols	**Nomenclature and classification of viruses:** Scientific nomenclature, old classification, modern classification, Baltimore classification, crypto gram of virus	Lecture Multimedia Presentation Brainstorming Feedback Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ explain replication ✓ justify viral multiplication as replication ✓ list and sketch the steps of replication ✓ illustrate the type of replication	**Replication:** Definition, steps**,** type**,** description	Lecture Multimedia Presentation Brainstorming, Feedback, Interactive Discussion	Quiz Short answer Broad answer Class attendance
✓ define viral gene ✓ verify viral genetics ✓ assemble the genetic code and genetic map ✓ explain the scope of Viral genetics ✓ illustrate specific enzyme ✓ demonstrate different molecular techniques of diagnosis ✓ describe and explain PCR technique	**Viral genetics:** Gene, genetics, gene code, map **Molecular Virology:** Name and introduction of different molecular diagnosis**,** description of PCR	Lecture Multimedia Presentation Brainstorming Feedback Interactive Discussion	Quiz Short answer Broad answer Class attendance
✓ asses and judge the vertical and horizontal transmission ✓ distinguish between different transmission pathway	**Viral transmission:** Different transmitting mode, particles causing disease transmission	Lecture Multimedia Presentation	Quiz Short answer Class attendance
✓ represent agents which inactivate virus ✓ explain the mode of action of viral inactivating agents	**Viral inactivating agent:** Describe different methods and mode of action of inactivation	Lecture Multimedia Presentation	Quiz Short answer Class attendance
✓ describe viral effect on host ✓ express and explain entry of virus in body ✓ describe viral attachment in cell ✓ explain how virus control the cell metabolism ✓ distinguish and differentiate kind of change and degeneration in cell are caused by virus ✓ represent viral spread in body. ✓ explain the viral effects on many organ ✓ explain the cause high fever in viral disease ✓ discussion on different kinds of effect ✓ describe mechanism of diseases production	**Host-viral relationship:** Effects of virus on host at cellular, effect of virus in multi-cellular level and organs, entry of virus in host, spread of virus by circulatory system, release of virus from host, diseases production by virus	Lecture Multimedia Presentation Interactive Discussion Brainstorming Feedback	MCQ Short answer Broad answer Class attendance
✓ describe the type of viral infection ✓ distinguish the difference of sing symptom among different kinds of viral infection ✓ represent of different kinds of infection with example	**Types of viral infection:** Persistent viral infection, slow virus infection chronic viral infection	Lecture Multimedia Presentation Interactive Discussion Brainstorming Feedback	Quiz Short answer Essay type Class attendance
✓ explain resistance against ✓ subdivide immunity due to viral infection ✓ define and explain interferon ✓ define and explain interference ✓ Interpret different mode of interferon production ✓ categorize of interferon ✓ explain mode of action of Interferon	**Introduction, production, type and mode of action:** Resistance to viral infection and immunity, interference phenomenon and interferon, effect of interferon and interference	Lecture Multimedia Presentation Interactive Discussion Brainstorming Feedback	Quiz Short answer Broad answer Class attendance
✓ introduce bacteriophage ✓ subdivide the different bacteriophage ✓ categorize the replication of bacteriophage ✓ explain the importance and use of bacteriophage	**Bacteriophage:** Morphology, type, replication and its application	Lecture Multimedia Presentation Brainstorming	Quiz Short answer Class attendance

		Feedback	
✓ estimate the epidemiology of virus ✓ express the objectives of Epidemiology ✓ illustrate the epidemics ✓ classify the pattern of diseases occurrence ✓ illustrate the purification of virus ✓ subdivide methods of purification	**Viral epidemiology and Viral purification:** Definition, explanation and application and some terminology of Viruses, requirements of viral purification technique and procedure of viral purification	Lecture Multimedia Presentation Brainstorming Feedback	Quiz Short answer Broad answer Class attendance
✓ represent and explain morphological characteristics, cultivation, pathogenicity, transmission of different virus in Paramyxoviridae family ✓ distinguish viral diseases of animals and birds caused by virus of Paramyxoviridae family	**Family- Paramyxoviridae:** Important disease-causing viral genus with their morphology, cultivation, transmission, diagnosis and immunity	Lecture Multimedia and Visual presentation Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ represent and explain morphological characteristics, cultivation, pathogenicity, transmission of different virus of Orthomyxoviridae family ✓ distinguish viral disease of animals and birds caused by virus of Orthomyxoviridae family	**Family- Orthomyxoviridae:** Important disease-causing viral genus with their morphology, cultivation, transmission, diagnosis, and immunity	Lecture, Multimedia and Visual presentation Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ represent and explain morphological characteristics, cultivation, pathogenicity, transmission of different virus of Rhabdoviridae family ✓ distinguish viral disease of animals and birds caused by virus of Rhabdoviridae family	**Family- Rhabdoviridae:** Important disease-causing viral genus with their morphology, cultivation, transmission, diagnosis and immunity	Lecture, Multimedia and visual Presentation, Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ explain and represent morphological characteristics, cultivation, pathogenicity, transmission of different virus of Picornaviridae & Pox viridae family ✓ distinguish viral disease of animals and birds caused by virus Picornaviridae and Poxviridae family	**Family- Picornaviridae & Poxviridae:** Important disease-causing virus with their morphology, cultivation, transmission, Diagnosis and immunity	Lecture, Multimedia and visual Presentation, Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ represent and explain morphological characteristics, cultivation, pathogenicity, transmission of different viruse of Herpesviridae family ✓ distinguish viral diseases of animals and birds caused by virus of Herpesviridae family	**Family- Herpesviridae:** Important disease-causing virus with their morphology, cultivation, transmission, diagnosis and immunity	Lecture, Multimedia and visual Presentation, Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ represent and explain morphological characteristics, cultivation, pathogenicity, transmission of different virus of Adenoviridae and Birnaviridae family ✓ distinguish viral disease of animals and birds caused by virus of Adenoviridae and Birnaviridae family	**Family- Adenoviridae & Birnaviridae:** Important disease-causing virus and their morphology cultivation, transmission, diagnosis and immunity	Lecture, Multimedia and visual Presentation, Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ explain the morphological characteristics, cultivation, pathogenicity, transmission of different viruses of Coronaviridae, Retroviridae, Togaviridae, Flaviviridae, Bunyaviridae, Circoviridae, Parvoviridae, Papoviridae and Iridoviridae ✓ distinguish viral diseases of animals and birds caused by Coronaviridae, Retroviridae, Togaviridae, Flaviviridae, Bunyaviridae, Circoviridae, Parvoviridae, Papoviridae and Iridoviridae	**Family- Togaviridae, Flaviviridae, Bunyaviridae, Circoviridae, Parvoviridae, Papoviridae, Adenoviridae, Birnaviridae, and Iridoviridae:** Important disease-causing virus and their morphology, cultivation, transmission, diagnosis and immunity	Lecture, Multimedia and visual Presentation, Interactive Discussion	MCQ Short answer Broad answer Class attendance
✓ collect and revise latest research findings on virus	**Latest research findings:** Discussion on research finding upon virus	Lecture Review of journals and articles	Report writing

Reference Books

1. B. Markey .2013. Clinical Veterinary Microbiology.2nd Edition. Elsevier, Ireland.
2. B.S. Malik .2006. Lab. Manual of Veterinary Microbiology (In 4 Parts).2nd Edition. CBS Publisher. India.
3. B.S. Malik and M Malik. 2012. Objective and Short Answer Answers in Veterinary Virology.2nd Edition. CBS Publisher, India.
4. J. Carter and V. Saunders .2013. Virology: Principles and Applications.2nd Edition Wiley. USA.
5. R. Reddy. 2007. Essentials of Virology.2007. Scientific Publishers Journals. India.
6. S. Edward Luria and J. E Darnell.2013. General Virology. 2nd Edition. Wiley. U.S.A.
7. S.U. Nair. 2017. Virology: A Condensed Review: For the Students of Medicine and Microbiology. India.

Course Code: MIPA 258 **Course Title: Virology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide practical knowledge about Virus identification and diagnosis of viral infection.			
Course Learning Outcomes: The focal learning outcome of this course are to ✓ explain and perform different techniques to prepare the samples of virus for virological studies ✓ obtain knowledge to identify virus infectivity ✓ acquire knowledge of different techniques to apply on diagnosis ✓ express the concept of advanced diagnostic techniques			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ select sample for virological study is ✓ perform the techniques of collection, ✓ able to transport of samples to lab for virological studies ✓ preserve virus by different techniques	Selection, collection and transportation and preservation of viral samples for laboratory diagnosis of viral infection	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ define and explain inoculums ✓ collect and assemble requirements to prepare inoculums ✓ perform different process of inoculums preparation	Inoculums preparation for virological study preparation of inoculum from both solid and liquid sample	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ purify virus ✓ perform different methods of virus purification	Purification of virus by physical methods purify virus by chemical methods purify virus by immunological methods	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ recognize negative staining ✓ represent the process to identify viruses by negative staining ✓ detect the morphololgy of virus	Negative staining for morphology study of virus	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ perform and observe cultivation of virus ✓ explain and express the scope and objectives of cultivation ✓ classify viral cultivation ✓ represent the procedure of cultivation with advantage and disadvantage ✓ perform the methods of inoculation in chicken embryo through different routes ✓ perform harvesting virus after cultivation from chicken embryo	Cultivation of virus in intact host system, cultivation of virus in embryonated eggs	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ classify different kinds of tissue culture ✓ perform the preparation of tissue cultures ✓ enlist and describe the requirements of cultivation of virus in these culture ✓ demonstrate the process of viral propagation ✓ detect the contaminants of tissue culture	Preparation tissue cultures, virus cultivation in tissue culture, propagation of virus in cell culture	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ explain virus infectivity essay ✓ subdivide the types of infectivity assay ✓ perform plaque assay	Description, requirements and procedure of plaque assay	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book
✓ inactivate viruses ✓ represent agents which inactivate virus ✓ explain the mode of action of viral inactivating agent	Inactivation of viruses	Class lecture, Discussion, Practical demonstration, Practical note book preparation	Quiz, Laboratory or practical job, Viva-Voce, Practical note book

Reference Books

1. B. Markey. 2013. Clinical Veterinary Microbiolog.2nd Edition. Elsevier. Ireland.
2. B. S Malik. 2012. Objective and Short Answer Answers in Veterinary Virology. 2nd Edition. CBS Publisher. India.
3. B.S Malik. 2006. Lab. Manual of Veterinary Microbiology.2nd Edition. CBS Publisher; India.
4. J. Carter and V. Saunders .2013. Virology: Principles and Applications.2nd Edition Wile. USA.
5. R. Reddy. 2007. Essentials of Virology.2007. Scientific Publishers Journals. India.
6. S. Edward Luria and James E Darnell. 2013. General Virology.2nd Edition. Wiley. U.S.A.
7. S. U. Nair. 2017. Virology: A Condensed Review: For the Students of Medicine and Microbiology. CBS Publisher India.

Course Code: MIPA 319 **Course Title: Mycology, Mycoplasmology, Rickettsiology and Chlamydiology (Theory)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**
Rationale: This course is designed to provide concept of fungus, mycoplasma, rickettsia and chlamydia.			
Course Learning Outcomes (CLOs): The focal learning outcome of this course are to- ✓ distinguish among rickettsial, chlamydial, mycoplasmal and fungal species ✓ acquire knowledge on their general properties, biochemical properties, staining and cultural characters and their antigen and toxin and identify them ✓ detect the disease-causing microbes and predict their importance in human and animal health and differentiate harmful and useful species ✓ obtain knowledge to prevent these diseases ✓ demonstrate the immunity and predict their vaccines			
Intended Learning Outcomes (ILOS) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define fungi ✓ discuss the general properties of fungi ✓ describe the classification of fungi ✓ recall the history of fungi ✓ represent important fungal diseases ✓ differentiate and distinguish the natural habitat and transmission of fungi ✓ discuss the morphology& staining properties of fungi ✓ detect the cultural and biochemical properties of fungi ✓ explain the pathogenicity caused by fungus ✓ state the immunity of fungal diseases ✓ predict serological and molecular diagnostic techniques for fungus	**Mycology- definition, history, classification & general properties:** Morphology, chemical composition, physiolosy, multiplication, sensitivity and resistance; classification of fungi- morphologically, toxonomically and according to spore; history of fungus discovery establishment of fungus as a new phylum; natural habitat, transmission, staining, cultural and biochemical properties, pathogenicity, immunity, serological and molecular identification of important fungal genus Aspergillus, Coccidioidomycosis, Cryptococcosis, Micosporum, Tricophyton, Epidermatophyton, Histoplasma, Rhinosporidium, Candida	Lecture Interactive Discussion Multimedia presentation Brainstorming Feedback	MCQ Short answer Broad answer Report writing Class attendance
✓ define mycoplasma ✓ describe the general properties of mycoplasma ✓ represent classification of mycoplasma ✓ recall the history of mycoplasma discovery ✓ Identify important mycoplasmal diseases. ✓ recognize the natural habitat and express transmission of mycoplasma ✓ represent the morphology& staining properties of mycoplasma ✓ detect the cultural and biochemical properties of mycoplasma ✓ explain the pathogenicity caused by mycoplasma ✓ state the immunity of mycoplasmal diseases ✓ predict the serological and molecular diagnostic techniques for mycoplasma	**Mycoplasmology- definition, history,classification & general properties:** Morphology, chemical composition, physiology, multiplication; sensitivity and resistance; classification-from kingdom up to family; History, mycoplasmal discovery, differentiation from bacteria and L-phage bacteria; natural habitat, transmission, staining and cultural properties, pathogenicity, immunity, serological and molecular; identification techniques for mycoplasma (avian mycoplasma, caprine and bovine mycoplasma)	Lecture Interactive Discussion Multimedia presentation Brainstorming Feedback	Short answer Broad Answer Report writing Class attendance
✓ define rickettsia ✓ express and explain the general properties of rickettsia ✓ classify rickettsia ✓ represent history of rickettsia discovery ✓ identify important rickettsial disease ✓ distinguish and differentiate the natural	**Rickettsiology- definition, history,general properties:** Morphology, chemical composition, physiology, multiplication; sensitivity and resistance; classification (from order to family) history of rickettsial discovery; natural habitat,	Lecture Interactive Visual presentation Discussion Assignment	MCQ Short answer Broad answer Report writing Class attendance

habitat and transmission of rickettsia ✓ recognize the morphology& staining properties of rickettsia ✓ detect the cultural and biochemical properties of rickettsia ✓ explain the pathogenicity caused by rickettsia ✓ state the immunity of rickettsial diseases ✓ predict the serological and molecular diagnostic techniques for rickettsia	transmission, morphology& staining properties; culture and biochemical properties, pathogenicity, immunity, serological and molecular identification for rickettsia		
✓ define chlamydia ✓ discuss the general properties of chlamydia ✓ classify chlamydia ✓ recall the history of chlamydia identification ✓ recognize the natural habitat and transmission of chlamydia ✓ discuss the morphology& staining properties of chlamydia ✓ detect the cultural and biochemical properties of chlamydia ✓ explain the pathogenicity caused by chlamydia ✓ statet the immunity of chlamydial diseases ✓ predict the serological and molecular diagnostic techniques for Chlamydia	**Chlamydiology:** Definition, general properties & classification of chlamydia; history, natural habitat, transmission, morphology & staining properties; culture and biochemical properties, pathogenicity, immunity, serological and molecular identification for chlamydia	Lecture Interactive Discussion Visual presentation	MCQ Short answer Broad answer Report writing Class attendance
✓ collect and revise latest research findings of microbes like fungus, Mycoplasma, Chlamydia, rickettsia	**Latest research findings** Discussion on research finding upon fungus, Mycoplasma, Chlamydia,rickettsia	Lecture Review of journals and articles	Report writing

Reference Books

1. B. Markey. 2013. Clinical Veterinary Microbiolog. 2nd Edition. Elsevier. Ireland.
2. B.S Malik. 2006. Lab. Manual of Veterinary Microbiology (In 4 Parts) CBS Publisher & Distributors P Ltd; 2nd edition. India.
3. B.S Malik.2014. Objective and Short Answer Answers in Veterinary Bacteriology and Mycology. 2nd Edition CBS Publisher, India.
4. G.R Carter and D. J Wise.2003. Essentials of Veterinary Bacteriology and Mycology.6th Edition.Wiley. USA.
5. Samanta. 2015. Veterinary Mycology. 1st Edition. Springer. India.

Curse Code: MIPA 357 **Course Title: Immunology and Serology (Theory)**	**Credit Hour:2**	**Level: 3**	**Semester: II**
Course Rationale: To provide fundamental knowledge about immune system of the body, different types of serological events that maintain the equilibrium of host body defense system.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ attain knowledge about definition of immunity, antigen, antibody and related terminology ✓ acquire knowledge on different cells, organs, tissues that are involved in immune system of the body ✓ impart knowledge on differentiation among six types of immunity that works to protect the bodies ✓ gain knowledge about auto-immune diseases ✓ achieve knowledge on role of antibodies in the body defense mechanism			

- ✓ attain knowledge on hypersensitivity reactions that are harmful for the body
- ✓ obtain knowledge about mechanism of production diseases by different types of antigens (micro-organisms)

Intended Learning Outcomes (ILOS) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define, the definition and scope of immunology and serology and related terms ✓ distinguish the basic differences between immunology and serology ✓ recall the history and modern concepts of immunology and serology	**Introduction:** Definition and scope of immunology and serology, basic differences between immunology and Serology, history and modern concepts of immunology and serology	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ locate the organs cells that produce immunity ✓ define and describe different types of immunity and resistance ✓ summarize general features and mechanism of immune response ✓ represent antigen with definition, composition, properties, types and functions ✓ represent the processing of antigen and their relationship with major histo-compatibility complex (MHC) molecules	**Immunology:** Organs and cells associated with immunity, definition and types of immunity and resistance, general features and mechanism of immune response, antigen: definition, composition, properties, types and functions, processing of antigen and their relationship with major histo-compatibility complex (MHC) molecules, response of B and T cell to antigen, antigen binding sites and their genetics, antigenic determinants or epitopes, antibody	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ scrutinize the definition, properties, types and functions of antibodies ✓ examine the theory of antibody (Ab) production ✓ judge the antigen-antibody reaction and their consequences ✓ describe the chemical mediators of the immune system. ✓ appraise the complement system and their role in immunity ✓ categorize the hypersensitivity and immune tolerance: different types of hypersensitivity, factors responsible for immune tolerance ✓ describe vaccine with definition, types of vaccine, preparation of selected vaccine, method of administration of vaccine, vaccination schedule for livestock and poultry, efficacy of vaccine, limitation of vaccine and causes of vaccination failure. induction of immune response and immune effect or mechanisms	**Immunology**: Definition, properties, types and functions; theory of antibody (Abs) production, antigen-antibody reaction and their consequences, chemical mediators of the Immune system, complement system and their role in immunity, hypersensitivity and immune tolerance, different types of hypersensitivity, factors responsible for immune tolerance vaccine: definition, types of vaccine, preparation of selected vaccine, method of administration of vaccine, vaccination schedule for livestock and poultry, efficacy of vaccine, limitation of vaccine and causes of vaccination failure; induction of immune response and immune effect or mechanisms	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ summarize the principle, procedure, objectives, application of the serology & serological test ✓ intend to identify or detect antigen (ag) and antibodies (abs) ✓ detect antibodies, most of the auto-immune and other diseases will be confirm diagnosed & will be treated ✓ measure antibody level in blood	**Serology:** Principles, procedures and application of different serological tests, agglutination test, precipitation test, hemagglutination & hemagglutination–inhibition test, passive hemagglutination tests, complement fixation test, fluorescent antibody technique (FAT), radioimmunoassay, immunohistochemistry, enzyme linked immunosorbent assay (ELISA), agar gel immunodiffusion test, serum neutralization test (SNT), focus	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance

	inhibition test (FIT), counter immune-electrophoresis and protection test (PT)		
✓ achieve the latest research findings and information in the area of immunology & serology	**Latest research findings:** Information about latest research innovations in field of immunology & serology	Review of journals and articles	Assignment evaluation

Reference Books

1. B.O.G. Silva, D.D. Gotze and Mota. 1986. Fundamentals of Immunology. 2nd edition. Springer Verlag, Berlin, Heidelberg, New York.
2. I. Tizard. 2009. An Introduction to Veterinary Immunology. 8th edition. Saunders Co., Philadelphia, London.
3. P.J. Delves, S.J. Martin, D.R. Burton, and I.M. Roitt.2006. Roitt's Essential Immunology. Blackwell Scientific Publications, Oxford, UK.

Course Code: MIPA 358 **Course Title: Immunology & Serology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**

Course Rationale: To provide fundamental knowledge about antigen antibody reaction, detection, diagnosis, treatment, vaccination procedure.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ gain knowledge on preparation of serum, antiserum
- ✓ acquire knowledge on blood collection procedure
- ✓ obtain knowledge about definition of antigen, antibody and their titer in the body
- ✓ attain knowledge on different reagent, chemical preparation
- ✓ impart knowledge on differentiation among several types of antibodies that works to protect the bodies
- ✓ furnish knowledge on detection of auto-immune diseases
- ✓ gain knowledge on role of antibodies in the body defense mechanism
- ✓ acquire knowledge on hypersensitivity reactions that are harmful for the body
- ✓ gain knowledge mechanism of production diseases by different types of antigens (micro-organisms)

Intended Learning Outcomes (ILOS) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ prepare different reagent and RBC preparation to perform mentioned serological test	Preparation of reagents and RBC suspension for serological test	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ collect and prepare serum and hyper immune serum (Abs)	Collection of sera and preparation of Hyper immune sera	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ assess the mechanism of agglutination of rbc& how it precipitates to ensure presence of (abs)	Agglutination test; Study on precipitation test	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ determine amount of antibodies, reactions ✓ detect blood disease causing antigen	Hemagglutination & Hemagglutination–inhibition test	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ detect RBC as antigen ✓ aid in HA test	Passive hemagglutination tests	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ identify complement(c) in test sample that interfere with accuracy of test results	Complement fixation test	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ detect antibody ✓ diagnose rabies disease	Fluorescent antibody technique (FAT)	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ detect antigen (Ag) ✓ detect antibodies (Abs) ✓ diagnose various infectious diseases	Enzyme linked immunosorbent assay (ELISA)	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ detect antigen (Ag) ✓ detect antibodies (Abs) ✓ neutralize antibodies for effective dose of vaccine	Agar Gel Immunodiffusion test; serum neutralization test (SNT)	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical Note Book
✓ detect antigen (Ag) ✓ detect antibodies (Abs) ✓ neutralize antibodies for effective dose of vaccine	Protection test (PT)	Lecture Discussion Demonstration	Quiz, Short answers, Broad answers, Demonstration performance, Viva-voce, Class attendance, Practical note Book
✓ justify the class room, lab practices with field level ✓ gather more practical knowledge and find out difference between class room experience with field and their application in future circumstances	Field trip to different government and non-government organization, institutes, industries in Bangladesh	Field visit & Report writing	Report evaluation

Reference Books

1. I. Tizard. 2009. An Introduction to Veterinary Immunology. 8th edition. W.N.B. Saunders Co., Philadelphia, London, Toronto.
2. P.J. Delves, S. J. Martin, D. R Burton, and I. M. Roitt. 2006. Roitt's Essential Immunology. Blackwell Scientific Publications, Oxford.
3. B.O.G. Silva, D.D. Gotze and Mota. 1986. Fundamentals of Immunology. 2nd edition. Springer Verlag, Berlin, Heidelberg, New York.

Course Code: MIPA 417 **Course Title: Animal Hygiene, Biosafety & Biosecurity (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: I**

Course Rationale: To provide fundamental knowledge about hygiene, bio-safety, bio-security related to animal, animal farm, personnel, environment in and outside of the farm.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ gain different concept of hygiene & its impact on animal health
- ✓ acquire the fundamental aspects of bio-security of a farm
- ✓ gain knowledge about bio-safety of human being working in the farm
- ✓ attain knowledge about different types of bio-security and bio-safety measures
- ✓ achieve knowledge on management of farm in terms of biosecurity
- ✓ explore knowledge on impact of lack of hygienic practices in the farm & surroundings

Intended Learning Outcomes (ILOS) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define health & hygiene ✓ describe scopes of health hygiene	**Animal Hygiene:** Definition of health and hygiene, objectives and scopes of animal hygiene	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ assess abnormal behavior of livestock's ✓ justify the influence of environmental factors mentioned in the contents	Common abnormal behaviors of livestock and poultry, influences of environment (soil, air, water, ventilation) on animal and poultry health	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ able to define and construct the objectives of sanitation, drainage, sewerage system. ✓ justify the methods of disposal of wastes and carcass	**Sanitation:** Definition and objectives of sanitation, drainage, sewerage system and disposal of wastes, disposal of carcass	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ select the disinfectants and their application ✓ estimate the fumigation procedure and its importance	Disinfectants and their application; fumigation and its importance	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ formulate feed ingredients ✓ investigate the microbial contamination of feeds & their management ✓ prioritize the disease management procedure of livestock, poultry, and zoo and laboratory animals ✓ apply hygienic measures for health	Microbial safety of animal and poultry feed ingredients, hygienic measures for health and disease management of livestock, poultry, zoo and laboratory animals	Lecture Discussion Multimedia presentation	Quiz Essay type answers Short type answers Class attendance
✓ achieve the latest research findings and information in the area of Animal Hygiene, Biosafety & Biosecurity	**Latest research findings:** Information about latest research innovations in field of Animal Hygiene, Biosafety & Biosecurity	Review of journals and articles	Assignment evaluation

Reference Books

1. A. Buxton and G. Fraser. 1977. Animal Microbiology, Vol. 1. Vol. II. Blackwell Scientific Publication. Oxford, London, UK.
2. A. Haqand T. Ahmad. 2001. Poultry hygiene and Disease Prevention. Pak Book Empire, Lahore, Pakistan.
3. D. C Herendaand D. A. Franco. 1996. Poultry disease and Meat Hygiene, A Color Atlas. Iowa State University Press, Ames, Iowa, USA.
4. G.C. Banerjee. 1999. A Text Book of Animal Husbandry. 8th edition. Oxford and IBH publishing Co. New Delhi 11001. India.

Course Code: MIPA 429 **Course Title: Molecular Microbiology (Theory)**	**Credit Hour: 1**	**Level: 4**	**Semester: I**

Course Rationale: To provide fundamental knowledge about different molecular structure of micro-organism & their preparation in lab, molecular techniques used in rapid disease diagnosis.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ gain knowledge about history, concept of molecular microbiology
- ✓ assess the contribution on animal health and rapid disease diagnosis
- ✓ attain knowledge about the fundamental aspects of molecular microbiology
- ✓ acquire knowledge about micro-organism at molecular level
- ✓ obtain knowledge different types of molecular techniques, their uses, management
- ✓ achieve knowledge on its advantages disadvantages, ethical values in modern life
- ✓ acquire knowledge on cloning, DNA technology, insulin, vaccine production

Intended Learning Outcomes (ILOs) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ memorize & describe the definition, scope, history, molecular structure of different microbes	**Introduction:** Definition and scope of molecular microbiology, history of molecular microbiology; molecular structures of different microbes	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ enlist the different terms used molecular microbiology	**Molecular and related Techniques:** Vector, insert, plasmid and restriction enzymes and their uses in molecular biology	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ discuss the preparation procedure of plasmid and genomic DNA ✓ express the uses of these genome different research work	Preparation of genomic RNA & DNA from microbes, preparation of plasmid DNA from microbes and their uses in biotechnological research	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ characterize the genetic analysis of microbial DNA, RNA and protein by using following molecular techniques	**Molecular Techniques**: Polymerase chain reaction (PCR), reverse transcriptase-polymerase chain reaction (RT-PCR), gel electrophoresis (agarose gel electrophoresis and SDS-PAGE), preparation of purified RNA & DNA particles, restriction fragment length polymorphism (RFLP) analysis, recombinant DNA technology: restriction, ligation, cloning, transformation & transfection, gene expression and sequencing	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance

Reference Books

1. D. Clark. Molecular Biology. 2005. 1st edition. Elsevier Academic Press.
2. J. Wdale and M. V. Scantz. 2002. From Genes to Genomes: Concepts and Application of DNA Technology. 1st edition. John Wiley and Sons Publishers.
3. T.A. Brown. 2006. Gene cloning and DNA analysis. 5th edition. Black Well Publisher.

Course Code: MIPA 457 **Course Title: Zoonotic Microbiology (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**

Course Rationale: To provide fundamental knowledge about different structure of micro-organism, their characterization, diagnosis, vaccination, especially those who produce diseases in human being and vice-versa.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ obtain knowledge about definition, etiology, biological properties of different microorganism
- ✓ attain knowledge about zoonotic transmission cycle
- ✓ acquire knowledge about rapid detection method
- ✓ gain knowledge about relationship between zoonotic microbes & one health
- ✓ assess human, environment-animal health, perspective importance
- ✓ gain knowledge on special emphasis on environmental health
- ✓ furnish knowledge about zoonotic microbes, it's management, preparedness in aspect of Bangladesh
- ✓ accomplish knowledge about zoonoses& it's emergency management protocol in accordance to WHO, OIE (office international epizootics)

Intended Learning Outcomes (ILOs) The student will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ recall definition, scope, history of zoonotic microbiology ✓ assess the role of veterinarian or microbiologist in the field of zoonotic microbiology	**Introduction**: Definition & scopes of zoonotic microbiology, role of veterinarian or microbiologist in the field of zoonotic microbiology	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ evaluate the different methods in rapid risk assessment, preparedness, for zoonotic microbes ✓ construct the emergency preparedness for emerging, re-emerging & neglected zoonotic microbes	Methods of rapid risk assessment for emerging, re-emerging & neglected zoonotic microbes, emergency preparedness for emerging, re-emerging & neglected zoonotic microbes	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ state the habitat, host range, transmission cycle, outbreak history of zoonotic bacteria ✓ summarize the rapid detection techniques for zoonotic bacteria ✓ operate emergency preparedness of zoonotic bacterial outbreaks ✓ justify the public health significance ✓ sketch the epidemiological investigation procedurezoonotic bacterial outbreaks	**Bacteria having zoonotic importance:** *Bacillus, Mycobacterium, Escherichia coli O157 and other enterohemorrhagic E. coli (EHEC), Salmonella, Shigella, Campylobacter, Brucella, Listeria, Leptospira, Yersinia, Francicella,* etc.	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ memorize the habitat, host range, transmission cycle, outbreak history of zoonotic viruses ✓ scrutinize the rapid detection techniques ✓ execute emergency preparedness ✓ justify the public health significance ✓ construct the epidemiological investigation procedure	**Viruses having zoonotic importance**: *Avian Influenza virus, Rabies, Ebola virus, Lassa virus, Marbung virus, Pox virus, Herpes virus, Arbovirus, Hepatitis virus, Lymphocytic chorio-meningitis virus, Vesicular Stomatitis virus, West Nile fever virus, Eastern equine encephalitis virus, Western equine encephalitis virus, Japanese encephalitis virus, Hanta-virus, Rift Valley fever virus,etc*	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance

✓ generalize the habitat, host range, transmission cycle, outbreak history of zoonotic mycoplasma ✓ illustrate the rapid detection techniques ✓ investigate emergency preparedness ✓ estimate the public health significance ✓ evaluate the epidemiological investigation procedure	**Mycoplasmas having zoonotic importance:** *Mycoplasma pneumoniae, Mycoplasma salivarium, Mycoplasma arthritidis, Mycoplasma canis, Mycoplasma bovis, Mycoplasma arginini, Mycoplasma felis, etc*	Lecture Discussion Multimedia presentation Group discussion	Quiz Essay type answers Short type answers Class attendance
✓ achieve the latest research findings and information in the area of zoonotic microbiology	**Latest research findings:** Information about latest research innovations in field of zoonotic microbiology	Review of journals and articles	Assignment evaluation

Reference Books

1. H. Krauss. 2003.Zoonoses: Infectious Diseases Transmissible from Animals to Humans. Third edition, American Society for Microbiology. USA.
2. J. Colville. D. Berryhill& Mosby. 2007. Handbook of Zoonoses: Identification and Prevention, 1st edition**,** Oxford University Press, USA.
3. M.E.H. Jones. 2000. Zoonoses: Recognition, Control, and Prevention, 1st edition Iowa State University Press. USA.
4. S. Palmer. Soulsby. P. Torgerson, D.W.G. Brown. 2011. Oxford Textbook of Zoonoses: Biology, Clinical Practice, and Public Health Control. 2nd edition, Oxford University Press. USA.

Course Code: 513 **Course Title: Food Microbiology, Hygiene & Safety (Theory)**	**Credit Hour: 2**	**Level: 5**	**Semester: I**
Rationale: This course is designed to provide concepts about food safety**,** food borne infections and intoxication, Food sanitation, legislation& Abattoir hygiene practices.			
Course Objectives: The focal learning outcome of this course are to- ✓ acquire knowledge about concepts of food microbiology, food microorganism**,** food borne infections and intoxication ✓ enrich knowledge on contamination, spoilage of food & preservation techniques ✓ gain knowledge on hygiene practices ✓ impart knowledge about legislation& Abattoir hygiene practices ✓ develop knowledge on food sanitation & food safety rules and regulation used in food industries			
Intended Learning Outcomes (ILOS) Students will be able to-	**Course Contents**	**Teaching-learning Strategies**	**Assessment Strategies.**
✓ define food microbiology, food hygiene& food safety ✓ assess the importance of food safety ✓ memorize the history & scope of food hygiene ✓ evaluate the role & significance of food hygiene practices on public & animal health ✓ mention the importance of microbes in food ✓ priorities the microbes affecting food ✓ describe the classification of food ✓ perform the techniques to remove microorganism from food ✓ estimate the preservative factors of food ✓ examine the preservative factors to lengthen shelf life ✓ illustrate the mode of action & achievement of preservative factors	**Introduction:** Definition and scope of food microbiology., history of microorganisms in food, role and significance of microorganisms in nature and foods, microorganisms important in foods of animal and avian origin, classification of food on the basis of ease of spoilage and acid content, factors present in food which influence microbial activity, removal of microorganisms from foods, classification of preservation factors of food with their mode of action and achievements	Lecture Interactive Discussion Visual and Multimedia presentation	MCQ Short answer Broad answer Class attendance
✓ define &describe food contamination ✓ mention the specific microbes responsible for food spoilage ✓ select the appropriate preservatives ✓ sub-divide microorganism involving in spoilage of perishable food ✓ state the factors favoring spoilage of perishable food ✓ evaluate different kinds of can food spoilage ✓ describe the differences of different kind of can spoilage ✓ identify special organism responsible for different kind of can spoilage	**Food contamination, spoilage and preservation:** Sources of microbial contamination of milk, meat, egg, sea food and their products, microorganisms involve in spoilage of milk, meat, egg and their products., factors that influencing the growth of microorganisms in milk, meat, egg, sea food and their products, contamination and spoilage of canned foods and frozen foods with their preservation, coliform and thermoduric bacteria in food and their significance	Lecture Interactive Discussion Visual and Multimedia presentation	Quiz Short answer Broad answer Class attendance
✓ assemble the Coliforms bacteria, thermoduric bacteria responsible for food spoilage ✓ describe TA spoilage ✓ discuss about Flat-sour spoilage ✓ examine hydrogen sulfide gas spoilage	**Food contamination, spoilage and preservation:** General principles for preservation of milk, meat, egg, sea food and their products, coliform & Thermoduric bacteria in food &their significance, General principles for preservation of milk, meat, egg, sea food & their products; TA spoilage, Flat-sour spoilage, Hydrogen sulfide gas spoilage	Lecture Interactive Discussion Visual and Multimedia presentation	MCQ Short answer Broad answer Class attendance

✓ define & differentiate between Ante-mortem & post-mortem examination of slaughtering animals and birds ✓ state the scope and objectives of ante-mortem & post-mortem examination ✓ summarize the procedure of examination of living of animals & birds ✓ verify the carcass examination	**Abattoir hygiene practices:** Ante mortem and post-mortem examination of slaughtering animals and birds, Inspection of carcasses, judgment of carcasses and examination reports, adulteration and misrepresentation of meat foods, disposal of abattoir by-products. diseases transmitted through meat and meat products, prevention of meat borne diseases	Lecture Interactive Discussion Field trip	Quiz Short answer Field trip Report writing
✓ define & classify the foodborne infections and intoxication ✓ discuss the factors essential for occurrence of foodborne (milk, meat, egg & sea food) infections or hazards ✓ evaluate the food borne outbreaks investigation procedure ✓ summarize the general principle of preventive measures of food-borne disease outbreak, bacterial toxins and mycotoxins in food	**Food borne infections and intoxication:** Definition, classification and differentiation of food borne infections and intoxication., factors essential for occurrence of food borne (milk, meat, egg & sea food) infections or hazards, Investigation of food-borne disease outbreaks, general principle of preventive measures of food-borne disease outbreak, bacterial toxins and mycotoxins in food and their prevention	Lecture Interactive Discussion Visual and Multimedia presentation	Quiz Short answer Broad answer Class attendance
✓ define HACCP food safety or food hygiene ✓ describe the role of HACCP in the safety & hygiene ✓ execute hazard analysis and critical control point (HACCP) concept ✓ set the microbiological criteria in food plant sanitation, good manufacturing practice (GMP) and quality systems ✓ correlate with international agencies concerned with control, regulation and inspection of food ✓ formulate the food legislation, standards and codes of practices followed by OIE	**Food sanitation and legislation:** Food safety or food hygiene. Hazard Analysis and Critical Control Point (HACCP) concept. Microbiological criteria in food plant sanitation. Good Manufacturing Practice (GMP) and Quality Systems. International agencies concerned with control, regulation and inspection of food. Food legislation, standards and codes of practices followed by OIE	Lecture Interactive Discussion Food industry visit	MCQ Short answer Field trip Assignment.
✓ achieve the latest research findings and information in the area of Food Microbiology, Hygiene & Safety	**Latest research findings:** Information about latest research innovations in field of Food Microbiology, Hygiene & Safety	Review of journals and articles	Assignment evaluation

Reference Books

1. J.M. Jay. 2005. Modern Food Microbiology. 7th edition. Springer publications. USA.
2. M.K. Rao. 2007. Food and Dairy Microbiology. Manglam publications. India.
3. Wikie and F. Harrigan. 2012. Laboratory Methods in Food Microbiology. 3rd edition Blackwell publication. UK.

Course Code: MIPA 514 **Course Title: Food Microbiology, Hygiene & Safety (Practical)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**

Rationale: This course is designed to provide practical concepts of food microorganisms, It's practical significance in food industries.

Course Learning Outcomes (CLOs): The focal learning outcome of this course are to-

- ✓ acquired knowledge about different techniques of food sampling
- ✓ to know the viable bacterial count, probable number and direct microscopic count
- ✓ to know details about different type load food bacteria
- ✓ inspection of different food products and identify its quality
- ✓ provide hygienic food

Intended Learning Outcomes (ILOs) Students will be able to-	**Course Contents**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ execute different methods of food sampling for investigation ✓ collect solid, liquid and surface sample for food investigation	Methods of food sampling for investigation	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ prepare dilution for food investigation ✓ detect different kind of food blenders for this purpose	Preparation of dilution and food blender	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ identify microbial load ✓ determine the metabolic products of food sample	Microbial load and metabolic products of food sample determination	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ perform total viable count ✓ mention the indicator organism	Total viable counts; coliform bacteria	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ evaluate most portable number (MPN) index ✓ perform to identify MPN	Determination of MPN index	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ perform meat, milk, egg, seafood, canned food, frozen food examination ✓ detect the grade of food sample	Detection of pathogenic and toxigenic organisms from meat & meat products	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ perform direct microscopic count of bacteria (DMC) ✓ know the type of bacteria present in the food ✓ know the source of contamination	Direct microscopic count	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ perform dye reduction test ✓ check the quality of food ✓ identify the microbial load	Dye reduction test	Discussion Lecture Slide show Lab work Interactive	MCQ Short answer Broad answer Practical work Viva-voce
✓ justify the class room, lab practices with field level ✓ gather more practical knowledge and find out difference between class room experience with field and their application in future circumstances	Field trip to different government and non-government organization, institutes, industries in Bangladesh	Field visit & report writing	Report evaluation

Reference Books

1. J.M. Jay. 2005. Modern Food Microbiology. 7th edition. Springer publications. USA.
2. M.K. Rao. 2007. Food and Dairy Microbiology. Manglam publications. India.
3. Wikie and F. Harrigan. 2012. Laboratory Methods in Food Microbiology. 3rd edition Blackwell publication. UK.

Course Code: MIPA 221 **Course Title: General Parasitology and Malacology (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: I**
Rationale: This course is designed to provide basic concepts of parasites and molluscs.			
Course Learning Outcome (CLO): The major learning outcomes of this course are to- ✓ conceptualize the fundamentals of parasites and molluscs ✓ define and classify different terminologies related to parasites and snails ✓ distinguish morphology and biology different parasites and snails ✓ illustrate the diseases caused by parasites, their transmission and veterinary importance ✓ formulate the prevention and control measures against parasites and snails			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching Learning Strategies**	**Assessment Strategies**
Introductory Parasitology			
✓ define parasite, parasitology and veterinary parasitology ✓ describe history of parasitology ✓ recognize the importance of parasitology in veterinary curriculum ✓ compare different types of host-Parasites relationship	Introduction to parasitology and history of parasitology, significance of parasitology	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define Symbiosis, Parasitism, commensalism, mutualism, Predation, Phoresis etc. ✓ explain different types of relationship with examples ✓ compare different types of host-parasites relationship	Parasitism and host-parasite interactions:symbiosis, parasitism, commensalism, mutualism, predation, phoresis etc.	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ illustrate the code of rules related to zoological nomenclature of parasites ✓ recognize the system of binomial nomenclature	Zoological nomenclature of parasites	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define host, carriers, vector, parasites ✓ distinguish different types of parasites, hosts and vectors ✓ recognize the diversity of parasites ✓ compare the dependence of different types of parasites on hosts	Definition and classification of parasites hosts and vectors	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
General Parasitology			
✓ illustrate the effects of parasitism on host ✓ explain the impact of parasitism on parasites ✓ analyze different modes of parasitic adaptations ✓ assess the various harmful effects of parasites on their hosts and the prioritize most harmful parasites	Host-parasite relationships and adaptation of parasites	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define infection, infestation, super-infection, auto-infection, predator, prey, hypobiosis and diapause ✓ classify animal association ✓ discriminate different types of parasitism and analyze host-parasite equilibrium	Types of animal association and parasitism	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ summarize biotic potential ✓ discuss factors responsible for host and organ specificity ✓ contrast different routes of entry of parasites into the host body	Host specificity, organ specificity, routes of entry of parasites	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ assess sources of parasitic diseases/infection ✓ identify the need for hygienic management in the farm and family to secure animal and public health ✓ explain how parasitic diseases are transmitted	Source of parasitic infection and mode of parasitic diseases transmission	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ evaluate the economic importance of parasitic infections ✓ outline geographical distribution of parasites	Economic importance, geographical distribution of parasites	Lecture Interactive Discussion	Quiz Short answers Essay type

✓ interpret the epidemiology of parasites		Multimedia presentation Feedback	answers Class attendance
✓ define different types of cercariae, metacestodes and larvae ✓ identify the developmental stages of parasites ✓ evaluate the developmental biology of parasites ✓ recognize the stages where intervention is necessary for controlling the parasites	Developmental stages of parasites (different types of cercariae, metacestodes and larvae)	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ describe the general life cycle of trematodes, cestodes, nematodes and acanthocephala ✓ explain the general biology of parasites ✓ locate the points for intervention towards control of different parasites	General life cycle of helminths and acanthocephala	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ describe the general morphology of helminths ✓ describe the general morphology of arthropods and protozoa ✓ differentiate different groups of parasites	General morphology of parasites (trematode, cestode, nematode &acanthocephala, arthropods and protozoa)	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define different types of immunity ✓ judge effective immunity and describe factors associated with immunity or resistance ✓ explain the mechanism of parasitic immunity ✓ evaluate the scope and limitations of effective vaccine development against parasitic infections	Parasitic immunity, factors associated with immunity or resistance, importance of immunity against parasitic diseases, difference between parasitic and bacterial immunity	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ formulate a general control measure against parasitic diseases ✓ describe parasitic zoonoses ✓ assess human-animal interface for parasitic diseases (One health perspective)	General control measures of parasites, zoonotic importance of parasites	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define anthelmintics ✓ outine the properties of an ideal anthlmintic. ✓ describe the usage and methods of administration of anthelmintics ✓ analyze the effective route of administration in different animal species	Anthelmintics and their properties, routes of anthelmintic therapy	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ calculate the therapeutic efficacy of anthelmintics ✓ evaluate the therapeutic efficacy of anthelmintics on various parasitic infections ✓ recommend the most effective anthelmintic to the farmers	Therapeutic efficacy of anthelmintics against parasitic infections	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ know the generic groups of Anthelmintics ✓ identify the specific anthelmintic for specis parasites ✓ identify the ways towards anthelmintic resistance	Some commonly used generic groups of anthelmintics, anthelmintics resistance	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
Malacology			
✓ define malacology, molluscs and mollusc related terminologies ✓ describe the taxonomy of molluscs	Introduction to malacology, taxonomy, terminologies	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ explain general morphology of snails ✓ differentiate the biology and ecology of different species of snails ✓ describe biological classification of snail. ✓ justify economic importance and different aspect of molluscs	General morphology, biology ecology and economic importance of snails	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ differentiate the biology and ecology of different species of snails of the family Lymniidae ✓ explain morphology of snails of the family	Morphology, biology and ecology of snails of the family Lymniidae	Lecture Interactive Discussion Multimedia	Quiz Short answers Essay type answers Class

Lymniidae ✓ differentiate different species of snails of the family Lymniidae		presentation Feedback	attendance
✓ differentiate the biology and ecology of different species of snails of the family Planorbidae ✓ explain morphology of snails of the family Planorbidae ✓ differentiate different species of snails of the family Planorbidae	Morphology, biology and ecology of snails of the family Planorbidae	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ differentiate the biology and ecology of different species of snails of the family Thyriidae and Viviparidae ✓ explain morphology of snails of the family Thyriidae and Viviparidae ✓ differentiate different species of snails of the family Thyriidae and Viviparidae	Morphology, biology and ecology of snails of the family Thyriidae and Viviparidae	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ differentiate the biology and ecology of different species of snails of the family Bithyniidae, Physiidae, Ampulliridae ✓ explain morphology of snails of the family Bithyniidae, Physiidae, Ampulliridae ✓ differentiate different species of snails of the family Bithyniidae, Physiidae, Ampulliridae	Morphology, biology and ecology of snails of the family Bithyniidae, Physiidae, Ampulliridae	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ define intermediate hosts ✓ evaluate the role of molluscs in the transmission of common helminth parasites. ✓ identify the developmental stages of parasites within mollusks intermediate hosts	Role of molluscs in the transmission of common helminth parasites of livestock and poultry	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ select snails of veterinary & medical importance ✓ formulate effective control strategies against snails	Control measures of snails of veterinary importance in Bangladesh	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answers Essay type answers Class attendance
✓ revise the previous information in the field	Latest research updates	Review of Journals and articles	Assignment

Reference Books

1. D. Jacobs, M. Fox, L. Gibbons and C. Hermosilla. 2016. Principles of veterinary Parasitology. 1st edition. Wiley-Blackwell Publishing, USA.
2. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings.1996. Veterinary Parasitology. 2nd edition. Blackwell Science, UK.
3. L.S. Roberts and J. Janovy. 2005. Foundations of Parasitology. 7th edition. McGraw-Hill companies Inc., New York, USA.
4. M.A. Taylor, R.L. Coop and R.L. Wall. 2007. Veterinary Parasitology. 3rd edition. Blackwell Publishing, USA.
5. M.M. Rahman, S. Ahmed and M.M.H. Mondal. 1996. Introduction to helminth parasites of animals and birds in Bangladesh. 1st edition. Sheba printing press, Bangladesh.
6. S.C. Mandal. 2012. Veterinary Parasitology at a glance. 2nd edition. IBDC Pub, Lucknow, India.
7. T. Kassai. 1999. Veterinary Helminthology. Reed Educational and Professional Publishing Ltd., UK.

Course Code: MIPA 222 **Course Title: General Parasitology and Malacology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: I**

Rationale: This course is designed to provide practical concept of parasites and molluscs.

Course Objective: The major learning outcomes of this course are to-

- ✓ enrich knowledge on common laboratory instruments, reagents and solutions used in the laboratory
- ✓ prepare reagents and solutions required in the Parasitology laboratory
- ✓ gain knowledge about post-mortem examination, collection of parasites, preservation and shipment of parasites in livestock and poultry
- ✓ gather knowledge about different techniques of faecal sample examinations
- ✓ identify of different parasites and snails

Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ select the common laboratory instruments used for parasitological examinations ✓ recognize the usage of common laboratory instruments ✓ handlecommon laboratory instruments	Orientation to the laboratory, common laboratory instruments used for parasitological examinations and their usage	Lecture Interactive Discussion Demonstration Multimedia presentation Assignment preparation	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, evaluation of assignments class attendance and practical note book
✓ prepare common laboratory reagents and solutions ✓ explain the usage of common laboratory reagents and solutions with precaution. ✓ be aware of the harmful effects of reagents and solutions on human health	Common laboratory reagents and solutions and their usages,precaution of common laboratory solutions / buffer and their usage	Lecture Interactive Discussion Assignment preparation	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, evaluation of assignments class attendance and practical note book
✓ identify the gross morphology of parasitological specimens ✓ differentiate different developmental stages of parasites under microscope ✓ apply the techniques of ante-mortem examination	Ante-mortem examination. Practical demonstration of parasitological museum specimens (Cercariae, metacestodes and larvae)	Lecture Interactive Discussion	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, class attendance and practical note book
✓ demonstrate the techniques of post mortem examination of ruminant and poultry for the collection of parasites ✓ collect the endo and ecto parasites from livestock and poultry ✓ describe preservation and shipment the parasites	Collection, preservation and shipment of parasites from livestock & poultry	Lecture Interactive Discussion Demonstration Practical work Assignment preparation	Written examination, demonstration of laboratory methods, viva voce, evaluation of assignments, class attendance and practical note book
✓ examine fecal samples through direct smear ✓ examine fecal sample through indirect methods (sedimentation, Flotation, centrifugation) ✓ interpret the results of qualitative methods of faecal sample examination	Qualitative methods of fecal sample examination	Lecture Interactive Discussion Practical work	Written examination, identification of sample, demonstration of laboratory methods, viva voce, class attendance and practical note book
✓ illustrate the quantitative methods of fecal sample examination ✓ execute the quantitative methods of fecal sample examination (McMaster technique, Stoll's ova technique) ✓ interpret the result of quantitative methods of faecal sample examination	Quantitative methods of fecal sample examination	Lecture Interactive Discussion Practical work Assignment preparation	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, evaluation of assignments, class attendance and practical note book
✓ explain the importance for the recovery of larvae ✓ apply techniques for the recovery of larvae from the pasture/ feces/ soft tissues by Baermann's technique ✓ identify the larvae from different sources	Recovery of larvae from the pasture/feces/ soft tissues by Baermann's technique	Lecture Interactive Discussion Practical work	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, class attendance and practical note book

✓ identify the different types of snails ✓ differentiate Lymnaidae, Planorbidae, Ampullaridae and Thyridae	Morphological identifications of snails	Lecture Interactive Discussion Practical work Assignment preparation	Written examination, identification of sample/ demonstration of laboratory methods, viva voce, class attendance, evaluation of assignments, and practical note book

Reference Books

1. A.M. Zajac and G.A. Conboy.2012. Veterinary Clinical Parasitology. 8th edition. Wiley-Blackwell Publishing, USA.
2. C.M. Hendrix, Ed. Robinson.2017. Diagnostic parasitology for Veterinary Technicians, 5th edition. Elsevier Inc. USA.
3. E.J.L. Soulsby.1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7thedition. ELBS/Baillere Tindall, London.
4. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings.1996. Veterinary Parasitology. 2nd edition. Blackwell Science, UK.
5. R.D. Turner. 1974. Collecting shipworms. How to Study and Collect Shells. 4th edition. American Malacological Union, Wrightsville Beach, North Carolina.

Course Code: MIPA 259 **Course Title: Nemathelminthes & Platyhelminthes (Theory)**	**Credit Hour: 3**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide an intensive orientation on Nemathelminthes and Platyhelminthes.			
Course learning outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental concepts of Nematodes, Trematodes and Cestodes ✓ outline morphology and biology of different Nematodes, Trematodes and Cestodes ✓ interpret the diseases caused Nematodes, Trematodes and Cestodes and their transmission dynamics ✓ design prevention and control measures against Nematodes, Trematodes and Cestodes			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
Nemathelminthes			
✓describe the morphology of Ascarididae ✓sketch the life cycle of Ascarididae ✓explain the transmission and injurius effects of Ascarididae on animals. ✓plan out the controlling measures against Ascarididae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Ascarididae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓describe the morphology of Heterakidae ✓sketch the life cycle of Heterakidae ✓explain the transmission and injurius effects of Heterakidae on animals. ✓plan out the controlling measures against Heterakidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Heterakidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓identify the morphology of Ancylostomatoidea ✓illustrate the life cycle of Ancylostomatoidea ✓detect the transmission and harmful effects of Ancylostomatoidea ✓plan necessary steps for controlling Ancylostomatoidea	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the super family Ancylostomatoidea	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓identify the morphology of Dictophymatidae ✓illustrate the life cycle of Dictophymatidae ✓detect the transmission and harmful effects of Dictophymatidae ✓plan necessary steps for controlling Dictophymatidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Dictophymatidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓describe the morphology of Trichostrongyloidea ✓identify the hosts of Trichostrongyloidea ✓draw the life cycle of Trichostrongyloidea ✓explain the route of transmission and pathology of Trichostrongyloidea ✓prevent parasitic diseases by controlling Trichostrongyloidea ✓illustrate the zoonotic importance of Trichostrongyloidea	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the order Trichostrongyloidea	Lecture Interactive Discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answers Class attendance
✓describe the morphology of Strongylidae ✓identify the hosts of Strongylidae ✓draw the life cycle of Strongylidae ✓explain the route of transmission and pathology of Strongylidae ✓prevent parasitic diseases by controlling Strongylidae ✓illustrate the zoonotic importance of Strongylidae	Morphology, lifecycle, transmission, harmful effects, and control/prevention of the major species in the Strongylidae family	Lecture Interactive Discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answers Class attendance
✓point out the morphology of Filariidae ✓sketch the life cycle of Filariidae ✓describe the transmission and injurius effects of Filariidae on animals. ✓formulate preventive measures against Filariidae ✓know the socioeconomic importance of Filariidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Filariidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓point out the morphology of Strongyloididae ✓sketch the life cycle of Filariidae and Strongyloididae ✓describe the transmission and injurius effects of Filariidae on animals. ✓formulate preventive measuresagainstFilariidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Strongyloididae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance

✓ know the socioeconomic importance of Strongyloididae			
✓ compare the morphology of eggs and adult parasites belonging to the family Spiruridae and Trichuridae ✓ locate the distribution of Spiruridae and Trichuridae. ✓ sketch the life cycle of Spiruridae and Trichuridae ✓ explain the transmission and injurius effects of Spiruridae and Trichuridae ✓ propose control measures against the Spiruridae and Trichuridae ✓ discuss the zoonotic importance of Spiruridae and Trichuridae	Morphology, lifecycle, transmission, harmful effects, and control/prevention of the major species in the family Spiruridae and Trichuridae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ identify Parasites under Trichinellidae and Capillariidae ✓ sketch the life cycle of Parasites under Trichinellidae and Capillariidae ✓ explain the transmission and detrimental effects of Parasites under Trichinellidae and Capillariidae on animals. ✓ control Parasites under Trichinellidae and Capillariidae. ✓ outline the zoonotic importance of Parasites under Trichinellidae and Capillariidae.	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Trichinellidae and Capillariidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ idenify Parasites belonging to Syngamidae and Oxyuridae ✓ diagram the life cycle of Parasites belonging to Syngamidae and Oxyuridae ✓ discuss the health hazards of Parasites belonging to Syngamidae and Oxyuridae ✓ recommend prevention and control measures against the parasites belonging to Syngamidae and Oxyuridae.	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Syngamidae and Oxyuridae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology of Dracunculidae ✓ sketch the life cycle of Dracunculidae ✓ explain the epidemiology, transmission and injurius effects of Dracunculidae ✓ solve problems inflicted by Dracunculidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Dracunculidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology of Dracunculidae and Gnathostomatidae ✓ sketch the life cycle of Gnathostomatidae ✓ explain the epidemiology, transmission and injurius effects of Gnathostomatidae ✓ solve problems inflicted byGnathostomatidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Gnathostomatidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ discribe the anatomy of eggs and adult parasites of Metastrongyloidea ✓ sketch the life cycle of Metastrongyloidea ✓ determine the pathology of Metastrongyloidea ✓ control Metastrongyloidea	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Metastrongyloidea	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ discribe the anatomy of eggs and adult parasites of Rhabditidae ✓ sketch the life cycle of Rhabditidae ✓ determine the pathology of Rhabditidae ✓ control Rhabditidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Rhabditidae	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ identify Stephanuridae and Thelaziidae ✓ lebel the life cycle of Stephanuridae ✓ explain the transmission and injurius effects caused by Stephanuridae ✓ formulate effective control measures against	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Stephanuridae	Lecture Interactive Discussion Visual presentation	Quiz Short answer Essay type answers Class attendance

Stephanuridae		Feedback	
✓ identify Stephanuridae ✓ explain the life cycle of Thelaziidae ✓ explain the transmission and injurius effects caused by Thelaziidae ✓ formulate effective control measures against Thelaziidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Thelaziidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
Platyhelminthes(Trematode)			
✓ describe the differential morphological features of different genera under the family Fasciolidae ✓ describe how adult *Fasciola*& immature *Fasciola* cause diseases in animals ✓ discuss weather pattern & disease risk with possible forecasting methods in fasciolosis as well as the possible treatment ✓ design control measures against Fasciolidae	Morphology, lifecycle, transmission harmful effects and control/prevention of the major species in the family Fasciolidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ differentiate the morphological features of different species under the family Paramphistomatidae ✓ describe the life cycle of Paramphistomatidae. ✓ report about the transmission and harmful effects of Paramphistomatidae ✓ control of Paramphistomatidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Paramphistomatidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of Schistosomatidae. ✓ describe the life cycle of Schistosomatidae ✓ explain diseases caused bySchistosomatidae ✓ illustrate the zoonotic significance of parasitses ✓ plan out control measures of this parasites	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Schistosomatidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of Dicrocoeliidae ✓ describe the life cycle of Dicrocoeliidae ✓ explain the transmission and injurius effects of Dicrocoeliidae ✓ illustrate the vererinary importance of Dicrocoeliidae ✓ control of Dicrocoeliidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Dicrocoeliidae	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of Echinostomatidae. ✓ describe the life cycle of Echinostomatidae ✓ explain the transmission and injurius effects of Echinostomatidae ✓ recommend preventive measures against Echinostomatidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Echinostomatidae	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of Opisthorchiidae ✓ label the life cycle of Opisthorchiidae ✓ discuss the transmission and injurious effects of Opisthorchiidae ✓ illustrate the veterinary importance of Opisthorchiidae ✓ control of Opisthorchiidae.	Morphology, lifecycle, transmission, harmful effects, and control/prevention of the major species in the family Opisthorchiidae	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of Prosthogonimidae ✓ sketch the life cycle of Prosthogonimidae ✓ explain health hazards of Prosthogonimidae ✓ control Prosthogonimidae	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the family Prosthogonimidae	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
Platyhelminthes (Cestodes)			
✓ state the morphology of *Taenia* spp. ✓ describe the life cycle of *Taenia* spp. ✓ explain the transmission and injurius effects of *Taenia* spp. ✓ control of these parasites ✓ report the public health importance of *Taenia* spp.	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genera *Taenia* spp.	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance

✓ state the morphology of the genus the *genus Echinococcus* ✓ describe the life cycle of the *genus Echinococcus* ✓ explain the transmission and injurious effects of the genus *Echinococcus* ✓ report the public health importance the genus *Echinococcus* ✓ control the parasites	Morphology, lifecycle, transmission harmful effects and control/prevention of the major species in the genera the *genus Echinococcus*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ explain the morphology of the genera the genus *Dipylidium* ✓ diagram the life cycle of the genus *Dipylidium* ✓ discuss the pathology of the genus *Dipylidium* ✓ describe the Veterinary and zoonotic importance of the genus *Dipylidium* ✓ control the genus *Dipylidium*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus the genera *Dipylidium*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ explain the morphology of the genera the genus *Diphyllobothrium* ✓ diagram the life cycle of the genus *Diphyllobothrium* ✓ discuss the pathology of the genus *Diphyllobothrium* ✓ describe the zoonotic importance of the genus *Diphyllobothrium* ✓ control the genus *Diphyllobothrium*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genera the genus *Diphyllobothrium*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ express the morphology of genus genus *Davainea* ✓ describe the life cycle of genus *Davainea* ✓ explain the transmission and injurius effects of genus *Davainea* ✓ control of genus *Davainea*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genera genus*Davainea*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ explain the morphology of genus *Raillietina* ✓ describe the life cycle of genus *Raillietina* ✓ explain the transmission and injurius effects of genus *Raillietina* ✓ control of genus *Raillietina* ✓ discuss the zoonotic importance of genus *Raillietina*	Morphology, lifecycle, transmission, harmful effects, and control/prevention of the major species in the genera genus *Raillietina*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology ant anatomy of parasites of *Choanotaenia* and *Moniezia* ✓ draw the life cycle of *Choanotaenia* and *Moniezia* ✓ determine the transmission and injurius effects of *Choanotaenia* and *Moniezia* ✓ detect the veterinary importance of *Choanotaenia* and *Moniezia* ✓ control of these parasites	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genera *Choanotaenia* and *Moniezia*	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ understand the morphological characteristics of *Mesocestoides* ✓ describe the life cycle of *Mesocestoides* ✓ recognize the injurius effects of *Mesocestoides* ✓ control of Mesocestoides ✓ illustrate the zoonotic importance of *Mesocestoides*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus *Mesocestoides*	Lecture Interactive Discussion Visual presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology of *Spirometra* and *Anoplocephala* ✓ draw the life cycle of *Spirometra* and *Anoplocephala* ✓ explain the transmission and injurius effects of *Spirometra* and *Anoplocephala* ✓ illustrate the veterinary importance of *Spirometra* and *Anoplocephala* ✓ control of *Spirometra* and *Anoplocephala*.	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genera *Spirometra* and *Anoplocephala*	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ discuss the morphology of *Paranoplocephala* ✓ describe the life cycle of, *Paranoplocephala* ✓ point out the transmission and harmful effects of *Paranoplocephala*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers

✓ recognize the veterinary and zoonotic importance of *Paranoplocephala* ✓ treat of *Paranoplocephala*	*Paranoplocephala*		Class attendance
✓ discuss the morphology of *Amoebotaenia*sketch the life cycle of *Amoebotaenia* ✓ point out the transmission and harmful effects of *Amoebotaenia* ✓ treat *Amoebotaenia* and recognize the zoonotic importance of *Amoebotaenia*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus *Amoebotaenia*	Lecture Interactive Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ state the morphology of *Hymenolepis* ✓ describe the life cycle of *Hymenolepis* ✓ interpret the transmission and injurius effects of *Hymenolepis* ✓ illustrate the veterinary significance of *Hymenolepis* ✓ plan out of control measures against *Hymenolepis*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus *Hymenolepis*	Lecture Interactive Presentation Discussion Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology of *Stilesia* ✓ diagram the life cycle of *Stilesia* ✓ describe the transmission and detrimental effects of *Stilesia* ✓ controland treat of *Stilesia*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus *Stilesia*	Lecture Interactive Discussion Presentation Feedback	Quiz Short answer Essay type answers Class attendance
✓ describe the morphology of *Avitellina* ✓ diagram the life cycle of *Avitellina* ✓ describe the transmission and detrimental effects of *Avitellina* ✓ controland treat of *Avitellina* ✓ justify the veterinary and zoonotic significance of *Avitellina*	Morphology, lifecycle, transmission, harmful effects and control/prevention of the major species in the genus *Avitellina*	Lecture Interactive Discussion Presentation Feedback	Quiz Short answer Essay type answers Class attendance

Reference Books

1. D.D. Bowman.2013. Georgis' Parasitology for Veterinarians. 10th edition. Saunders, USA.
2. E.J.L. Soulsby.1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7thedition. ELBS/Baillere Tindall, London.
3. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings.1996. Veterinary Parasitology. 2nd edition. Blackwell Science, UK.
4. K.D. Chatterjee.2011. Parasitology (protozoology and helminthology). 11th edition. CBS Publishers and Distributors PVT. Ltd, New Delhi, India.
5. L.S. Roberts and J. Janovy.2005. Foundations of Parasitology. 7th edition. McGraw-Hill companies Inc., New York, USA.
6. M.A. Taylor, R.L. Coop and R.L. Wall. 2007. Veterinary Parasitology. 3rd edition. Blackwell Publishing, USA.
7. T. Kassai. 1999. Veterinary Helminthology. Reed Educational and Professional Publishing Ltd., UK.
8. Y.R. Ortega.2006. Foodborne parasites. 1st edition. Springer Science and Business Media, New York, USA.
9. S.C. Mandal. 2012. Veterinary Parasitology at a glance. 2nd edition. IBDC Pub, Lucknow, India.
10. S. Nandi. 2014. Zoonotic diseases. New India Publishing agency, India.
11. G. hambidge. 2008. Diseases and Parasites of sheep and goats. Daya Publishing house, New Delhi, India.

Course Code: MIPA 260 **Course Title: Nemathelminthes & Platyhelminthes (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**
Rationale: This course is designed to providepractical concept of Nemathelminthes & Platyhelminthes.			
Course learning outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental practical concepts of Trematodes, Cestodes and Nematodes ✓ enrich knowledge on common laboratory instruments, reagents and solutions ✓ gain knowledge about practical demonstration of Parasitological museum specimens ✓ gather knowledge aboutdetection of Trematode, Cestode and Nematode eggs by fecal and nasal discharge sample examination ✓ develop knowledge about the techniques of permanent slide preparation of trematode, cestode and nematode ✓ know techniques for the identification of eggs and adult parasites of trematode, cestode and nematode			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ select the common laboratory reagents and solutions ✓ use the instruments ✓ perform the lab work ✓ take precautionary measures	**Laboratory instruments:** Common laboratory instruments used for parasitological examinations and their usage	Lecture Interactive Discussion Report writing	Quiz, Short answer, Identification, Skill test, Viva voce, report, Practical note book, Class attendance
✓ demonstrate the parasitological museum specimens ✓ compare the specimens ✓ identify the specimens ✓ represent the specimens	**Parasitological museum specimens:** Demonstration of parasitological museum specimens	Lecture Interactive Discussion Report writing	Quiz, Short answer, Identification, Skill test, Viva voce, Report, Practical note book, Class attendance
✓ apply the techniques of detection of eggs by fecal and nasal discharge sample examination ✓ describe the morphology of eggs ✓ distinguish and draw the eggs	**Trematode and Cestode Eggs:** Detection by fecal sample examination	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ explain the techniques of detection of eggs by fecal and nasal discharge sample examination ✓ explain the morphology of eggs ✓ diagram and distinguish the eggs	**Nematode Eggs:** Detection by fecal and nasal discharge sample examination	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ design the technique for preparation of permanent slide for trematode, cestode and nematode ✓ sketch out the procedure of permanent slide preparation ✓ use the reagents properly ✓ store the slide for further use	**Permanent slide preparation:** Preparation of permanent slide of trematodes and cestodes	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ design the technique of preparation of temporary slide for nematode ✓ sketch out the procedure of temporary slide preparation	**Temporary slide preparation:** Preparation of temporary slide for nematode	Lecture Interactive Discussion Practical work Report writing	Quiz, Short answer, Identification, Skill test, Viva voce, Report, Practical note book, Class attendance
✓ identify the eggs of *Fasciola* and Amphistomes ✓ recognize the adult *Fasciola* and Amphistomes parasites ✓ infer the morphology of eggs and parasites ✓ differentiate the identifying characteristics of eggs and parasites	**Identification of Trematodes eggs and adult parasites:** *Fasciola* and *Amphistomes*	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ identify the eggs of *Dicrocoelium, Echinostomum, Clonorchis* ✓ recognize the adult trematode parasites of the genera ✓ infer the morphology of eggs and parasites ✓ differentiate the identifying characteristics of eggs and parasites	**Identification of Trematodes eggs and adult parasites:** *Dicrocoelium, Echinostomum, Clonorchis*	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ demonstrate the general morphological features of cestode (microscopically) ✓ study on the scolex and different segments (immature, mature and gravid proglottids of cestodes ✓ demonstrate gross morphology of hydatid and coenurus cyst	**Morphology of cestodes**: Gross and microscopic features. Microscopic features of Scolices and different types of segments	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ explain the characteristics of *Taenia* and *Echinococcus* eggs and adult parasites	**Identification of Cestodes eggs and adult parasites**:	Lecture Interactive	Quiz, Short answer, Identification, Skill

✓ study on the scolex and different segments (immature, mature and gravid proglottids of *Raillietina* and *Davainea* ✓ go for differential diagnosis with other parasites	Genera *Taenia* and *Echinococcus*: Gross and microscopic features of eggs. Microscopic features of Scolices, and different types of segments	Discussion Practical work	test, Viva voce, Practical note book, Class attendance
✓ demonstrate the general morphological features of *Raillietina* and *Davainea* (microscopically) ✓ identify *Raillietina* and *Davainea* eggs and adult parasites ✓ study on the scolex and different segments (immature, mature and gravid proglottids of *Raillietina* and *Davainea* ✓ identify cyst of *Raillietina* and *Davainea*	**Identification of Cestode eggs and adult parasites**: Genera *Raillietina* and *Davainea*: Gross and microscopic features. Microscopic features of Scolices, and different types of segments	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ identify the Nematodes eggs ✓ explain the anatomy adult parasites of Nematodes ✓ detect Nematode eggs and parasites ✓ differentiate the identifying characteristics of Nematodes eggs and parasites	**General morphology of Nematode eggs and adult parasites:** Identify, anatomy, morphology of nematode eggs	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ identify the eggs of *Haemochus* and *Ancylostoma* ✓ explain the anatomy adult parasites of *Haemochus* and *Ancylostoma* ✓ differentiate the identifying characteristics of *Haemochus*and *Ancylostoma* eggs and parasites	**Morphology of Nematode eggs and adult parasites**: Genera *Haemochus* and *Ancylostoma*	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ identify the eggs of *oesophagostomum, Ascaridia, Heterakis, Toxocaracati, Neoascaris vitulorum* etc. ✓ explain the morphology of adult parasites of the genera *Oesophagostomum, Ascaridia, Heterakis, Toxocaracati, Neoascaris* etc. ✓ differentiate the identifying characteristics of eggs and parasites of the genera *Oesophagostomum, Ascaridia, Heterakis, Toxocara* etc.	**Morphology of Nematode eggs and adult parasites**: *Oesophagostomum, Ascaridia, Heterakis, Toxocara cati, Neoascaris vitulorum* etc.	Lecture Interactive Discussion Practical work	Quiz, Short answer, Identification, Skill test, Viva voce, Practical note book, Class attendance
✓ justify the habitat of helminths ✓ collect different types of helminths ✓ process, preserve and ship helminth parasites	Field trip to hawor area	Lecture Discussion Field visit Demonstration Feedback	Report evaluation Oral test Class attendance

Reference Books

1. A. Roepstorff and P. Nansen. 1998. FAO Animal health manual: Epidemiology, diagnosis and control of helminth parasite of swine. FAO publication, Rome, Italy.
2. A.M. Zajac and G.A. Conboy. 2012. Veterinary Clinical Parasitology. 8th edition. Wiley-Blackwell Publishing, USA.
3. A.M. Zajac. 2015. Veterinary Clinical Parasitology. 6th edition. IBDC Pub, India.
4. C.M. Hendrix, Ed. Robinson.2017. Diagnostic Parasitology for Veterinary Technicians, 5th edition. Elsevier Inc. USA.
5. D. Jacobs, M. Fox, L. Gibson and C. Hermocilla. 2015. Principles of Veterionary Parasitology. Wiley-Blackwell, USA.
6. D.D. Bowman.2013. Georgis' Parasitology for Veterinarians. 10th edition. Saunders, USA.
7. E.J.L. Soulsby.1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7thedition. ELBS/Baillere Tindall, London.
8. P.D. Juyal, N.K. Singh and H. Singh. 2013. Diagnostic Veterinary Parasitology: An Introduction. New India Publishing Agency, India.
9. W.J. Foreyt.2001. Veterinary Parasitology: Reference manual. 5th edition. Blackwell Publishing, USA.

Course Code: MIPA 321 **Course Title: Veterinary Entomology & Aquatic Parasitology (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: I**
Rationale: This course is designed to provide basic concept of external parasite.			
Course learning outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental concepts of external parasite having veterinary importance ✓ enrich knowledge on morphology and biology different external parasite ✓ gain knowledge about classification and terminology of parasites ✓ gather knowledge about transmission, diseases caused by external parasites and zoonosis ✓ plan the preventive and control measures of external parasites			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
Veterinary Entomology			
✓ define Entomology, veterinary entomology ✓ identify the importance of veterinary entomology ✓ gather knowledge about history of veterinary entomology	**Introduction:** Definition, classification & importance of veterinary entomology, history of veterinary entomology	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define external parasite related terms (Larva, nymph, naiad, pupa, imago, ecdysis, stadium, instar, diapause) ✓ identify the developmental stages of ecto-parasites. ✓ differentiate different developmental stages of ecto-parasites	**Terminologies:** Larva, nymph, naiad, pupa, imago, ecdysis, stadium, instar, diapause	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ draw & label a typical arthropod ✓ describe external organ with their functions	**General morphology:** External anatomy (exoskeleton, chitin, pore canals, stomodaeum, proctodaeum head, thorax)	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ draw & label a different internal system of arthropod ✓ summarize the neuro-transmission in arthropods ✓ describe the body fluid circulation in arthropods ✓ identify the differences in digestion and respiration in arthropods compared to other animals	**General morphology:** Internal anatomy (digestive, respiratory, circulatory, excretory and nervous system)	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate the feeding strategies of arthopods ✓ show how feeding habits are associated with disease initiation and transmission ✓ define & classify metamorphosis	Biological characteristics & Classification of arthropods, feeding habit, metamorphosis	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define vector and intermediate host ✓ classify vectors with examples ✓ justify vector acts as mandatory for animal diseases as well as zoonotic disease ✓ differentiate between vector and intermediate host	**Vectors and their classification:** Definition of mechanical vector, biological vector, obligatory vector (cyclopropagative transmission, cyclo-developmental transmission), intermediate host	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe pathological conditions caused by arthropods ✓ identify the economic importance of arthropod ✓ detect vector borne diseases	**General pathological conditions caused by arthropods (**Entomophobia, blood loss, injury, envenomization, dermatosis mayiasis, allergy)	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe taxonomy, morphology, biology, ecology, behavior of diptera ✓ differentiate among species of diptera ✓ illustrate transmission, distribution, Life cycle, ✓ harmful effects of diptera ✓ evaluate economic significance and public health importance of diptera ✓ formulate control measures for diptera	**Order- Diptera:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ explain taxonomy, morphology, biology, ecology, behavior of phthiraptera ✓ compare among species of phthiraptera. ✓ illutrate transmission, distribution, Life cycle of phthiraptera ✓ interpret harmful effects of phthiraptera ✓ evaluate economic significance and public health importance of phthiraptera ✓ design control for phthiraptera	**Order-Phthiraptera:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ write the taxonomy, morphology, biology, ecology, behavior of siphonaptera ✓ analyze differentiation among species of siphonaptera ✓ sketch transmission, distribution, life cycle, ✓ assess harmful effects of siphonaptera ✓ compose economic significance and public health importance of siphonaptera ✓ develop control measure for siphonaptera	**Order-Siphonaptera:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ compose taxonomy, morphology, biology, ecology, behavior of hemiptera ✓ distinguish among species of hemiptera ✓ show transmission, distribution, life cycle, ✓ evaluate harmful effects of hemiptera ✓ evaluate economic significance and public health importance of hemiptera ✓ Propose control measures for hemiptera	**Order-Hemiptera:** Taxonomy, morphology, biology, ecology, behavior, harmful effects and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe taxonomy, morphology, biology, ecology, behavior of ceratopogonidae ✓ differentiate among species of Ceratopogonidae ✓ illustrate transmission, distribution, life cycle, ✓ harmful effects of Ceratopogonidae ✓ evaluate economic significance and public health importance of Ceratopogonidae ✓ schedule control measure against Ceratopogonidae	**Family- Ceratopogonidae:** Taxonomy, morphology, biology, ecology, behavior, public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain taxonomy, morphology, biology, ecology, behavior of simuliidae ✓ differentiate among species of simuliidae ✓ describe transmission, Distribution, life cycle, ✓ harmful effects of simuliidae ✓ Investigate economic significance and public health importance of simuliidae ✓ design control measures against simuliidae	**Family-Simuliidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe taxonomy, morphology, biology, ecology, behavior of Psychodidae ✓ compare among species of Psychodidae ✓ diagram transmission, distribution, life cycle, ✓ describe harmful effects of Psychodidae ✓ analyze economic significance and public health importance of Psychodidae ✓ recommend control strategies for Psychodidae	**Family-Psychodidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ show taxonomy, morphology, biology, ecology, behavior of Culicidae ✓ differentiate among species of culicidae ✓ illutrate transmission, distribution, life cycle and harmful effects of culicidae ✓ discover economic significance and public health importance of culicidae ✓ propose control measures for culicidae	**Family- Culicidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain taxonomy, morphology, biology, ecology, behavior of Muscidae, Calliphoridae ✓ distinguish among species of muscidae, calliphoridae ✓ sketch transmission, distribution, life cycle and harmful effects of muscidae,calliphoridae ✓ evaluate economic significance and public health importance of muscidae,calliphoridae.	**Family-Muscidae, Calliphoridae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ design control measures for muscidae, calliphoridae			
✓ discusstaxonomy, morphology, biology, ecology, behavior of Hippoboscidae, Oestridae ✓ differentiate among species of hippoboscidae, oestridae ✓ show transmission, distribution, life cycle and harmful effects of Hippoboscidae, Oestridae ✓ interpret economic significance and public health importance of hippoboscidae, oestridae ✓ execute control strategy against Hippoboscidae, Oestridae	**Family-Hippoboscidae, Oestridae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain taxonomy, morphology, biology, ecology, behavior of Ixodidae, Argasidae ✓ differentiate the species of Ixodidae, Argasidae ✓ illustrate transmission, distribution, life cycle, ✓ harmful effects of Ixodidae, Argasidae ✓ interpret economic significance and public health importance of Ixodidae, Argasidae ✓ execute control measures against Ixodidae, Argasidae	**Family- Ixodidae, Argasidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe taxonomy, morphology, biology, ecology, behavior of Sarcoptidae, Demodicidae ✓ differentiate among species of Sarcoptidae, Demodicidae ✓ illustrate transmission, distribution, life cycle and harmful effects of Sarcoptidae, Demodicidae. ✓ evaluate economic significance and public health importance of Sarcoptidae, Demodicidae ✓ formulate control plan for Sarcoptidae, Demodicidae	**Family-Sarcoptidae, Demodicidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain taxonomy, morphology, biology, ecology, behavior of Psoroptidae,Cheyletidae, Dermanyssidae ✓ compare among species of Psoroptidae,Cheyletidae, Dermanyssidae ✓ sketch transmission, distribution, life cycle, ✓ evaluate harmful effects of Psoroptidae,Cheyletidae, Dermanyssidae ✓ evaluate economic significance and public health importance of Psoroptidae,Cheyletidae, Dermanyssidae ✓ execute control measures for Psoroptidae,Cheyletidae, Dermanyssidae	**Family-Psoroptidae, Cheyletidae, Dermanyssidae:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain taxonomy, morphology, biology, ecology, behavior of Pentastomida ✓ compare among species of Pentastomida ✓ describe transmission, distribution, life cycle, ✓ evaluate harmful effects of Pentastomida ✓ evaluate economic significance and public health importance of Pentastomida ✓ execute control measures for Pentastomida	**Pentastomida:** Taxonomy, morphology, biology, ecology, behavior, veterinary and public health significance and control	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
Aquatic Parasitology			
✓ enlist the protozoan and helminth parasites of freshwater and marine fishes ✓ classify protozoan and helminth parasites of freshwater and marine fishes ✓ describe common diseases of fish caused by protozoa and helminths ✓ identify protozoa and helminths of fishes through morphological identification ✓ illustrate the biology of fish parasites ✓ recommend control/preventive measures against fish parasites ✓ identify the role of fish as carrier of human parasitic diseases	**Parasitic fauna of freshwater and marine fishes:** Classification, characteristics, life cycle and control of protozoan, and helminth parasites	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ achieve the latest research findings and information	**Latest research findings:**	Review of	Assignment

in the area of vector biology and neglected tropical diseases	Information about latest research innovations in vector biology and neglected tropical diseases	journals and articles	evaluation

Reference Books

1. B.B. Bhatia, K.M.L. Pathak and D.P.A. Banerjee. 2007. Text book of Veterinary Parasitology. Kalyani Publishers, New Delhi, India.
2. D.S. Kettle. 1995. Medical and Veterinary Entomology. 2nd edition. CAB International, UK.
3. E.J.L. Soulsby.1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7thedition. ELBS/Baillere Tindall, London.
4. G. Mullen and L. Durden. 2009. Medical and Veterinary Entomology. 2nd edition. Academic Press, USA.
5. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings.1996. Veterinary Parasitology. 2nd edition. Blackwell Science, UK.
6. H.H. Williams and A. Jones. 1994. Parasitic Worm of fish. Tayler and Francis, Basingstocke.
7. M. Gary and D. Lance. 2009. Medical and veterinary entomology. 2nd edition. Academic Press, USA.
8. P.T.K. Woo. 1995. Fish diseases and disorders. Vol. I. Protozoan and metazoan infections. CAB, international.
9. R.G. Bland and H.E. Jaques. 2018. How to Know the Insects. 3rd edition. Bio-Green, USA.
10. S. Nandi. 2014. Zoonotic diseases. New India Publishing agency, India.
11. Z. Kabata. 1985. Parasites and diseases of fish cultured in the tropics. Taylor and francis, London.

Course Code: MIPA 322 **Course Title: Veterinary Entomology and Aquatic Parasitology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**
Rationale: This course is designed to provide practical concept of Veterinary Entomology.			
Course Learning Outcomes: The focal learning outcomes of this course are to– ✓ acquire knowledge about fundamental practical concepts of external parasite ✓ enrich knowledge on common laboratory instruments, reagents and solutions ✓ gain knowledge about practical demonstration of Parasitological museum specimens ✓ develop knowledge about the techniques of permanent slide preparation of external parasite ✓ know about the identification of eggs and adult parasites			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
Veterinary Entomology			
✓ enlist the common laboratory instruments and appliances used for the study of arthropods ✓ handle the common laboratory instruments and appliances with safety ✓ use common laboratory instruments and appliances	Common laboratory instruments used for parasitological (arthropods) examinations and their usage	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ list the common laboratory reagents and solutions used for veterinary entomology ✓ prepare the common laboratory reagents and solutions ✓ determine the usage common laboratory reagents and solutions with precaution	Common laboratory reagents and solutions used for parasitological (arthropods) examinations and their usage	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ explain storage temperature and humidity for the preservation of arthropods ✓ identify the commonly used chemical for the preservation of arthropods ✓ process arthropods for shipment ✓ prepare salt solution, sugar solution, formalin (10%), and alcohol solutions (70%, 95%)	Preservation/ storage, handling and shipment of arthropod samples	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ discuss about reagents requirements, procedure and precaution ✓ apply the techniques to preparation permanent slide	Preparation of permanent slides of arthropods	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ sketch and identify of mouth parts of various insects ✓ compare the morphology of mouth parts of different arthropods ✓ identify arthropods using mouthparts	Identification of mouthpart of insects	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ draw and label the wings & legs of insects ✓ compare wings & legs of different arthropods ✓ identify arthropods using wings & legs	Identification of wings and legs of insects	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ identify different body parts of flea as identification key ✓ sketch and label the different body parts of flea ✓ distinguish different flea of veterinary and medical importance	Identification of different body parts of flea	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ draw and label biting lice ✓ identify biting lice ✓ distinguish different biting lice	Identification of biting lice	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ draw and label sucking lice ✓ identify sucking lice ✓ distinguish different sucking lice ✓ compare mouth parts of biting and sucking lice	Identification of sucking lice	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ sketch and label the mouth part of ticks ✓ differentiate the species of ticks	Identification of ticks	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ sketch and label the mouth part of mites ✓ differentiate the species mites	Identification of mites	Lecture, Interactive discussion, Visual	Quiz, Short answer, Skill test,

✓ distinguish the mouth parts for burrowing and non-burrowing mites		presentation, Field/Lab work, Brain storming, Feedback	Practical note book, Oral test, Class attendance
✓ enlist the morphological characteristics of diptera fly ✓ sketch and label the diptera fly ✓ identify the diptera fly by morphological study	Identification of dipteral fly	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ enlist the morphological characteristics of diptera fly ✓ sketch and label the diptera fly ✓ identify the diptera fly by morphological study	Identification of dipteral fly	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ enlist the morphological characteristics of bug, toung worm and maggots ✓ identify bug, toung worm and maggots by morphological studies	Identification of bug, toung worm and maggots	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ enlist the parts of the mouthpart and wings of mosquitoes ✓ sketch and label the mouthpart and wings of mosquitoes ✓ differentiate the various mosquitoes species	Identification of mouthpart and wings of mosquitoes	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ enlist the morphological characteristics of *Anopheles* mosquitoes ✓ sketch and label the gross structure of *Anopheles* mosquitoes ✓ identify the *Anopheles* mosquitoes	Identification of gross structure of *Anopheles* mosquitoes	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
Aquatic Parasitology			
✓ collect parasites from freshwater and marine fishes ✓ process, preserve parasites for future identification ✓ ship collected samples to laboratory in home lab or abroad	Collection, processing, preservation and shipment of fish parasites	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ process protozoa and helminth for identification by morphology ✓ stain parasites of fishes ✓ identify protozoa and helminth parasites freshwater and marine fishes	Processing, staining and identification of protozoa and helminth of freshwater and marine fishes	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ justify the habitat of common arthropod vectors ✓ collect different vectors ✓ process, preserve and ship arthropod vectors	Field trip to a dense forest area	Lecture Discussion Field visit Demonstration Feedback	Report evaluation Oral test Class attendance

Reference Books

1. B.B. Bhatia, K.M.L. Pathak and D.P.A. Banerjee. 2007. Text book of Veterinary Parasitology. Kalyani Publishers, New Delhi, India.
2. C. Hendrix. 2017. Diagnostic Parasitology for Veterinary Technicians. 5th edition. Mosby, USA.
3. D.S. Kettle. 1995. Medical and Veterinary Entomology. 2nd edition. CAB International, UK.
4. E.J.L. Soulsby. 1982. Helminths, Arthropods and Protozoa of Domesticated Animals. 7th edition. ELBS/Baillere Tindall, London.
5. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings. 1987. Veterinary Parasitology. 2nd edition. Blackwell Science, UK.
6. H.H. Williams and A. Jones. 1994. Parasitic Worm of fish. Tayler and Francis, Basingstocke.
7. M. Gary and D. Lance. 2009. Medical and veterinary entomology. 2nd edition. Academic Press, USA.
8. P.T.K. Woo. 1995. Fish diseases and disorders. Vol. I. Protozoan and metazoan infections. CAB, international.
9. Z. Kabata. 1985. Parasites and diseases of fish cultured in the tropics. Taylor and francis, London.

Course Code: MIPA 359 **Course Title: Protozoology (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: II**
Rationale: This course is designed to provide basic concept of protozoa.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about fundamental concepts of protozoa ✓ enrich knowledge on morphology and biology of different protozoa ✓ gather knowledge about transmission and diseases caused protozoa ✓ develop knowledge about veterinary importance of protozoa ✓ formulate prevention and control measures for protozoa			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define protozoa and protozoology ✓ differentiate between protozoa and protophyta ✓ explain different types of locomotion of protozoa	**Introduction:** Definition of protozoa and protozoology; importance of protozoology; locomotion of protozoa	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define nutrition and reproduction of protozoa ✓ differentiate holozoic, holophytic and saprozoic protozoa ✓ explain the modes of sexual and asexusal reproduction ✓ differentiate between conjugation and syngamy	Nutrition (holozoic, holophytic & saprozoic) & reproduction (sexual & asexual) of protozoa	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ draw and label a typical protozoa ✓ differentiate between vesicular type and compact type nucleus ✓ classify different types of protozoa based on morphology ✓ enlist different enteric and blood protozoa	General morphology of protozoa, taxonomy and classification of protozoa	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the developmental stages of *Trypanosoma* ✓ differentiate between salivaria and stercoraria trypanosomes ✓ illustrate the veterinary public health importance of *Trypanosoma* spp. ✓ elaborate Chagas diseases, Dourine and Surra	**Genus/Genera-** ***Trypanosoma:*** (species under the genus, morphology, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.)	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate the morphology, life cycle of *Leishmania* spp. ✓ describe the visceral and cutaneous leishmaniasis ✓ differentiate between amastigote form and promastigote form ✓ create short note on new world and old world leishmaniasis ✓ formulate the control strategies against *Leishmaniasis* ✓ explain the PKADL	***Leishmania:*** Species under the genus, morphology, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate the morphological features of *Balantidium* sp. ✓ differentiate between trophozoite and cyst ✓ diagram the Life cycle of *Balantidium* sp. ✓ determine the detrimental effects of	***Balantidium:*** Species under the genus, morphology, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Balantidium sp.			
✓ diagram the life cycle of *Giardia* spp. ✓ determine the detrimental effects caused by *Giardia* spp. ✓ illustrate the zoonotic importance of *Giardia* spp. ✓ recommend the control measure against *Giardia* spp.	***Giardia:*** Species under the genus, morphology, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ differentiate between trophozoite and cyst of *Entamoebia histolytica*. ✓ diagram the life cycle of *Entamoebia* sp. ✓ determine the pathology of *Entamoebia* sp. ✓ illustrate the veterinary public health importance of *Entamoebia histolytica*	***Entamoebia:*** species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology, ecology and transmission of *Tritrichomonasfoetus* ✓ determine the pathology of *Tritrichomonas foetus* infection ✓ describe the reason of early abortion in cow ✓ recommend the possible management practices of the disease	***Tritrichomonas:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ identify *Babesia* spp. ✓ explain the different types of transmission of *Babesia* spp. ✓ illustrate the "cerebral babesiosis". ✓ explain the reason of haemoglobinuria, haemolytic anemia induced by *Babesia* spp. ✓ suggest the control measures against babesiosis	***Babesia:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ elaborate the identification keys based on morphology of *Theileria*spp. ✓ sketch the Life cycle of *Theileria* spp. ✓ formulate the control strategies against *Theileria* spp.	***Theileria:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ differentiate between *Anaplasma centrale*and*Anaplasma marginale* ✓ diagram the Life cycle of *Anaplasma* spp. ✓ determine the harmful effects caused by *Anaplasma* spp. ✓ plan effective control program for anaplasmosis	***Anaplasma:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ elaborate the morphology and transmission of *Histomonas melegridis* and *Hexamita* sp. ✓ diagram the Life cycle of *Histomonas melegridis* and *Hexamita* spp. ✓ determine the harmful effects of genera *Histomonas* and *Hexamita*. ✓ plan out the control for *Histomonas melegridis* and *Hexamita* spp.	***Histomonas and Hexamita:*** Species under the genera, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ enlist the *Eimeria* species in chicken ✓ sketch the developmental stages in *Eimeria* life cycle ✓ determine the pathology of *Eimeria* spp. in poultry and livestock ✓ create integrated and shuttle program to control coccidiosis	***Eimeria:*** Species under the genera, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology and transmission of *Isospora*spp. ✓ sketch the Life cycle of *Isospora* spp. ✓ differentiate between the oocyst of *Isospora* and *Eimeria*. ✓ plan control program for *Isospora* spp.	***Isospora:*** Species under the genera, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ differentiate between thin walled oocysts and thickwalled oocysts ✓ sketch the life cycle of *Cryptosporidium* spp. ✓ determine the pathology caused by *Cryptosporidium* spp. ✓ design the control program for *Cryptosporidium* spp.	***Cryptosporidium:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define Tachyzoite and Bradyzoite ✓ explain the role of cat in transmission of toxoplasmosis ✓ illustrate the veterinary public health importance of *Toxoplasma gondi*	***Toxoplasma:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate gametogony and schizogony. ✓ sketch the life cycle of *Sarcocystis* sp. ✓ determine the harmful effects of *Sarcocystis* ✓ illustrate the "Dalmeny disease"	***Sarcocystis:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ sketch the Life cycle of *Besnoitia* spp. ✓ illustratethe veterinary public health importance of *Besnoitia* spp. ✓ formulate the control program for *Besnoitia* spp.	***Besnoitia:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology and transmission of *Wenyonella* spp. ✓ diagram the Life cycle of *Wenyonella* spp. ✓ determine the health hazard of *Wenyonella* spp. ✓ illustrate the veterinary public health importance of *Wenyonella* spp.	***Wenyonella:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define bradyzoite and tachyzoite of *Hammondia* ✓ diagram the life cycle of *Hammondia* ✓ determine the health hazard of *Hammondia*	***Hammondia:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define syngamy and schizogony. ✓ sketch the life cycle of *Hepatozoan* spp.	***Hepatozoan:*** Species under the genus, epidemiology,	Lecture Discussion	Quiz Short answer

✓ illustrate the veterinary public health importance of *Hepatozoan* spp. ✓ Plan out the control program for *Hepatozoan* spp.	life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Multimedia presentation Brain storming Feedback	Broad answer Class attendance
✓ enlist the *plasmodium* spp. prevalent Bangladesh. ✓ enlist anthropozoonotic *plasmodium* species. ✓ sketch the life cycle of *Plasmodium* spp. ✓ determine the harmful effects of *Plasmodium* spp. ✓ Plan out the control program for *Hepatozoan Plasmodium* spp.	***Plasmodium:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology, biology and transmission of *Haemoproteus* spp. ✓ diagram the Life cycle of *Haemoproteus* spp. ✓ determine the harmful effects of *Haemoproteus* spp. ✓ formulate the control program of *Haemoproteus*spp.	***Haemoproteus:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ diagram the Life cycle of *Leucocytozoon* spp. ✓ determine the harmful effects of *Leucocytozoon* spp. ✓ formulate the control programs for *Leucocytozoon* spp.	***Leucocytozoon:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology, transmission of *Eperythrozoan* sp. ✓ sketch the Life cycle of *Eperythrozoan* sp. ✓ illustrate the veterinary public health importance of *Eperythrozoan* sp. ✓ plan out the control program of *Eperythrozoan* sp.	***Eperythrozoan:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ sketch the Life cycle of *Haemobartonella* sp. ✓ determine the pathology of *Haemobartonella* sp. ✓ illustrate the veterinary public health importance of *Haemobartonella* sp. ✓ plan out the control of *Haemobartonella* sp.	***Haemobartonella:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the morphology and transmission of *Aegyptionella* spp. ✓ sketch the Life cycle of *Aegyptionella* spp. ✓ determine the pathology of *Aegyptionella* spp. ✓ plan out the control program for *Aegyptionella* spp.	***Aegyptionella:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain the morphology, biology and Transmission of *Ehrlichia* spp. ✓ sketch the Life cycle of *Ehrlichia* spp. ✓ determine the pathology of ✓ illustrate the veterinary public health importance of *Ehrlichia* spp. ✓ plan out the control program of	***Ehrlichia:*** Species under the genus, epidemiology, life cycle, pathology/harmful effects, disease conditions, control/prevention etc.	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Ehrlichia spp.			
✓ achieve the latest research findings and information in the area of Protozoology	**Latest research findings:** Information about latest research innovations in the field of Protozoology	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. B.B. Bhatia and H.L. Shah. 2001. Protozoa and protozoan diseases of domestic livestock. Indian Council of Agricultural Research. India.
2. B.B. Bhatia. 2000. Text book of Veterinary Protozoology. Indian Council of Agricultural Research. India.
3. E.J.L. Soulsby.1982. Helminths, arthropods and protozoa of domesticated animals. 8th edition. Baillere Tindall. London.
4. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings. 1996. Veterinary Parasitology. 2nd edition. Blackwell Science. UK.
5. K.D. Chatterjee. 1976. Parasitology: Protozoology and helminthology in relation to clinical medicine.3rd edition. Chartterjee Medical Publishers. India.

Course Code: MIPA 360 **Course Title: Protozoology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is designed to providepractical concept of protozoa.			
Course Learning Outcomes: The major outcomes of this course are to- ✓ acquire knowledge about fundamental practical concepts of protozoa ✓ enrich knowledge on common laboratory instruments, reagents and solutions ✓ gain knowledge about practical demonstration of Parasitological museum specimens ✓ gather knowledgeaboutdetection of protozoa ✓ develop knowledge about the techniques of permanent slide preparation of protozoa ✓ know about the identification of oocyst and adult protozoa			
Intended Learning Outcomes (ILOs) The students will be able to	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ enlist the common laboratory reagents and solutions ✓ describe the usage of reagents with precaution ✓ categorize reagents for different objectives in preservation and staining	Common laboratory instruments used for parasitological (Protozoa) examinations and their usage	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ classify different types of stains ✓ demonstrate the staining procedure of protozoa ✓ prepare the Giemsa stock solution	Staining and its classification, preparation of Giemsa stain.	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the objectives of Leishman stain ✓ prepare Leishman stain solution	Preparation of Leishman stain	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the objectives of Methylene blue stain ✓ demonstrate the Methylene blue staining procedure	Preparation of Methylene blue stain	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the objectives of various cultural media ✓ enlist the culture media for protozoa ✓ identify selective cultural media used to propagate specific protozoa	Preparation of different culture media of protozoa, preservation and dispatch of protozoan specimens for identification	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ define preservatives ✓ categorize the preservatives ✓ enlist the preservatives used in protozoan sample collection	Preservation and dispatch of protozoan specimens for identification	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ collect blood sample ✓ describe the objectives of thin blood smear ✓ classify the blood smear ✓ demonstrate thin blood smear procedure	Collection of blood and preparation of blood smear (Thin)	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the objectives of thick blood smear ✓ demonstrate the procedure for thick blood smear preparation	Preparation of blood smear (Thick)	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the objectives of wet blood smear ✓ explain thin blood smear procedure ✓ differentiate thin, thick and wet blood smear	Preparation of blood smear (Wet)	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ classify the procedure of fecal sample examination ✓ demonstrate the direct smear method ✓ execute the sedimentation method for protozoan diagnosis	Qualitative fecal examination for identification of G.I protozoa (Direct smear and Sedimentation)	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback
✓ illustrate the objectives of floatation and centrifugation method. ✓ demonstrate the floatation and	Qualitative fecal examination for identification of G.I	Lecture, Interactive discussion, Visual presentation, Field/Lab	Lecture, Interactive discussion, Visual presentation,

centrifugation method	protozoa (Floatation and centrifugation method)	work, Brain storming, Feedback	Field/Lab work, Brain storming, Feedback
✓ explain the objectives of quantitative method ✓ explain the Stoll's ova counting technique and calculate the results ✓ describe the advantages and disadvantages	Quantitative (Stoll's ova counting technique) fecal sample examination for identification of protozoan Oocyst	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ demonstrate the McMaster technique. ✓ calculate the result of McMaster technique ✓ describe the advantages and disadvantages of McMaster technique	McMaster technique for identification of protozoan Oocyst	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the identifying characteristics of oocyst of *Eimeria spp* ✓ describe the identifying characteristics of *Trichomonas spp.*	Laboratory methods and techniques used in the identification of protozoan parasites such as *Trichomonas spp. and Eimeria spp.*	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ differentiate between trophozoite and cyst of *Balantidium* sp., *Giardia* spp, *Entamoeba* spp. ✓ describe the identifying characteristics of oocyst of *Balantidium* sp. ✓ describe the identifying characteristics of *Giardia* spp.	Laboratory methods and techniques used in the identification of protozoan parasites such as *Balantidium* sp., *Giardia* spp, *Entamoeba* spp.	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the identifying characteristics of oocyst of Coccidia. ✓ illustrate the microscopic characteristics of *Leishmania* spp.	Laboratory methods and techniques used in the identification of protozoan parasites such as Coccidiaand *Leishmania* spp.	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ describe the identifying characteristics of *Babesia* spp. ✓ illustrate the microscopic characteristics of *Theileria* spp. ✓ define Coch's Blue bodies	Laboratory methods and techniques used in the identification of protozoan parasites such as *Babesia* spp. and*Theileria* spp.	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ explain the microscopic characteristics of *Anaplasma centrale* and *Anaplasma marginale* ✓ describe the identifying characteristics of *Plasmodium* spp.	Laboratory methods and techniques used in the identification of protozoan parasites such as *Anaplasma* spp. and *Plasmodium* spp.	Lecture, Interactive discussion, Visual presentation, Field/Lab work, Brain storming, Feedback	Quiz, Short answer, Skill test, Practical note book, Oral test, Class attendance
✓ collect faecal & blood samples ✓ process, preserve and ship the samples	Field trip to Hill tract area and poultry farms	Lecture, Discussion, Field visit, Feedback	Report evaluation Oral test Class attendance

Reference Books

1. B.B. Bhatia and H.L. Shah. 2001. Protozoa and protozoan diseases of domestic livestock. Indian Council of Agricultural Research. India.
2. B.B. Bhatia. 2000. Text book of Veterinary Protozoology. Indian Council of Agricultural Research. India.
3. E.J.L. Soulsby.1982. Helminths, arthropods and protozoa of domesticated animals. 8th edition. Baillere Tindall. London.
4. G.M. Urqhart, J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings. 1996. Veterinary Parasitology. 2nd edition. Blackwell Science. UK.
5. K.D. Chatterjee. 1976. Parasitology: Protozoology and helminthology in relation to clinical medicine.3rd edition. Chartterjee Medical Publishers. India.
6. P.D. Juyal, N.K. Singh and H. Singh. 2013. Diagnostic Veterinary Parasitology: An Introduction. New India Publishing Agency. India.

Department of Pharmacology & Toxicology (PTOX)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	PTOX 263: General Pharmacology (Theory)	2	2	II
2.	PTOX 264: General Pharmacology (Practical)	1	2	II
3.	PTOX 325: Systemic & Aquatic Pharmacology (Theory)	2	3	I
4.	PTOX 326: Systemic & Aquatic Pharmacology (Practical)	1	3	I
5.	PTOX 361: Toxicology (Theory)	2	3	II
6.	PTOX 362: Toxicology (Practical)	1	3	II
7.	PTOX 420: Pharmacy & Therapeutics (Practical)	2	4	I
Total (Theory + Practical) 6+5= 11				

Total Credit Hour	
Theory	6
Practical	5
Total	**11**

Course Code: PTOX 263 **Course Title: General Pharmacology (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide knowledge of different type of drugs, pharmacokinetics, pharmacodynamics, dosage form and their pharmacological dose used in veterinary practices.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge of pharmacology such as pharmacokinetics & pharmacodynamics ✓ select different type of drugs and used in veterinary practices ✓ develop student ability to understand knowledge of sources, action, use & Pharmacological doses of drug ✓ evaluate the adverse effect of market available drug and their incompatibility ✓ enrich knowledge on indication, contraindication, residual effect, precaution of drugs & drug resistance			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define and classify pharmacology ✓ explain history and sources of pharmacology ✓ explain terminology related to pharmacology ✓ discuss and explain branches and scope of pharmacology	**Introduction:** Historical background and development of pharmacology, definition, terminology, classification, branches and scope of pharmacology	Lecture Interactive Discussion Power point presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define & classify source of drugs ✓ represent characteristics of drugs ✓ illustrate/ identify the source of drugs ✓ explore the source for new drug development	**Source of drugs:** Definition, sources, classification, characteristics of drugs	Lecture Interactive discussion Power point presentation Feedback Brain storming	Quiz Short answer Essay type answer, Class Attendance
✓ illustrate different processes of pharmacokinetic ✓ explain absorption of drug ✓ justify absorption rate in different form of drugs ✓ Priorities the route of distribution of drugs ✓ list the barrier of drug distribution & explain the drug distribution process ✓ evaluate the factors responsible for drug distribution ✓ describe the biotransformation process of drug ✓ enlist the enzyme responsible for biotransformation ✓ show the route for excretion of drugs	**Pharmacokinetics:** absorption, distribution, biotransformation, excretion of drugs	Lecture Interactive discussion, Power point presentation Feedback Brain storming	Quiz Short answer Essay type answer, Class Attendance
✓ define and classify receptor ✓ choose of receptor for drug action ✓ identify the receptor for each group of drugs ✓ select /determine drug receptor theory & explain drug activities	**Receptor:** Classification, drug-receptor theory, principle of drug activity	Lecture Interactive discussion Power point presentation Feedback Brain storming	Quiz Short answer Essay type answer, Class Attendance
✓ assess the adverse effects of drug ✓ justify the factors altering drug response ✓ choose the drug for minimum adverse effect ✓ select the pregnancy safe drugs & identify the drug with their selective adverse effect ✓ define & classify incompatibility ✓ evaluate the incompatibility of each drugs ✓ design a schedule to reduce drug incompatibility	**Pharmacodynamics & others**: adverse effects of drugs, factor altering drug response, drug incompatibility, multiple drug therapy	Lecture Interactive discussion Power point presentation Feedback Brain storming	Quiz Short answer Essay type answer, Class Attendance
✓ list& classify drug administration method ✓ assess the drug administration for different disease ✓ compare drug administration methods ✓ describe advantage and disadvantage of drug administration methods ✓ justify the route of drug administration related to patients/disease condition	**Drug administration**: dosage forms and methods of drug administration, advantage & disadvantage of different form of drugs,	Lecture Interactive discussion Power point presentation Feedback Brain storming	Quiz, Short answer Essay type answer Class Attendance
✓ define & classify prescription ✓ explain the all parts of prescription ✓ write a prescription using all steps of prescription ✓ define & classify metrology	**Prescription:** Prescription writing and metrology, definition, classification, steps of prescription	Lecture Interactive discussion Power point	Quiz Short answer Essay type answer

✓ enlist different weight measurement charts ✓ estimate dose according to their body weight ✓ use of different weight measurement unit ✓ calculate weight of drug & describe the drug activity	writing	presentation Feedback Brain storming	Class Attendance
✓ define & classify chemotherapy ✓ execute the drug in chemotherapeutic patient & explain their mode of action ✓ compare the adverse effect of each chemotherapeutic drugs ✓ differentiate chemotherapy and radiotherapy ✓ measure the resistance power of each chemotherapeutic drugs ✓ select the chemotherapeutic drug resistance, ✓ explain features and basic terminology related with chemotherapy	**Chemotherapy:** introduction and basic terminology, different chemotherapeutics and their features, mechanisms of action and resistance of chemotherapeutics.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define & explain terminology & classification related to antibiotics ✓ differentiate antibiotics and antimicrobials with justification ✓ explain list of various antibiotics ✓ generate the history, properties, chemistry and classification of antibiotics ✓ discuss the pharmacokinetics properties, dose, action, therapeutic uses, adverse effects, contra-indications and drug withdrawal period ✓ evaluate the principle of antibiotic therapy & assess of sensitivity and resistance of antibiotics ✓ judge the toxic effect of different antibiotics ✓ illustrate the cause of resistance of antibiotic ✓ assess the safe antibiotics for pregnant animal & recommend the antibiotic for specific diseases	**Antibiotic-**definition, classification, ideal features of antibiotics, sensitivity and resistance of antibiotics	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ explain chemistry, history of different antibiotics ✓ describe pharmacokinetics and pharmacodynamics ✓ classify different antibiotics ✓ list different market available antibiotics ✓ calculate the dose rate and dosage of different antibiotics ✓ mention/indicate the use of antibiotics ✓ identify first & second choice of antibiotics for specific antigens ✓ evaluate toxicity & precautions different antibiotics ✓ mention the dose of market available antibiotics ✓ Illustrate the indication and contraindication of different antibiotics	**Penicillin, B-lactams, Cephalosporin, Tetracycline, Chloramphenicol, Aminoglycosides, Macrolides, Fluroquinalones:** Mode of action, pharmacokinetics and pharmacodynamics, dose, indications and contraindications, precautions, residues in food animals, bacterial resistance, toxicity of antibiotics-penicillin, B-lactams, cephalosporin, tetracycline, chloramphenicol, aminoglycosides, macrolides, fluroquinalones	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ sort out properties, chemistry, classification, available commercial preparation, pharmacokinetic and pharmacodynamics of miscellaneous and polypeptide antibiotics	**Miscellaneous and Polypeptide antibiotics-** sources, dose, mode of action, indication, contraindication, resistance, toxicity	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ focus on properties, pharmacokinetics, mode of action, therapeutic uses, doses and duration, adverse effects and contra-indications of steroidal anti-inflammatory drugs	**Steroidal Anti-inflammatory Drugs:** Steroidal anti-inflammatory drugs, properties, pharmacokinetics, mode of	Lecture Interactive discussion Visual presentation Feedback	Quiz Short answer Essay type answer Class Attendance

	action, therapeutic uses, doses and duration, adverse effects and contra-indications	Brain storming	
✓ explain chemistry, pharmacokinetic properties, mode of action, therapeutic uses, doses with duration, adverse effects and contra-indications of NSAID, analgesics and antipyretics	**Non-Steroidal Anti-inflammatory Drugs, Analgesics and Antipyretic drugs:** Chemistry, pharmacokinetic properties, mode of action, therapeutic uses, doses with duration, adverse effects and contra-indications of NSAID, analgesics and antipyretics	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ focus on the history, properties, chemistry and pharmacokinetic properties of newly discovered antimicrobials ✓ explain the dose, mode of action, therapeutic uses, adverse effects, contra-indications	**Newer Antimicrobials**: History, properties, chemistry and pharmacokinetic properties of newly discovered antimicrobials**,** dose, mode of action, therapeutic uses, adverse effects, contra-indications	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ explain chemistry, illustrate history of Sulphonamide discover ✓ classifysulphonamide& describe pharmacokinetics and pharmacodynamics & withdrawal period ✓ mention with general properties of sulphonamides ✓ list market available different sulphonamide drugs ✓ calculate the dose rate and dosage of different sulphonamide in different animals ✓ mention/indicate the use & precautions of sulphonamide drug ✓ illustrate the indications and contraindications of sulphonamide drug ✓ evaluate the toxicity and incompatibility of sulphonamide drugs	**Sulphonamide:** Mode of action, pharmacokinetics and pharmacodynamics, dose, indications and contraindications, precautions, residues in food animals, bacterial resistance, toxicity of antibiotics-sulphonamide	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ explain chemistry, illustrate history of antifungal drug discover ✓ classify & describe Pharmacokinetics and Pharmacodynamics ✓ list different market available antifungal drugs & calculate the dose and dosage ✓ illustrate the indications and contraindications of antifungal drug ✓ mention precautions and toxicity of the antifungal drugs	**Antifungal Drugs:** Mode of action,pharmacokinetics, pharmacodynamics, dose, indications, contraindications, toxicity of antifungal drugs	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define & classify anthelmintics ✓ identify the characteristics of ideal anthelmintic ✓ enlist different anthelmintic drug & discuss individual anthelmintic with their trade name ✓ isolate anthelmintic drug for different helminthes ✓ calculate the dose rate and dosage of different anthelmintics for different animals ✓ explain indications, contraindications and adverse effects, toxicity & precautions of anthelmintics drugs ✓ detect pharmacokinetics and pharmacodynamics of anthelmintics ✓ isolateantitrematodal, antinematodal, anticestodal drug for different helminthes	**Anthelmintics:** Definition, classification of different anthelmintics, characteristics of an ideal anthelmintics, mode of action,pharmacokinetics, pharmacodynamics, dose, indications, contraindications, toxicity of antinematodal drugs, anti trematodal and anticestodal drugs	Lecture Interactive discussion Visual presentation Feedback Brain storming on	Quiz Short answer Essay type answer Class Attendance
✓ classify & identify the ideal characteristics of antiprotozoal &anticoccidial drugs ✓ explain on the properties, pharmacokinetics, mode of action, therapeutic uses, doses with duration, side effects and contraindication of	**Antiprotozoal & anticoccidial drugs:** Mode of action,pharmacokinetics, pharmacodynamics, dose,	Lecture Interactive discussion Visual presentation	Quiz Short answer Essay type answer Class

antiprotozoal and anticoccidial drugs. ✓ enlist different market available antiprotozoal &anticoccidial drugs & calculate the dose rate and dosage of antiprotozoal drugs for different animals	indications, contraindications, toxicity of antiprotozoal drugs	Feedback Brain storming	Attendance
✓ recognize the antiviral agents, their properties, mode of action, doses and duration, therapeutic applications, side effects and contraindications ✓ calculate the drug rate of different animal for different disease	**Anti-Viral Drugs:** Mode of action, pharmacokinetics, pharmacodynamics, dose, indications, contraindications, toxicity of antiviral drugs	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ classify& identify the ideal characteristics ✓ recognize the ectoparacidal drugs, their properties, mode of action, doses and duration, therapeutic applications, side effects and contraindications ✓ discuss individual ectoparasiticidal drugs with their trade name & calculate the dose and dosage of ectoparasiticidal drugs for different animals	**Ectoparasiticidal drugs:** Mode of action, pharmacokinetics, pharmacodynamics of ectoparasiticides, indications, contraindications, toxicity of ectoparasiticidaldrugs	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define general principles of cancer chemotherapy, cell cycle, chemistry, classification and pharmacokinetic properties ✓ describe mode of action, doses and duration, adverse effects and contra-indications of alkylating agents, antimetabolites ✓ explain mitotic spindle inhibitors, topoisomerase inhibitors or antitumor antibiotics, hormones, enzymes and miscellaneous agents	**Antineoplastic and cytotoxic drugs:** Definition, classification,mechanism of action of antineoplastic drugs, principle of cancer chemotherapy, toxicity of different antineoplastic drugs	Lecture Interactive Discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ identification of different medicinal plants, extraction, their mode of action with active agents, ✓ describe doses and duration, therapeutic uses and adverse effects of herbal drugs ✓ illustrate relationship between herbal drugs and modern drugs ✓ compute role, preparation and standardization of herbal drugs	**Indigenous drugs or herbal drugs:** Different medicinal plants, extraction, their mode of action with active agents, doses and duration, therapeutic uses and adeverse effects, relationship between herbal drugs and modern drugs, preparation and standardization of herbal drugs, role of herbal drugs	Garden visit oral talk and lecture	Quiz Short answer Essay type answer Class Attendance
✓ define & classify immunomodulatory ✓ compare the mode of action of immunomodulatory agents ✓ enlist the immunomodulatory drugs ✓ calculate the dose rate and dose of immunomodulatory drug ✓ describe pharmacokinetic and toxicity of immunomodulatory drugs	**Immunomodulatory**: Definition, classification, mode of action & toxicity of immunomodulatory agents	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz, Short answer Essay type answer Class Attendance
✓ be aware about different antiseptics and disinfectants and their appropriate uses	**Antiseptics and disinfectants:** Different antiseptics and disinfectants and their appropriate uses, preparation	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance Practical experiment

Reference Books

1. A.H. Rock.2007. Veterinary Pharmacology: A Practical Guide for the Veterinary Nurse. ISBN13 9780750688628. Publisher Elsevier Health Sciences.UK.
2. J. Romich.2010. Fundamentals of Pharmacology for Veterinary Technicians.2ndedition, ISBN13 9781435426009 Publisher Cengage Learning, Inc UK.
3. J.E. Riviere, and Mark G. Papich. Veterinary Pharmacology and Therapeutics. 1st edition, ISBN 13: 9780813820613. Iowa State University Press. USA.
4. M.G. Papich.2015. Saunders Handbook of Veterinary Drugs: Small and Large Animal. 4th Revised edition, ISBN13 9780323244855. Publisher Elsevier - Health Sciences Division.USA.
5. N.H. Booth & L.E. McDonald .2009. Jones Veterinary Pharmacology and Therapeutics.3rd edition, Kalayani Publishers, Ludhiana, India.
6. W.H. Hsu.2013. Handbook of Veterinary Pharmacology. 2nd edition. Publisher Iowa State University Press, USA.

Course Code: PTOX 264 **Course Title: General Pharmacology (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide practical knowledge of different laboratory instrument and uses, different type of drugs preparation, familiar to herbal drugs and give the knowledge of prescription writing.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge of laboratory instruments and appliances, their specific uses in pharmacological fields ✓ select appropriate route of drug administration and compare the advantage and disadvantage of different route of drug administration ✓ explain packaging form for solid, semisolid and liquid sample & gain knowledge on measurement of weight of drug to write a complete prescription of different diseases ✓ enrich knowledge to identify medicinal plants and prepare ointment, solution and powder form for different diseases			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching–Learning Strategies**	**Assessment Strategies**
✓ identify and justify the use of various instruments	Identification and usage of various instruments used in Pharmacology	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ evaluate drug dose ✓ recommended the drug form ✓ differentiate the drug dose according to their body weight	Drug dosage forms	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ define & classify drug administration method ✓ assess the drug administration for different disease ✓ describe all route & justify the advantage and disadvantage	Methods of drug administration	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ define & classify weight measurement ✓ enlist different weight measurement chart ✓ estimate the drug dose according to their body weight ✓ use of different weight measurement unit	Weight & measures of drugs	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ define & classify packaging ✓ isolate the packaging material for different form of drugs ✓ evaluate characterstis of packaging ✓ describe ✓ compare advantage and disadvantage of packaging materials ✓ use of packaging materials	Packaging of drugs	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ define & classify prescription ✓ explain all parts of prescription ✓ write a prescription using all parts of prescription	Prescription writing	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration,	Quiz Short answer Essay type answer Class attendance Demonstration performance

✓ apply the knowledge of prescription in different disease of different animals ✓ enlist some common diseases and apply prescription parts to complete a prescription		Hand on practice Group exercise Practical note book preparation	Identification Practical note book Viva voce
✓ represent the formulae & prepare the whitfield's ointment ✓ implement the whitfield's ointment ✓ illustrate the mode of action of whitfield's ointment	Preparation of whitfield's ointment	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& use of sulpherointment ✓ prepare the sulpher ointment ✓ implement the sulpher ointment in specific diseases ✓ illustrate the mode of action of sulpher ointment	Preparation of sulpher ointment	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the normal saline ✓ implement the normal saline& illustrate the mode of action of normal saline	Preparations of normal saline solution	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the of 0.01% Potassium Permanganate solution ✓ implement the solution& illustrate the mode of action of 0.01% Potassium Permanganate solution	Preparations of 0.01% Potassium Permanganate solution	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the solution of mitis & fortis ✓ implement the solution& illustrate the mode of action of mitis & fotis	Preparations of Tincture iodine (mitis), Tincture iodine (fortis)	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the solution ✓ implement the solution& illustrate the mode of action lugols iodine solution	Preparations of lugols iodine solution,	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the dusting powder ✓ implement the dusting powder & illustrate the mode of action of dusting powder	Preparation of dusting Powder	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the boric acid solution ✓ implement boric acid solution in	Preparation of boric acid solution	Lecture Interactive discussion Visual presentation, Feedback	Quiz Short answer Essay type answer

different disease condition& illustrate the mode of action of boric acid solution		Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare the calcium borogluconate solution ✓ implement the solution& illustrate the mode of action of calcium borogluconate solution	Preparation of calcium borogluconate solution	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ represent the formulae& prepare of castor oil solution ✓ Implement the solution& illustrate the mode of action of castor oil solution	Preparation of castor oil	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ learn bangali, english, scientific name of medicinal plants ✓ select main ingradients of medicinal plants ✓ identify practically different medicinal properties ✓ illustrate medicinal properties and uses of plants ✓ implement selective plant ingredients for selective diseases	Identify the medicinal plants with their medicinal properties and uses	Lecture Interactive discussion Visual presentation, Feedback Brainstorming Demonstration, Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration performance Identification Practical note book Viva voce
✓ achieve the latest research findings and information in the area of general pharmacology	Latest research findings- Information about latest research innovations in field of general Pharmacology	Report writing	Report

Reference Books

1. A.G. Gilman, L.S. Goodman and A. Gilman. 2010. The Pharmacological Basis of Therapeutics. 3rd edition. Macmillan Publishing Co. Inc. New York.
2. D.C. Plumb. 2015. Plumb's Veterinary Handbook: Pocket. 8th edition, John & Sons inc, New York, USA.
3. F. Cunningham, J. Elliott and P. Lees. May 21, 2010.Comparative and Veterinary Pharmacology. 1st edition, Springer.
4. G.C. Brander, D.M. Pugh, R.J. Bywater & W.L. Jenkins. 2009.Veterinary Applied Pharmacology and Therapeutics. 4th edition, ELBS with Bailliere Tindall, U.K.

Course Code: PTOX 325 **Course Title: Systemic & Aquatic Pharmacology (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: I**

Rationale: This course is designed to provide knowledge of different type of drugs in different systems, which is used in veterinary practices.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge of systemic pharmacology, drug resistance, indication, contraindication, residual effect, and precaution of drugs of different system of terrestrial & aquatic animal bodies
- ✓ select different type of drugs in different system of body and use in veterinary practices & aquatic production
- ✓ develop student ability to understand knowledge of diseases, name of drug in different system in body, sources, action, use, Pharmacological doses of drug
- ✓ gain knowledge on physiochemical properties of drug, method of drug administration and prescription writing of different disease in different system in body

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define and classify of systemic pharmacology ✓ explain history and scope of systemic pharmacology ✓ illustrate the basic terminology of systemic pharmacology in different system	**Introduction:** Definition, scope and importance of systemic pharmacology, pharmacological basis of different system of the body	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ enlist all terms of drugs used in digestive system diseases ✓ comparison and calculate the dose rate of each group of drugs ✓ justify the use of digestive drug ✓ discuss and explain pharmacokinetics & pharmacodynamics of digestive drugs	**Digestive system**: Pharmacology of the drugs acting on gastrointestinal tract; sialics and antisialics, demulcents, stomachics, emetics and antiemetic's, carminative and antizymotics, astringents antidiarrheal, antacids, cathartic drugs, laxatives, purgatives etc.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ classify the group of drugs used in respiratory system ✓ illustrate/ identify the pharmacokinetic and pharmacodynamics of drugs ✓ select & apply the drug in different respiratory disease ✓ compare & calculate the market available name with generic name, available form with dose rate	**Respiratory system:** Pharmacology of the drugs acting on respiratory system; pharyngeal demulcents, expectorants, mucolytic, antitussive, anticongestants, analeptics, antihistamines and bronchodilators etc.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ represent the disease in urinary system with their specific drug ✓ explain pharmacokinetic and pharmacodynamics of each group of drugs ✓ compare the market available name with generic name, available form with dose rate ✓ identify pregnancy save drug which is used in urinary system disease animals	**Urinary system**: Pharmacology of the drugs acting on urinary system; diuretics and antidiuretics urinary acidifiers and alkalizes, drugs which alter the excretion of organic molecules, urinary antiseptics and sedatives	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ explain pharmacokinetic and pharmacodynamics of different group of cardiovascular drugs ✓ compare and evaluate trade name and generic name with dose rate in different animals used in cardiovascular system ✓ formulate a mixture & select pregnancy safe drug ✓ Differentiate & compare between two	**Cardio-vascular system and fluid therapy**: Pharmacology of the drugs acting on cardio–vascular system; heart tonic, heart stimulants and heart depressant, antianemic agents, hemostatic, coagulants and anticoagulants, heart stimulants and heart depressant, antianemic	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

relevant groups. ✓ assemble different drugs from different groups& justify uses in cardio- vascular diseases	agents, hemostatic, coagulants and anticoagulants, thrombofugi,blood volume expender		
✓ design a chart for different diseases with selected specific drugs for nervous diseases ✓ classify & describe different group of nervous system drugs ✓ compare & evaluate the market available name with generic name ✓ calculate dose rate of most useable drug of nervous system ✓ differentiate sympathetic & parasympathetic nervous system ✓ identify pregnancy safe drugs used in nervous diseases	**Nervous system**: Pharmacology of the drugs acting on nervous system; sympatholytic, and parasympatholytics drugs, ganglionic blocking drugs, stimulants; sympathomimetic and parasympathomimetic drugs	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ classify endocrine gland with secreted component and function of hormone ✓ describe different drugs and calculate dose in different animals ✓ represent the disease & select specific drugs used in reproductive diseases ✓ identify pregnancy safe drug used in endocrine system disease animals	**Endocrine Pharmacology**: Classification of drugs affecting the endocrine system (hormones and related drugs) with their pharmacology effects, interpretation of mechanism of actions of endocrine hormones	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define and classify of autacoids and anti-inflammatory drugs ✓ enlist and describe different groups of drugs used in different diseases ✓ propose anti-inflammatory and anti-histaminic drug in different disease ✓ indiscriminate use of steroid drug in beef fattening purpose ✓ identify pregnancy safe autacoids and anti-inflammatory drugs	**Autacoids and Related Drugs**: plasma kinins, angiotensin, histamine,5-hydroxytryptamine and their antagonists & pharmacology of the NSAIDS and anti-inflammatory drugs	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define & classify ophthalmic and dermatopharmacological drugs ✓ enlist different groups of drugs & describe pharmacokinetic and pharmacodynamics ✓ represent the disease with their specific drugs used in dermatological, ophthalmic, aural system ✓ differentiate & compare amongantibiotics, antifungal, anti-inflammatory and antiseptic drug used in both pharmacology ✓ identify pregnancy safe drug& estimate dose rate for different animals	**Dermatologic, ophthalmic and Aural Pharmacology**: pharmacology of the drugs acting on affecting skin, mucous membranes, ears, and eyes.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define & classify vaccine ✓ differentiate live vaccine and killed vaccine ✓ design vaccination schedule in broiler, layer, large and small animal in commercial farm ✓ assess & judge sensitivity, resistance& toxic effects of vaccine ✓ diagram the market available vaccine in Bangladesh ✓ illustrate the cause of vaccination failure	**Prophylactic pharmacology:** Classification of vaccine, live and killed vaccine, antisera and diagnosticagents, cause of vaccination failure & precautions	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

& precautions of vaccination programs.			
✓ classify general and local anesthetic drugs ✓ enlist general and local anesthetic drugs, trade name, and dose rate in different animals ✓ explain tranquillizer drugs ✓ illustrate & explain tranquilizer, muscle relaxants and pre-mendicant's drugs ✓ diagrams of procedure of anesthesia in different animals ✓ differentiate stage and hazards of anesthesia with remedy	**Anesthesiology**-introduction, characteristics, classification, local anesthetic drug, general anaesthetic drug, general depressant sedative, hypnotics or soporifics, narcotics, analgesics or anodynes, tranquillizers, anaesthetics, anesthetic procedure of different animals, stage of anesthesia, hazard of anesthesia and remedy	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ enlist all vitamins and minerals with their deficiency disease ✓ recommend drug for specific disease ✓ compare different market available vitamin and minerals drugs with generic name & pharmacological dose rate ✓ calculate dose rate and route of drugs according to animal body weight	**Nutritional Pharmacology:** supplementation of nutrients as drugs, deficiency diseases, mode of action, dose, dosage, market available drugs, calculate dose rate.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ design a chart for different diseases with selected specific drugs for aquatic animals ✓ classify & describe different group drugs, chemicals ✓ compare & evaluate the market available name with generic name ✓ calculate dose rate of most useable aquatic drug ✓ identify breeding safe drugs & describe different drug used in pond management	**Aquatic Pharmacology:** antibiotics **(**renamycin, bactitab, chlorsteclin, Cotrim-Vet, orgacycline15%, oxysentin 20% and sulfatrim), chemicals (geotox, zeolite, zeocare, lime, mega zeo, bio aqua, aquanone and zeo prime) for pond preparation and water quality management, disinfactants (bleaching, aquakleen, BKC, EDTA, efinol, formalin) for the treatment of disease, other chemicals (bio-ox, best oxygen, oxygen plus, oxyflow, oxylife, oxymax, oxymore and oxyplus) for increasing oxygen concentration in the pond	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

Reference Books

1. A.G. Gilman, Louis S. Goodman and Alfred Gilman. 2010. The Pharmacological Basis of Therapeutics. 3rd edition. Macmillan Publishing Co. Inc. New York.
2. F. Cunningham, J. Elliott and P. Lees. 2010. Comparative and Veterinary Pharmacology. 1st edition, Springer.
3. G.C. Brander, D.M. Pugh, R.J. Bywater & W.L. Jenkins. 2009. Veterinary Applied Pharmacology and Therapeutics. 4th edition, ELBS with Bailliere Tindall, U.K.
4. Janet Amundson Romich.2015. Fundamental of Pharmacology for Veterinary Technicians. 2nd edition. Cengage India. India.
5. N.H. Booth & L.E. McDonald. 2009. Jones Veterinary Pharmacology and Therapeutics. 3rd edition. Kalayani Publishers, Ludhiana, India.

Course Code: PTOX 326 **Course Title: Systemic & Aquatic Pharmacology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**

Rationale: This course is designed to provide knowledge of mixture preparation, demonstration of different systemic drugs.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ select different type of drugs in different system of body and use in veterinary practices
- ✓ develop student ability to understand knowledge of disease, name of drug in different system, pharmacological doses of drug
- ✓ formulate and prepare mixture for different systemic diseases

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ prepare & demonstrate mixture ✓ explain use of mixture and each of ingredient ✓ estimate dose rate and route and interval of prepared drugs ✓ illustrate the mode of action of prepared drugs	Compounding and dispensing of mixture acting on digestive system; carminative, stomachic, antizymotic, antiemetic, antacid etc.	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ formulate and prepare mixture preparation ✓ estimate dose rate, route and interval of prepared drugs ✓ illustrate the mode of action, uses of prepared drugs	Compounding and dispensing of mixture acting on cardio –vascular system-antianaemic/haematinic etc.	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ formulate and prepare mixture preparation ✓ calculate dose rate, route and interval of prepared drugs ✓ describe the mode of action, uses of prepared drugs	Compounding and dispensing of febrifuge mixture	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ formulate and prepare mixture preparation ✓ estimate dose rate, route and interval of prepared drugs ✓ explain the mode of action, uses of prepared drugs illustrate the mode of action of prepared drugs	Compounding and dispensing of mixture acting on respiratory system; expectorant, etc.	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ prepare mixture with formulate the ingredients ✓ estimate dose rate, route and interval of prepared drugs ✓ evaluate the mode of action, uses of prepared drugs illustrate the mode of action of prepared drugs	Compounding and dispensing of mixture acting on urinary system; diuretics, normal saline, urinary antiseptics, etc.	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce

✓ formulate and prepare solution ✓ estimate dose rate, route and interval of prepared solution ✓ illustrate the mode of action & uses of prepared drug solutions	Compounding and dispensing of mixture acting on skin; Na-salicylate, ointment, liniments$KMnO_4$	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ formulate and prepare ointment preparation ✓ estimate dose rate, route and interval of prepared ointment drugs ✓ explain the mode of action, uses of prepared ointments	Compounding and dispensing of mixture acting on eyes-antibiotic ointment, antifungal cream, anti-inflammatory cream	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ formulate and prepare mixture preparation ✓ estimate dose rate, route and interval of prepared drugs ✓ evaluate the mode of action, uses of prepared drugs	Compounding and dispensing of mixture acting on ear etc.	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ show all market available mixture preparation and drugs of different system ✓ select the appropriate drug in different system of all diseases ✓ calculate dose rate for market available form according to generic drug dose	Interpretation and presentation of mixture drugs available related to different to groups in the market	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ achieve the latest research findings and information in the area of systemic pharmacology	Information about latest research innovations in field of systemic pharmacology	Report writing	Report

Reference Books

1. B.W.K. Massey.2015. Applied pharmacology for veterinary technicians, 5e (PB). 9780323186629. Elsevier Health science division. USA.
2. D.M. Boothe. 2012. Small Animal Clinical Pharmacology and therapeutics, 2e (PB). 9780721605555. Australian veterinary journal. Australia.
3. J.E.M. Stephen, W.P. David and B. church.2008. Small animal Clinical Pharmacology. 2rd Revised edition. Elsevier Health science division. USA.
4. Jim E. Riviere, Mark G. Papich.2009. Veterinary Pharmacology and Therapeutics. 9th Revised edition. Iowa state university press. USA.
5. Michael E. Peterson Patricia A. Talcott .2006. Small animal Clinical Pharmacology. 2nd Revised edition. Elsevier Health science division. USA.

Course Code: PTOX 361 **Course Title: Toxicology (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: II**

Rationale: This course is designed to provide knowledge of different type poison, toxic substances, toxic plants, agrochemicals, metals and nonmetal poisons, poisonous animals, bacterial toxins, mycotoxins, radiation hazards, rodenticide, feed additive.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ differentiate toxin and poisons, metal poison and non- metal poisons, bacterial and fungal poison
- ✓ select specific type of antidotes and use in veterinary toxicological practices
- ✓ develop student ability to understand knowledge of sources, action, use, toxic doses of poison/toxin, lethal dose rate, factors, specific clinical signs, specific post mortem lesion, confirmatory diagnosis, specific antidotes
- ✓ enrich knowledge on Agrochemicals and rodenticides, additives and toxic effect in animals

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define and classify of toxicology ✓ illustrate history and development of toxicology ✓ differentiate& classify toxin and poisons ✓ differentiate toxic substances according to dose rate ✓ evaluate factors alter the action of poisons	**Introductory Toxicology**: Definition and classification of toxicology, terminology related of toxicology; toxin, toxicity, toxicants, hazards and lethal dose 50, etc. source of poisoning, factors altering the action of poisons, classification of toxicants	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ describe pharmacokinetics of drugs ✓ illustrate all process of pharmacokinetics	**Toxicokinetics:** Absorption, distribution, biotransformation and excretion of toxicants	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ recognize correctly the toxicological cases by following the proper techniques ✓ relate the clinical signs with the nature and mechanism of toxicity ✓ analyze the case and take immediate action by following exact treatment of that diagnosed case	**Diagnosis and treatment of poisoning:**correct the toxicological cases, clinical signs, diagnosis, treatment of poisoning	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ classify all poison on the basis of mode of actions ✓ represent general diagnostic procedure of poisons ✓ illustrate general and specific treatment of poisons ✓ justify the knowledge of toxicological analysis and explain ✓ apply the specific antidote for specific poisons	**Poison**: Mechanisms of poison, general diagnosis; collection and sending of materials for toxicological analysis, antidote of poisoning	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ differentiate metal poisoning on the basis of pharmacokinetics and pharmacokinetics ✓ estimate the toxic dose rate according to animal body weight ✓ list the clinical signs of metal poisons & choose the specific postmortem lesion for specific metals for diagnosis ✓ compare metal substance on the basis of differential diagnosis ✓ identify the specific diagnostic test for specific metal substances diagnosis ✓ describe treatment of metal substances ✓ select the specific treatment and calculate dose rate, route, interval of antidote according to animal body weight	**Metal poisoning:** Toxicokinetics, toxicodynamic, diagnosis and antidote of Arsenic, Lead, Mercury, Selenium, Molybdenum, Copper, Iron, Zinc, Thallium poisoning	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

✓ differentiate non-metal poisoning on the basis of mode of action and clinical signs ✓ differentiate source of related non-metal substances which is responsible for poisoning ✓ mention the toxic and lethal dose of non-metal substances ✓ estimate the toxic dose rate & lethal dose according to animal body weight ✓ explain absoption, distribution, biotransformation and excretion process of non- metal substances ✓ justify toxic forms of non-metal poisons responsible for toxicity in animal bodies ✓ choose the selective mode of action which specifically responsible selective non-metal poisons ✓ compare non-metal substance on the basis of clinical sign, differential diagnosis ✓ choose the specific postmortem lesion for specific non-metals for diagnosis ✓ identify the specific diagnostic test for specific non-metal substances diagnosis ✓ describe treatment of non-metal substances ✓ select the specific treatment and calculate dose rate, route and intervals according to animal body weight	**Nonmetal poisoning:** Toxicokinetics, toxicodynamic, diagnosis and antidote of nitrate and nitrate, cyanide, ammonia, urea ammonia compounds, iodine, fluoride,phosphorous, acids and alkalis poisoning	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ enlist different sources of fungi associated with their metabolites and various bacteria that cause toxicity ✓ achieve knowledge regarding altering factors of toxicity, toxicokinetics, mechanism of action, clinical signs, diagnosis and treatment/ management of mycotoxins and bacterial toxin	**Fungal toxins and bacterial:** Toxins, toxicokinetics, toxicodynamic, diagnosis and antidote for poisoning arising from mycotoxins and bacterial toxins	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ make a broad list of poisonous plants associated with their toxic constituents ✓ discuss about toxicokinetics, mechanism of producing toxic effect, clinical signs, diagnosis and treatment poisons etc.	**Plant poisoning:** Phytotoxicology, toxicokinetics, toxicodynamic, diagnosis and antidote of datura, oxalate,oleander, castor bean , abrus, nux vomica, strychnine ,ergot, ipomoea,etc. poisoning arising from cyanogenetic, teratogenic, lathyrism, photosensitizations producing plants etc.	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define venom, apotoxin, other toxins ✓ introduce with wide range of poisonous animals, insects, fish associated with their metabolites that causes toxicity ✓ explain factors of toxicity, toxicokinetics, mechanism of action, clinical signs, diagnosis and treatment/ management of that sorts of toxicity ✓ identify visually of different toxic animals according to importance aspect of veterinary practices in Bangladesh ✓ describe and select specific clinical signs, post mortem lesions after biting of poisonous animals ✓ identify& describe diagnostic test for specific animal poisonings ✓ compare differential diagnosis with toxic plants and other metal, non-metal and animal poisons etc. ✓ justify specific antidotal treatment and symptomatic treatment and management as well as ✓ calculate the dose rate, route, interval of dose according to animal body weights	**Poisonous Animals:** Toxicokinetics, toxicodynamic, diagnosis and antidote for poisoning arising from snakes, honey bees,wasps and ants	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

✓ define pesticides& classify pesticides, insecticide, rodenticide, herbicides, fungicides, fumigants ✓ differentiate organophosphate and organocarbamate ✓ assess toxic dose, clinical signs toxicokinetics, toxicodynamic of different type of insecticides, rodenticides ✓ identify visually of all toxic substances according to importance aspect of veterinary practices in Bangladesh ✓ enlist all important fungicides and fumigants ✓ compare specific and symptomatic clinical signs, post mortem lesions all important pesticide ✓ identify diagnostic test& compare differential diagnosis for specific pesticide poisoning and management as well as ✓ justify specific & symptomatic antidotal treatment & calculate the dose rate, route, interval of dose according to animal body weights in different animals	**Toxicology of Agro chemicals:** Pesticides poisoning,toxicokinetics, toxicodynamic, diagnosis and antidote for poisoning arising from insecticides, herbicides, fungicide, fumigants, rodenticides	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ point out sources and factors affecting toxicity involved with radiation ✓ describe mechanism of action, diagnosis, treatment and management of radiation cases	**Radiation Hazards and Toxicity:** Toxicokinetics, toxicodynamic, diagnosis and antidote for poisoning arising from radiations	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ focus on some therapeutic agents having toxicological effects ✓ criticize diagnosis based on clinical signs and post mortem findings, treatment and management	**Drug Toxicity:** Toxicology of therapeutic agents, their diagnosis, clinical sign, postmortem findings, treatment & management	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance
✓ define and classify feed additives ✓ describe the toxicokinetic properties, factors, mechanism of action, clinical sign, diagnosis and treatment ✓ illustrate different household poisoning create toxicity	**Feed additives toxicity and household poisoning:** Definition, classification, toxicokinetic & toxicodynamic properties, different household products & feed additives, clinical sign diagnosis, treatment of feed additive and household poisoning	Lecture Interactive discussion Visual presentation Feedback Brain storming	Quiz Short answer Essay type answer Class Attendance

Reference Books

1. B.K. Roy. 2009. Veterinary Pharmacology and Toxicology, 2nd edition, India.
2. E. Hodgson. 2010. A Textbook of Modern Toxicology, 4th edition. USA.
3. H.S. Sandhu and R.S.Barar. 2003. Text book of Veterinary Toxicology, 2nd edition. India.
4. H.S. Sandu. 1999. Laboratory Manual on Veterinary Pharmacology and Toxicology, 1st edition. India.
5. J.D. Roder. 2001. The Practical Veterinarian-Veterinary Toxicology, 1st edition. USA.
6. M.J. Derelanko and C. Auletta. 2014. Handbook of Toxicology, 3rd edition. USA.
7. S.C. Gad. 2015. Animal Models in Toxicology. 3rd edition.CRC Press. USA.
8. S.K. Garg. 2013. Veterinary Toxicology, 3rd edn. India.

Course Code: PTOX 362 **Course Title: Toxicology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is designed to provide practical knowledge of different type poison, toxic substances, toxic plants and confirmatory diagnosis of different metal, non-metals, chelating agents (chemical antagonisms) and rodenticide used in veterinary practices in toxicological fields.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ identify and characterize common poisonous important plants available in Bangladesh ✓ illustrate general diagnosis, sample collection procedure, name of collected sample, amount of sample ✓ select specific chemical antagonism, use and diagnostic test of chelating agents in veterinary toxicological practices & demonstrate diagnostic procedure of poisons ✓ develop student ability to understand knowledge to select diagnostic test for metal, nonmetals, toxic components of plants, mycotoxin, agrochemical substances & animal poisons			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching–Learning Strategies**	**Assessment Strategies**
✓ define toxin and poisons ✓ evaluate the history of development of toxicology, poison, toxins ✓ discuss brief overview of all topics of toxicology	Definition of toxin & poison, history of toxicology, brief overview	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ define plant poisoning ✓ identify and characterize common poisonous plants ✓ prepare a chart of common important toxic plants, scientific name, Bengali name, toxic parts, toxic principle and toxic effects ✓ identify poisonous chemical substances in plants	Identification and characterization of common poisonous plants available	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ classify & describe all diagnostic procedure	General diagnostic procedure for different poisoning cases	Lecture Feedback Brainstorming, Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ enlist the sample collected from animal bodies ✓ describe the rules of sealing and transportation of sample ✓ explain preservatives and ice cooling	Collection, preservation and specimens for toxicological analysis	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ discuss principle of diphenyl amine test & list the instruments and chemicals for nitrate tests ✓ explain test procedure ✓ discuss the observation of result in a group ✓ present the justification of result	Diagnosis of nitrite/nitrite poisoning by diphenyl amine test	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book

		exercise Practical note book preparation	Viva voce
✓ explain principle& procedure of reinsch test &list the instruments and chemicals for nitrate tests ✓ discuss the observation of result in a group ✓ present the justification of result	Diagnosis of arsenic and mercury poisoning by reinsch test	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ describe principle of semi-quantitive test arsenic & list the instruments and chemicals for arsenic tests ✓ collect and prepare the arsenic containing sample & explain test procedure ✓ discuss the observation of result in a group ✓ present the justification of result	Semi-quantitative method of arsenic determination by arsenic	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ explain principle of picrate paper test ✓ list the instruments and chemicals for cyanide tests ✓ collect and prepare the cyanide containing sample ✓ explain test procedure& practically done the experiment ✓ discuss the observation of result in a group ✓ present the justification of result	Diagnosis of cyanide poisoning by sodium picrate paper method	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ describe principle of lead test& list the instruments and chemicals for lead tests ✓ collect and prepare the lead containing sample & explain test procedure ✓ discuss the observation of result in a group ✓ present the justification of result	Determination of lead poisoning in supplied sample	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ describe principle of mycotoxin detection test ✓ list the instruments and chemicals for mycotoxin detection tests ✓ collect and prepare the mycotoxins containing sample ✓ explain test procedure &discuss the observation of result in a group ✓ present the justification of result by group presentation	Diagnosis of mycotoxin in supplied sample	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ define chemical antagonism &chelating substances ✓ prepare the solution ✓ discuss the implementation of the solution ✓ illustrate the mode of action of arsenics ✓ explain the procedure of chelating of	Chemical antagonism (Arsenic)	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book

arsenic		exercise Practical note book preparation	Viva voce
✓ define chemical antagonism, chelating substances ✓ prepare the solution ✓ discuss the implementation of the solution ✓ illustrate the mode of action of arsenics ✓ explain the procedure of chelating of arsenic	Chemical antagonism, dimercaprol	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ define physical antagonism of organophosphate ✓ discuss the implementation of the solution of atropine/ 2 PAM/DAM ✓ illustrate the mode of action of organophosphate ✓ explain the procedure of organophosphate	Physiological antagonism (Organophosphate)	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ select the animals & decide artificially introduce poisonings ✓ observe& identify clinical signs ✓ confirm by lab test& select the specific antidote ✓ implement the antidote by calculating the dose according to knowledge of theory ✓ observe & justify of result of experiments ✓ identify the effectiveness of antidote	Experimental poisoning	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ discuss the implementation of the solution of sodium thiosulphate ✓ illustrate the mode of action of sodium thiosulphate ✓ explain the procedure of sodium thiosulphate	Chemical antagonism sodium thiosulphate	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ achieve the latest research findings and information in the area of toxicology	Information about latest research innovations in field of toxicology	Report writing	Report

Reference Books

1. K. Plumlee. 2004. Clinical veterinary Toxicology.1st edition ISBN10.0323054552 ISBN13.9780323054553. Elsevier Health science division. USA.
2. M. Peterson. 2013. Small Animal Toxicology 3e (PB). 9781455707171. Elsevier Health science division. USA.
3. R.C. Gupta. 2018. Veterinary Toxicology: Basic &Clinical Principles, 3e (HB). 9780123859266. Elsevier Health science division. USA.
4. R.H. Poppenga. 2013. Small Animal Toxicology Essentials (PB). 9780813815381. John Wiley and Sons, Inc. USA.
5. R.W. Gfeller, S. Messonnien. Hand book of small Animal Toxicology and poisonings. 2nd4th revised edition. Elsevier Health science division. USA.

Course Code: PTOX 420 **Course Title: Pharmacy and Therapeutics (Practical)**	**Credit Hour: 2**	**Level: 4**	**Semester: I**
Rationale: This course is designed to provide knowledge of different type of veterinary drugs, new drug development, instruments and some quality assurance tests used in pharmaceutical industries.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge of pharmacy and all activities which is used in compounding and dispensing of drugs ✓ select different type of instruments, quality assurance test in pharmaceutical industries & develop student ability to understand knowledge of new drug development ✓ gain knowledge on preparation of different types of tablets, capsule and solution with their difficulties arises during preparation ✓ select and identify the drugs for appropriate diseases after effective group discussion			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching–Learning Strategies**	**Assessment Strategies**
✓ define & classify pharmacy and therapeutics ✓ explain history of drug developments	Introduction on pharmacy & therapeutics	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ recommended the specific instruments for specific uses ✓ present the picture of instruments by multimedia projectors ✓ Prepare report by conducting study tour in pharmaceutical industries	Different types instruments and appliances used in quality assurance of drugs in pharmaceutical industries	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ describe quality assurance test ✓ identify specific instruments for quality test ✓ present the video of test in multimedia projector	Different tests for quality assurance of drug	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ list the stage of new drug development & describe each stage	Stage of new drug development	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ isolate the packaging material for different form of drug ✓ compare advantage and disadvantage of packaging materials ✓ video presentation of	Packaging of drugs	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration	Quiz Short answer Essay type answer Class attendance Demonstration Performance

packaging		Hand on practice Group exercise Practical note book preparation	Practical note book Viva voce
✓ define, classify and characterize tablet ✓ explain the procedure &difficulties of tablet preparation ✓ select the test for quality assurance of tablets ✓ present the video of tablet preparation in multimedia projector	Preparation of tablet	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ define &classify capsule ✓ evaluate the characteristic& environmental hazards of capsule ✓ describe the procedure of capsule preparations ✓ present the video of capsule preparation in multimedia projector	Preparation of capsule	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ enlist the name of sterility and microbial tests ✓ describe the test procedure ✓ present the video of sterility and microbial test procedure in multimedia projector	Sterility and microbial test on pharmaceutical industries	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ represent rule and regulation of pharmacy ✓ propose law for drug regulations	Rules and regulation of pharmacy and drug regulation laws in Bangladesh	Lecture Feedback Brainstorming, Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ represent the process/steps of size deductions ✓ describe size reduction procedure ✓ implement the nanotechnology for size reduction of drugs ✓ present the video of size reduction procedure in multimedia projector	Size reductions by neno-technology	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise Practical note book preparation	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce
✓ identify the drugs ✓ introduce the trade name by visual inspection ✓ implement the drug in specific diseases ✓ illustrate the mode of action ✓ calculate the dose rate of drugs	Identification and group discussion and presentation of different type drugs	Lecture Interactive discussion Visual presentation Feedback Brainstorming Demonstration Hand on practice Group exercise	Quiz Short answer Essay type answer Class attendance Demonstration Performance Practical note book Viva voce

		Practical note book preparation	
✓ achieve the latest research findings and information in the area of pharmacy & therapeutics	**Latest research findings:** Information about latest research innovations in field of Pharmacy	Report writing	Report

Reference Books

1. J.E. Riviere, M. G. Papich. 2018. Veterinary Pharmacology and Therapeutics 10th Edition, (USA) ISBN-13: 978-1118855829 ISBN-10: 1118855825.WILEY Blackwell. USA.
2. M.G. Papich. 2015. Saunders Handbook of veterinary Drugs small and large Animal. 4threvisedEdition. Elsevier Health science division. USA.
3. R.L. Bill. 2016. Clinical Pharmacology and Therapeutics for Veterinary Technicians, 4e. 4th Edition. ISBN-13: 978-0323086790 ISBN-10: 0323086799. Elsevier health division. USA.
4. V.J. Wiebe. Drug Therapy for Infectious Diseases of the Dog and Cat. 1st Edition.ISBN-13: 978-1118557341 ISBN-10: 1118557344. Jul 20, 2015. WILEY Blackwell. USA.
5. W.H. Hsu. 2013. Handbook of Veterinary Pharmacology 1st Edition. (USA)ISBN-13: 978-0813828374 ISBN-10: 0813828376. WILEY Blackwell. USA.

Department of Pathology (PATH)
Course Layout

Sl.No.	Course Code and Title	Credit Hour	Level	Semester
1	PATH 223: General and Nutritional Pathology (Theory)	3	2	I
2	PATH 224: General and Nutritional Pathology-(Practical)	1	2	I
3	PATH 261: Systemic and Aquatic Pathology & Oncology (Theory)	3	2	II
4	PATH 262: Systemic and aquatic pathology & Oncology (Practical)	1	2	II
5	PATH 363: Pathology of Infectious Diseases of Animal & Avian Pathology (Theory)	3	3	II
6	PATH 364: Pathology of Infectious Diseases of Animal & Avian Pathology (Practical)	1	3	II
7	PATH 516: Clinical Pathology & Necropsy (Practical)	2	5	1
Total (Theory + Practical) 9+5 = 14				

Total Credit Hour	
Theory	9
Practical	5
Total	**14**

Course Code: PATH 223 Course Title: General and Nutritional Pathology (Theory)	**Credit Hour: 3**	**Level: 2**	**Semester:1**
Rationale: This course will provide introductory exploration of pathology with emphasis on basic alterations of the tissues, cells or molecules. Nutritional pathology includes gross and microscopic alterations of tissues due to carbohydrate, fat, protein, mineral and vitamin deficiencies, nutritional imbalance and metabolic dysfunction.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about the terminology related with abnormal cell and tissue pathology ✓ enrich knowledge on basic changes of tissues during ante mortem and post-mortem examination ✓ gain knowledge on various types of extracellular and intracellular deposition and photosensitization ✓ develop knowledge on disturbances of growth and circulation ✓ gather knowledge on gross and microscopic studies of metabolic diseases ✓ know about diseases caused by protein, mineral and vitamin deficiencies and nutritional imbalance			
Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
General Pathology			
✓ define pathology ✓ discuss branches and scope of pathology ✓ describe the brief history of pathology ✓ recall glossary related to pathology	**Introduction:** Brief history, branches and scope of Pathology	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance
✓ define terminology ✓ state predisposing and exciting causes of disease ✓ draw portals of infection, local defence mechanisms, resistance to infection and establishment of infection	Different terminologies, predisposing and exciting causes of diseases, portals of infection, local defense mechanisms, resistance to infection and establishment of infection	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance
✓ describe cell injury, cell death, apoptosis, necrosis and their causes ✓ memorize post-mortem changes ✓ explain characteristics of necrotic cells and tissues ✓ differentiation of necrosis and post-mortem autolysis ✓ contrast types of necrosis and outline disposition of necrotic tissue	Cell injury and cell death, biochemical and ultrastructural changes in accidental cell death and apoptosis, somatic death and postmortem changes; disposition of necrotic tissues	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ list causes of gangrene & infarct ✓ classify gangrene & infarct ✓ explain occurrences of gangrene & infarct ✓ report lesions and predict significance of different types of gangrene & infarct	Causes, pathology of gangrene and infarct	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance

✓ define and explain fatty change ✓ enlist different types of degeneration ✓ explain causes, mechanisms & pathology of extra cellular accumulation of lipids, glycogen deposition and glycogen storage diseases, lysosomal storage diseases, extracellular deposition of proteins-amyloid, albumin and fibrin	**Intracellular and extra cellular depositions, degenerations:** Fatty change, pathology of different types of degenerative changes	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance
✓ discuss the types, causes, occurrences, lesions of calcification ✓ predict significance of pathological calcification ✓ express ossification and gout ✓ explain exogenous pigmentation ✓ discuss causes, occurrences, lesions and significance of melanosis; hemosiderosis, jaundice, pneumoconiosis, anthracosis, plumbism, tattooing ✓ describe pathogenesis, types, causes, lesions and significance of photosensitization in domestic animal	**Mineral deposits and pigments:** Pathologic calcifications and ossification, gout, exogenous pigments, endogenous pigments photosensitization	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ enlist different types of disturbances of growth ✓ discuss causes, types, pathology of aplasia, hypoplasia, atrophy, hypertrophy, hyperplasia, metaplasia, anaplasia, dysplasia, neoplasia	**Disturbances of growth:** Aplasia, hypoplasia, atrophy, hypertrophy, hyperplasia, metaplasia, anaplasia, dysplasia, neoplasia	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ define &classify thrombosis, embolism, hyperemia and congestion ✓ explain pathophysiology of thrombosis, postmortem clot, embolism, hyperemia and congestion, fever, ischemia, hemorrhage, edema and shock, failure to clot	**Disturbances of circulation:** Definition, classification, etiology, occurrences, pathogenesis, changes, significances and effects of thrombosis, postmortem clot, embolism, hyperemia and congestion, fever, ischemia, hemorrhage, edema and shock, failure to clot	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance
✓ define and classify inflammation ✓ discuss steps of inflammation, chemical mediators and reactive cells involved in inflammation ✓ draw significances and effects of inflammation ✓ categorize different types of inflammation & inflammatory cells ✓ characterize features of different inflammations ✓ discuss the process of healing	**Inflammation:** Definition, etiology, cardinal signs, classification, occurrences, pathogenesis, changes, significances and effects, vascular and cellular events in inflammation; chemical mediators of inflammations, cells of inflammation; types of inflammation; healing and repair	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance

✓ define immunity, immune reaction, immunopathology ✓ classify immunity, components of natural and acquired immunity ✓ discuss hypersensitivity, autoimmunity and immunodeficiency diseases	**Immunopathology:** Immune effectors mechanism, pathological aspects of hypersensitivity; autoimmunity; immunodeficiency.	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
Nutritional Pathology			
✓ define nutritional pathology ✓ describe deficiency, imbalance or excess of CHO, protein & fat ✓ express pathogenesis and pathology of fat soluble (Vit. A, D, E and K) & water-soluble vitamins (Vit. C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Pyridoxine, Biotin, Choline, Folic acid, Vit. B12) ✓ predict the causes of diseases ✓ illustrate the differential diagnosis of diseases	Deficiency, imbalance or excess of CHO, protein & fat Pathology of fat soluble and water-soluble vitamins	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ describe pathology of deficiency diseases of calcium, phosphorus, iron, copper, zinc, iodine and protein ✓ express pathology of ketosis, milk fever, grass tetany, rickets, osteomalacia and fibrous osteodystrophy ✓ compare the diseases and predict the causes of diseases	Pathology of deficiency diseases of calcium, phosphorus, iron, copper, zinc, iodine and protein; pathology of ketosis, milk fever, grass tetany, rickets, osteomalacia and fibrous osteodystrophy	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance
✓ report pathological classification of extraneous poison. ✓ discuss the pathology of different poisonings commonly occurring in Bangladesh ✓ invent the causes of diseases	Pathological classification of extraneous poison, pathology of arsenics, urea, oleander, copper, carbon tetrachloride, gossypol, vetch, sulfonamides, selenium, bracken fern, nitrate, mycotoxins, organophosphates, organocarbamates, strychnine, lathyrus	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Short answer Broad answer Class attendance

Reference Books

1. A. Ganti, Sastry and P.Pama Rao 2001.Veterynary Pathology. 7th Edition. AsiaPrintograph, Delhi, India.
2. I. Roitt, J. Brostoff and D. Male. 2001. Immunology, Moshby, London.
3. R.C. Curran. 1981. Colour Atlas of Histopathology. 2nd Edition. Harvey Miller Publishers, London, England.
4. T.C Jones, R.D. Hunt and N.W. King. 1997. Veterinary Pathology. 6th Edition Williams and Wilkins, Philadelphia, USA.
5. V. Kumar, R.S. Cotron and S.L. Robins. 1992. Basic Pathology. 5th Edition. W.B. Saunders Co., London.

Course Code: PATH 224 Course Title: General and Nutritional Pathology (Practical)	**Credit Hour: 1**	**Level: 2**	**Semester:1**

Rationale: This course will provide gross and microscopic features with emphasis on basic alterations of the tissue. Nutritional pathology includes gross and microscopic studies of diseases caused by protein, mineral and vitamin deficiencies, nutritional imbalance and metabolic diseases.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge about pathological museum specimens, requirements and uses of equipment and chemicals for a pathology laboratory
- ✓ gather knowledge on gross and microscopic demonstration of on basic alterations of the tissue
- ✓ know about includes gross and microscopic studies of diseases caused by protein, mineral and vitamin deficiencies, nutritional imbalance and metabolic diseases

Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ represent requirements and uses of equipment and chemicals for a pathology laboratory	Demonstration of the pathological museum specimens	Demonstration, Group discussion Practical test Exercise	Identification Demonstration performance Viva-voce. Practical note book Class attendance
✓ discuss different types of dyes and stains, staining procedures ✓ prepare tissue samples for histopathology ✓ discuss different types of dyes and stains, staining procedures	Methods of collection, preservation, fixation, processing and staining of pathological specimens	Demonstration, Group discussion Practical test Exercise	Identification Demonstration performance Viva-voce. Practical note book Class attendance
✓ differentiate features of live and dead cell ✓ differentiate live and dead cells under microscope	Basic alteration of cells and tissues using laboratory specimens	Demonstration, Group discussion Practical test Exercise	Identification Demonstration performance Viva-voce. Practical note book Class attendance
✓ differentiate different types of general pathology topics under light microscope ✓ identify macro and microscopic changes in cell degeneration, necrosis, infarct and gangrene, disturbances of growth, disturbances of blood flow, inflammation etc.	Gross and microscopic demonstration of general pathology topics (cell degeneration, necrosis, infarct and gangrene, disturbances of growth, disturbances of blood flow, inflammation)	Demonstration, Group discussion Practical test Exercise	Identification Demonstration performance Viva-voce. Practical note book Class attendance
✓ differentiate necrosis	Technique of post-	Demonstration	Identification

from post mortem autolysis ✓ operate technique of post-mortem examination ✓ illustrate post-mortem changes	mortem examination, post-mortem changes	Group discussion Practical test Exercise	Demonstration performance Viva-voce. Practical note book Class attendance

Reference Books

1. A. Ganti, Sastry and P.Pama Rao 2001.Veterynary Pathology. 7th Edition. Asiaprintograph, Delhi, India.
2. G. Majno and I. Joris. 1996. Cells, Tissues and Disease. Principles of General Pathology. Blackwell Scientific Publications, London.
3. L.G. Luna. 1967. Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology. McGraw-Hill Book Company, New York.
4. R.C. Curran.1981. Colour Atlas of Histopathology. 2nd Edition. Harvey Miller Publishers, London, England.
5. V. Kumar, R.S. Cotron and S.L Robins. 1992. Basic Pathology. 5th Edition. W.B. Saunders Co., London.

Course Code: PATH 261 Course Title: Systemic and Aquatic Pathology & Oncology (Theory)	**Credit Hour: 3**	**Level:2**	**Semester: II**
Rationale: This course is designed for the details study of pathology of different systems. Oncology provides basic concepts on tumor. Aquatic pathology is designed to discuss the pathology of common diseases of aquatic animals.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about terminology in different systems ✓ enrich knowledge on systemic diseases of livestock ✓ recognize the pertinent aspects of the diseases including etiology, pathogenesis and pathological features which will help in the diagnosis of the diseases ✓ develop knowledge on comprehensive, state-of-the-art expertise and proficiency in oncology ✓ gather knowledge on causes, epidemiology & pathology common diseases of aquatic animals			
Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ enlist developmental anomalies of digestive system ✓ explain pathogenesis and pathology of stomatitis, sialoadenitis, oesophagitis etc. ✓ express tympanitis, ruminal acidosis, traumatic reticulopericarditis/peritonitis, gastritis, gastric ulcers, enteritis, intestinal obstruction, impaction of caecum, colitis, proctitis, peritonitis, ✓ discuss hepatitis, cirrhosis, cholecystitis, cholelithiasis, pancreatitis ✓ investigate the diseases of digestive system ✓ enlist neoplasms of digestive system	**Digestive system**: pathological conditions of buccal cavity, salivary glands, esophagus, stomach, liver, gallbladder etc, neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ memorize pathological conditions of upper respiratory tract, pneumonia, pneumonitis, special types of pneumonia, bronchial asthma, pleuritis, atelectasis, emphysema etc ✓ summarize pathogenesis and pathology of respiratory system ✓ investigate the diseases of digestive system ✓ state neoplasms of respiraory system	**Respiratory system**: pathological conditions of upper respiratory tract, lungs Pathological conditions of the upper respiratory tract, and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ name developmental anomalies and express pathological conditions of cardiovascular systems ✓ describe pathogenesis and pathology of cardiac failure, myocarditis, cardiomyopathy, pericarditis, endocarditis, arteriosclerosis, arteritis, phlebitis ✓ investigate the diseases of respiratory system ✓ recall neoplasms of cardiovascular system	**Cardiovascular systems:** Developmental anomalies; cardiac failure, myocarditis, cardiomyopathy, pericarditis, endocarditis, arteriosclerosis, arteritis, phlebitis, and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ explain pathological conditions of bone marrow, lymph nodes, spleen and thymus ✓ define and classify anemia ✓ sketch different types of anemia ✓ investigate the diseases of hemic and	**Hemic and lymphatic system**: Pathological conditions of bone marrow, lymph nodes, spleen and thymus, anemia; and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise	Quiz Report Short answer Broad answer Class attendance

lymphatic system ✓ enlist neoplasms of hemic and lymphatic system		Report writing	
✓ state muscular dystrophy, muscular hypoplasia and hyperplasia, muscle glycogenosis, ossification of muscle, steatosis, atrophy, hypertrophy, degeneration and necrosis ✓ explain nutritional myopathy (white muscle disease), steatites, myositis, equine rhabdomyolysis, arthritis ✓ illustrate the diseases of hemic and lymphatic system ✓ enlist neoplasms of musculoskeletal system	**Musculoskeletal system**: muscular dystrophy, muscular hypoplasia and hyperplasia, muscle glycogenosis, ossification of muscle, steatosis, atrophy, hypertrophy, degeneration and necrosis, nutritional myopathy (white muscle disease), steatites, myositis, equine rhabdomyolysis, arthritis and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ discuss disorders of epidermis, dermis and subcutis ✓ explain dermatitis & other skin diseases ✓ define & describe autoimmune skin diseases ✓ detect pathology of skin and appendices ✓ state neoplasms of skin and appendices	**Skin and appendices**: disorders of epidermis, dermis and subcutis, dermatitis, autoimmune skin diseases, and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ recall congenital anomalies ✓ define & describe glomerulonephritis, interstitial nephritis, pyelonephritis, nephrosclerosis, cystitis, urolithiasis ✓ differentiate nephritis ✓ scrutinize the pathology of urinary system ✓ name neoplasms of Urinary system	**Urinary system**: Congenital anomalies, glomerulonephritis, interstitial nephritis, pyelonephritis, nephosclerosis, cystitis, urolithiasis, and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ enlist congenital anomalies of female and male reproductive organs ✓ define, classify & explain cystic ovary, oophoritis, salpingitis, metritis, abortifacient infections, vaginitis, vulvitis, mastitis ✓ discuss orchitis, schirrrous cord, gut tie, posthitis ✓ analyze the pathology of male & female genital system ✓ state neoplasms of genital system	**Genital system**: Congenital anomalies of female and male reproductive organs, cystic ovary, oophoritis, salpingitis, metritis, abortifacient infections, vaginitis, vulvitis, mastitis, orchitis, schirrrous cord, gut tie, posthitis; and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ recall pathological conditions of different endocrine glands ✓ explain goiter, hypoparathyroidism, hyperparathyroidism ✓ discuss & contrast diabetes mellitus, diabetes insipidus ✓ list neoplasms of endocrine system	**Endocrine system**: Pathological conditions of different endocrine glands, goiter, hypoparathyroidism, hyperparathyroidism, diabetes mellitus, diabetes insipidus and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
✓ state pathological conditions of brain, spinal cords and peripheral nerves ✓ define & explain encephalitis, myelitis, epilepsy, spongiform encephalopathy ✓ detect pathology of nervous system ✓ enlist neoplasms of nervous system	**Nervous system:** Pathological conditions of brain, spinal cords and peripheral nerves, encephalitis, myelitis, epilepsy, spongiform encephalopathy; and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance

✓ memorize Pathological conditions of eye and ear ✓ define & describe conjunctivitis, blepharitis, keratitis, cataract, gluocoma, Define & explain otitis, otorrhea ✓ identify diseases of eye & ear ✓ name neoplasms of eye & ear	**Organs of special senses**: Pathological conditions of eye and ear; conjunctivitis, blepharitis, keratitis, cataract, gluocoma, otitis, otorrhea;and neoplasms	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
Aquatic pathology			
✓ explain pathology of bacterial diseases, viral, fungal, parasitic and non-infectious diseases of aquatic animals ✓ identify the causal agent of aquatic organisms ✓ draw differential diagnosis of diseases of aquatic animals	Pathology of bacterial diseases, viral, fungal, parasitic and non-infectious diseases of aquatic animals	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance
Oncology			
✓ define of oncology ✓ describe recent development in the field of oncology ✓ enlist development anomalies and malformation ✓ explain nomenclature and classification of neoplasms; ✓ define & differentiate atrophy, hypertrophy, hyperplasia, metaplasia, hypoplasia, aplasia, dysplasia, anaplasia, neoplaisa, ✓ differentiate between benign and malignant neoplasms ✓ express histological features of malignant tumors ✓ identify causes & describe spread, pathogensis ✓ predict diagnosis, effects, tumor immunology	Definition of oncology, recent development in the field of oncology, development anomalies and malformation; nomenclature and classification of neoplasms; atrophy, hypertrophy, hyperplasia, metaplasia, hypoplasia, aplasia, dysplasia, anaplasia, neoplaisa, differences between benign and malignant neoplasms, histological features of malignant tumors, causes, spread, pathogensis, diagnosis, effects, tumor immunology	Lecture Interactive Discussion Audio visual Video clip Exercise Report writing	Quiz Report Short answer Broad answer Class attendance

Reference Books

1. D.P Anderson. 1974. Diseases of fishes, Book IV, Immunology. T.F.H. Publications. 237 pp. ISBN 0-87666-036-7.
2. J.E. Moulto. 1990. Tumors in Domestic Animals. 3rd edition. University of California Press, Berkeley, California, USA.
3. J.H.S. Blaxter and A. Southwar (Eds.) 1991. Advances in marine biology, Vol 26. Academic Press. 311 pp.
4. J.L. Vegad, Madhu Swamy, 2015. Textbook of Veterinary Systemic Pathology. CBS Pub.
5. K. McEntee. 1990. Reproductive Pathology of Domestic Mammals. Academic Press Inc., New York, USA.
6. K.V.F Jubb, P. C. Kennedy and N. Palmer. 1993. Pathology of Domestic Animals. Vol. 1, 2 & 3. 4th edition. Academic Press Inc. New York, USA.
7. N.C. Boustead. 1989. A Guide to diseases of salmon in New Zealand. N.Z. Freshwater Fisheries Report No. 112. MAF Fisheries F/W. 87 pp. ISBN 0-477-08180-0.
8. Ronald J. Roberts**,** 2012.Fish Pathology, 4th Edition ISBN: 978-1-444-33282-7May 2012, Wiley-Blackwell
9. T.C. Jones, R.D. Hunt and N.W. King. 1997. Veterinary Pathology. 6th edition. Williams and Wilkins. Philadelphia, USA.

Course Code: PATH 262 Course Title: Systemic and Aquatic Pathology & Oncology (Practical)	**Credit Hour: 1**	**Level: 2**	**Semester: II**

Rationale: This course is designed for the gross & microscopic study of different systems. Oncology provides gross & microscopic study on tumor. Aquatic pathology is designed to discuss the gross & microscopic features of common diseases of aquatic animals.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ enrich practical knowledge on systemic diseases of livestock
- ✓ recognize the pertinent aspects of the diseases including etiology, pathogenesis and pathological features which will help in the diagnosis of the diseases
- ✓ gather knowledge on macroscopic and microscopic demonstration of pathology of different systems of livestock which help in diagnosis of diseases
- ✓ develop knowledge on tumour of animals

Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify pathological changes in respiratory, cardiovascular, haemopoietic and integumentary, digestive, musculo-skeletal, and nervous systems system ✓ differentiate features of live and diseased part	Gross pathology of diseases or disease conditions respiratory, cardiovascular, haemopoietic and integumentary, digestive, musculo-skeletal, and nervous systems using laboratory specimens	Demonstration Group discussion Exercise	Identification Demonstration performance Viva-voce, Evaluation of Practical note book Class attendance
✓ differentiate live and diseased part under microscope ✓ identify histopathological changes in respiratory, cardiovascular, haemopoietic and integumentary, digestive, musculo-skeletal, and nervous systems	Histopathological slides of diseases or diseases conditions of respiratory, cardiovascular, haemopoietic and integumentary, digestive, musculo-skeletal, and nervous systems	Demonstration Group discussion Exercise	Identification Demonstration performance Viva-voce Evaluation of Practical note book Class attendance
✓ identify pathological changes in tumour of different system ✓ differentiate features of live and tumour	Gross pathology of tumour of different systems	Demonstration Group discussion Exercise	Identification Demonstration performance Viva-voce Evaluation of Practical note book Class attendance
✓ differentiate live and tumor cell under microscope ✓ identify histopathological changes in tumour of different systems	Histopathological slides of tumour of different systems	Demonstration Group discussion Exercise	Identification Demonstration performance Viva-voce Evaluation of Practical note book Class attendance

Reference Books

1. B.G. Anderson and D.L. Mitchum. 1974. Atlas of trout histology: Bulletin No. 13. Wyoming Game and Fish Department. 110 pp. No ISBN. No LC.
2. J. Ronald, Roberts**,** 2012.Fish Pathology, 4th Edition ISBN: 978-1-444-33282-7May 2012, Wiley-Blackwell
3. J.E. Moulton. 1990. Tumors in Domestic Animals. 3rd edition. University of California Press, Berkeley, California, USA.
4. J.H.S. Blaxter and A. Southward (Eds.) 1991. Advances in marine biology, Vol 26. Academic Press. 311 pp. ISBN not known.
5. J.L. Vegad, Madhu Swamy, 2015. Textbook of Veterinary Systemic Pathology. CBS Pub.
6. K. McEntee. 1990. Reproductive Pathology of Domestic Mammals. Academic Press Inc., New York, USA.
7. L.G. Luna. 1967. Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology. McGraw-Hill Book Company, New York.

Course Code: PATH 363 Course Title: Pathology of Infectious Diseases of Animal & Avian Pathology (Theory)	**Credit Hour: 3**	**Level: 3**	**Semester: II**
Rationale: This course would throw light on the characteristic pathological manifestations of the diseases of animal & avian sp. caused by bacterial, viral, parasitic, fungal agent and other causes. It provides clear ideas on pathogenesis, pathological features and diagnosis of diseases.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about background into the clinical and pathophysiologic aspects of infectious diseases of animal and avian diseases ✓ enrich knowledge on pathognomonic lesions and pathogenesis of diseases related to bacterial, viral, parasitic, fungal agent and others causes avian and animal diseases ✓ develop knowledge on pathological features including both macroscopically and microscopically ✓ predict diagnosis of diseases ✓ gain knowledge on differential diagnosis			
Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
Avian Diseases			
✓ explain pathogenesis and pathology of bacterial diseases ✓ predict diagnosis of bacterial diseases ✓ sketch differential diagnosis among bacterial diseases	**Bacterial Diseases:** Salmonellosis, colibaciollosis, pasturellsis, infectious coryza, tuberculosis, clostridial diseases, strptocoocosis, staphylocoocosis. new duck disease (anatipestifer), botulism in duck	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of viral diseases ✓ predict diagnosis of viral diseases ✓ sketch differential diagnosis among viral diseases	**Viral Diseases:** Infectious bursal disease, Newcastle disease, Marek's disease, avian leucosis, fowl pox, infectious bronchitis, infectious laryngotracheitis, avian encephalomyelitis, reovirus infection, hydroperitoneum hepatitis syndrome, avian influenza, chicken infectious anemia, egg drop syndrome, duck plaque, duck viral hepatitis, viral arthritis, immunosuppressive diseases	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of parasitic diseases ✓ predict diagnosis of parasitic diseases ✓ sketch differential diagnosis among parasitic diseases	**Parasitic Diseases:** Ascardiasis and other nematodiasis, tapeworm infection, coccidiosis, histomoniasis, cryptococcosis, leukocytozoonosis, infestation by ectoparasites	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of fungal, mycoplasmal and chlamydial diseases ✓ predict diagnosis of fungal, mycoplasmal and chlamydial diseases ✓ sketch differential diagnosis among fungal, mycoplasmal and chlamydial diseases	**Fungal Diseases:** Aspergillosis, thrush, canadidiasis, mycotoxicosis. **Mycoplasmal and chlamydal Diseases:** Avian mycoplsmosis, avian chlamydiosis	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of deficiency diseases of protein, minerals, vitamin and poisons ✓ predict diagnosis of protein, minerals, vitamin and poisons	**Non-infectious Diseases:** Deficiencies of fat soluble and water soluble vitamins, deficiencies of calcium, phosphorus, copper, zinc,	Lecture Interactive Discussion Video clip Visit	Quiz Short answer Broad answer Report Class

✓ sketch differential diagnosis among protein, minerals, vitamin and poisons	deficiencies of amino acids and protein, calories ad water, common vices, aflatoxicosis and other poisonings	Exercise Report writing	attendance
✓ explain pathogenesis and pathology of diseases of complex or unknown etiology ✓ predict diagnosis of diseases of complex or unknown etiology ✓ sketch differential diagnosis among diseases of complex or unknown etiology	**Diseases of complex or unknown etiology:** Gout, multicausal respiratory disease, hydropericardium hepatitis syndrome, ascites and right ventricular hypertrophy, enteric disease complex	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
Infectious Diseases of Animals			
✓ explain pathogenesis and pathology of bacterial diseases ✓ predict diagnosis of bacterial diseases ✓ sketch differential diagnosis among bacterial diseases	**Bacterial Diseases:** Anthrax, black quarter, pasteurellosis (HS), clostridial infections, strangles, glanders, colibaciolosis, brucellosis, campylobacteriosis, tuberculosis, paratuberculosis, bacillary haemoglobinuria, mastitis, Pink eye, necrobacillosis, actinomycosis, actinobacillosis, shigellosis, listerosis, leptospirosis, dermatophilosis, leprosis	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of viral diseases ✓ predict diagnosis of viral diseases ✓ sketch differential diagnosis among viral diseases	**Viral Diseases:** Rinderpest, hog cholera, peste des petits ruminants, vesicular exanthema, foot and mouth disease, bovine viral diarrohea, mucosal disease complex, contagious ecthyma, ephemeral fever, infectious bovine rhinotracheitis, rabies, pseudorabies, infectious canine hepatitis, canine distemper, pox, papillomatosis, prion disease	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of parasitic diseases ✓ predict diagnosis of parasitic diseases ✓ sketch differential diagnosis among parasitic diseases	**Parasitic Diseas:** Fascioliasis, stomach worm infection, hookworm infection, stephanofiliariasis, ascariasis and other nematodiasis, coccidiosis, amoebiasis, theileriosis, toxoplasmosis, babesiosis, trypanosomiasis, trichomniasis, hydatidosis and other tapeworm infections, mite and tick infestation	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of fungal and mycoplasmal diseases ✓ predict diagnosis of fungal and mycoplasmal diseases ✓ sketch differential diagnosis among fungal and mycoplasmal diseases	**Fungal Diseases:** Rhinosporidiosis, coccidiodomycosis, cryptococcosis, ringworm, degnala, dermtomycosis, aspergellosis, candidiasis, histoplsmosis, blastomycosis **Diseased Caused by Mycoplsma:** Bovine pleuropnemonia, contagious caprine pleuropnemonia, infectious bovine	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance

	keratoconjunctivitis, enzootic pneumonia of calves, bovine mycoplsmoarthritis, swine mycoplasmal arthritis and polyserositis		
✓ explain pathogenesis and pathology of rickettsia diseases ✓ predict diagnosis of rickettsia diseases ✓ sketch differential diagnosis among rickettsial diseases	**Diseass caused by Rickettsia:** Q-fever, salmon disease of dogs and foxes, heartwater of cattle, sheep and goats, anaplasmosis, haemobartonellosis, eperythrozoonosis	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ explain pathogenesis and pathology of chlamydial diseases ✓ predict diagnosis of chlamydial diseases ✓ sketch differential diagnosis among chlamydial diseases	**Diseases caused by Chlamydia:** Psittacosis, Sporadic bovine encephalmomyelitis, Enzootic abortion of ewes, Chalamydial abortion in cattle, Chalamydialpneumoniad in cattle and sheep	Lecture Interactive Discussion Video clip Visit Exercise Report writing	Quiz Short answer Broad answer Report Class attendance
✓ achieve the latest research findings and information in the area of avian and infectious diseases	**Latest research findings:** Information about latest research innovations in field of avian and infectious diseases	Review of journals and articles Report writing	Report

Reference Books

1. B.R. Charlton. 2000. Avian Diseas Manual. 5th edition. American Association of Avian Pathologists, Pennsylvania, USA.
2. B.W. Calnek, H.J. Barnes, C.W. Beard, L.R. McDougald and Y.M. Saif, 1997. Diseases of Poultry. 10th edition. Iowa State University Press, Armes, Iowa, USA.
3. C. Riddell, 1987. Avian Histopathology. The American Association of Avian Pathologists, Pennsylvania, USA.
4. E. Robert, 2015. Pathology of Pet and Aviary Birds 2/e, Wiley-blackwell.
5. H.B.S. Chauhan, and S. Roy 1996. Poultry Diseases. Daignosis and Treatment. New Age Internationa (Pvt) Ltd. Publishers, New Delhi, India.
6. K.V.F. Jubb, P. C. Kennedy and N. Plamer, 1993. Pathology of Domestic Animals. Vol. 1, 2 & 3, 4th edition. Academic Press. Inc. New York. USA.
7. O.M. Radostitis, C. C.Gay, D. C. Blood, and K. W. Hinchcliff, 1998. Veterinary Medicine. A Text Book of Diseases of Cattle, Sheep, Pigs, Goats and Horses. 9th edition. W. B. Saunders Co. Ltd. London. UK.
8. T.C. Jones, R. D.Hunt and N.W. King. 1997. Veterinary Pathology. 6th edition. Williams ad Wilkins, Philadelphia, USA

Course Code: PATH 364 Course Title: Pathology of Infectious Diseases of Animal & Avian Pathology (practical)	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course would throw light on the characteristic pathological manifestations of the diseases of animal & avian sp. caused by bacterial, viral, parasitic, fungal agent and other causes. It provides clear ideas on pathogenesis, pathological features and diagnosis of diseases.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire practical knowledge on pathophysiologic aspects of infectious diseases of animal and avian diseases ✓ develop knowledge on pathological features including both macroscopically and microscopically ✓ predict diagnosis of diseases ✓ gain knowledge on differential diagnosis ✓ achievable to perform post mortem examination of poultry and animal			
Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify pathological changes induced by different diseases in avian species	Gross pathology of different diseases of avian using laboratory specimens	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ demonstrate necropsy procedure and sample collection from avian species ✓ draw differential diagnosis of avian diseases	Post-mortem examination of poultry Gross pathology of different avian diseases	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ identify histopathoogical changes induced by different diseases in avian sp.	Histopathological slides of different diseases of poultry	Demonstration, Group discussion. Video clip Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Practical note book Class attendance
✓ identify causal agent of different diseases in avian sp.	Poultry farm visit	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Class attendance
✓ identify pathological changes induced by different diseases in animal	Gross pathology of different diseases of animal using laboratory specimens	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ demonstrate necropsy procedure and sample collection from animal ✓ draw differential diagnosis	Post-mortem examination of poultry Gross pathology	Demonstration, Group discussion Video clip Exercise	Demonstration performance Post mortem diagnosis Viva-voce

of animal diseases	of different avian diseases	Report writing e	Report Practical note book Class attendance
✓ identify histopathoogical changes induced by different diseases in avian sp.	Histopathological slides of different diseases of livestock and poultry	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Practical note book Class attendance
✓ identify causal agent of different diseases in animal	Animal farm visit	Demonstration, Group discussion Video clip Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Class attendance

Reference Books

1. B.R. Charlton. 2000. Avian Diseas Manual. 5th edition. American Association of Avian Pathologists, Pennsylvania, USA.
2. BW Calnek, H.J Barnes, C.W. Beard, L.R. McDougald, and Y.M. Saif, 1997. Diseases of Poultry. 10th edition. Iowa State University Press, Armes, Iowa, USA.
3. C. Riddell, 1987. Avian Histopathology. The American Association of Avian Pathologists, Pennsylvania, USA.
4. E. Robert, 2015. Pathology of Pet and Aviary Birds 2/e, Wiley-blackwell.
5. H.B.S. Chauhan and S. Roy 1996. Poultry Diseases. Daignosis and Treatment. New Age Internationa (Pvt) Ltd. Publishers, New Delhi, India.
6. K.V.F Jubb, P.C. Kennedy and N. Palmer. 1993. Pathology of Domestic Animals. Vol. 1, 2 & 3. 4th edition. Academic Press Inc. New York, USA.
7. O.M. Radostitis, C. C.Gay, D. C. Blood, and K. W. Hinchcliff, 1998. Veterinary Medicine. A Text Book of Diseases of Cattle, Sheep, Pigs, Goats and Horses. 9th edition. W. B. Saunders Co. Ltd. London. UK.
8. T.C. Jones, R.D. Hunt and N.W. King. 1997. Veterinary Pathology. 6th edition. Williams and Wilkins. Philadelphia, USA.

Course Code: PATH 516 Course Title: Clinical Pathology and Necropsy (Practical)	**Credit Hour: 2**	**Level:5**	**Semester: I**

Rationale: This course will provide understanding about pathological changes of patients in clinical phase of infectious and non-infectious diseases of animals and birds, as well as systematic examination of carcass at necropsy. Veterinary clinical pathology covers the disciplines of clinical biochemistry, haematology and cytology.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ perform necropsy examination of animals and birds for diagnosis
- ✓ able to interpret the laboratory results of pathological samples
- ✓ point out important clinico-pathological changes in different diseases
- ✓ perform collect samples for confirmatory diagnosis
- ✓ acquire knowledge on clinical biochemistry, haematology and cytology

Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ explain scope of clinical pathology and necropsy	Scope of clinical pathology and necropsy	Lecture Interactive Discussion Video clip Exercise Report writing	Viva-voce Report Practical note book. Class attendance
✓ make a plane setting up a clinical pathology laboratory	Setting up a clinical pathology laboratory	Lecture Interactive Discussion Visit Exercise Report writing	Demonstration performance Viva-voce Report Practical note book. Class attendance
✓ perform cleaning and maintenance of glassware and instruments used in clinical pathology laboratory	Cleaning and maintenance of glassware and instruments used in clinical pathology laboratory	Lecture Interactive Discussion Visit Exercise Report writing	Demonstration performance Viva-voce Report Practical note book. Class attendance
✓ perform preparation of various buffers, stains and reagents used in laboratory	Preparation of various buffers, stains and reagents used in laboratory	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Viva-voce Practical note book. Class attendance
✓ perform RE of blood ✓ draw interpretation of test results	Haematology: Methods of collection of blood, serum and plasma Routine haematological test with their interpretation (total erythrocyte count, total leukocyte count, hemoglobin estimation, erythrocyte sedimentation rate, packed cell volume test) in animals and birds	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Viva-voce, Report Practical note book. Class attendance

✓ analyze pathological tests for heart, muscles, liver, kidney, pancreas and bone ✓ draw interpretation of test results	Biochemistry: Pathological tests for heart, muscles, liver, kidney, pancreas and bone function with their interpretations	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Viva-voce Report Practical note book. Class attendance
✓ perform pathological tests for urine ✓ evaluate interpretation of test results	Pathological tests for urine and their interpretations	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Viva-voce Report Practical note book. Class attendance
✓ perform pathological tests for fecal samples and skin scrapings ✓ analyze interpretation of test results	Pathological diagnosis of parasitic diseases: Pathological examination of faecal samples and skin scrapings	Lecture Interactive Discussion Visit Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ perform pathological tests for diagnosis of bacterial and fungal infections ✓ analyze interpretation of test results	Pathological laboratory diagnosis of bacterial and fungal infections: Methods of sample collection, culture, common staining and antibiotic sensitivity tests. Techniques of immunodiagnosis (ELISA, agar gel precipitation test, haemagglutination and haemagglutination inhibition tests)	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Practical note book Class attendance
✓ collect and examine of biopsy materials and clinical cytology	Collection and examination of biopsy materials and clinical cytology	Lecture Interactive Discussion Visit Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ write down methods of pathological report	Methods of writing pathological report	Lecture Interactive Discussion Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance
✓ perform necropsy ✓ perform sample collection during necropsy of	Necropsy: post-mortem examination of animals and poultry	Lecture Interactive Discussion Field visit Clinical case Exercise	Demonstration performance Post mortem diagnosis Viva-voce, Report Practical note book Class attendance

different animals		Report writing	
✓ perform methods of recording of necropsy findings ✓ create interpretations of post-mortem findings	Methods of recording of necropsy findings, interpretations of post-mortem findings	Lecture Interactive Discussion Field visit Clinical case Exercise Report writing	Demonstration performance Post mortem diagnosis Viva-voce Report Practical note book Class attendance
✓ make a design for selection, collection, preservation of pathological specimens ✓ perform shipment of pathological specimens to the diagnostic laboratories	Selection, collection, preservation and shipment of pathological specimens to the diagnostic laboratories	Lecture Interactive Discussion Field visit Clinical case Exercise Report writing	Demonstration performance Necropsy Viva-voce Report Practical note book Class attendance
✓ design a plan for disposal of examined carcasses	Methods of disposal of examined carcasses	Lecture Interactive Discussion Field visit Clinical case Exercise Report writing	Demonstration performance Viva-voce Report Practical note book Class attendance

Reference Books

1. A. Ganti, sastry, 2014. Veterinary Clinical Pathology. CBS Pub.
2. D.L. Coffin, 1953. Manual of Veterinary Clinical Pathology. 3rd edition. Comstock Publishing Association, A Division of Cornell University Press, USA.
3. E.H. Coles, 1980. Veterinary Clinical Pathology. 3rd edition. W.B. Saunders Company.
4. Harvey, 2012. Veterinary Hematology: A Diagnostic Guide and Color Atlas
5. M.M. Benjanmin, 1978. Outline of Veterinary Clinical Pathology. 3rd edition. The lowa State University Press, Iowa, USA.
6. Manual of Veterinary Investigation. Laboratory Techniques1984. Vol. 1 and 2. MAFF/ADAS, Reference Book 389 and 390. HMSO, London.
7. Shapiro, 2005. Pathology & Parasitology for Veterinary Technicians with CD (PB)
8. Weiss, 2010. Schalm's Veterinary Hematology,6e (HB)

Department of Poultry Science (POSC)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	POSC 113: Fundamental Poultry Science (Theory)	3	1	I
2.	POSC 114: Fundamental Poultry Science (Practical)	1	1	I
3.	POSC 251: Broiler & Layer Production (Theory)	2	2	II
4.	POSC 252: Broiler & Layer Production (Practical)	1	2	II
5.	POSC 311: Duck & Specialized Fowl Production (Theory)	1	3	I
6.	POSC 312: Duck & Specialized Fowl Production (Practical)	1	3	I
7.	POSC 453: Breeder Farm & Hatchery Management (Theory)	2	4	II
8.	POSC 454: Breeder Farm & Hatchery Management (Practical)	1	4	II
Total (Theory + Practical) 8+4 = 12				

Total Credit Hour	
Theory	08
Practical	04
Total	**12**

Course Code: POSC 113 **Course Title: Fundamental Poultry Science (Theory)**	**Credit Hour: 3**	**Level:1**	**Semester: I**
Rationale: The course is designed to provide fundamental concept of poultry science.			
Course Learning Outcomes: The prime learning outcomes of this course are to- ✓ acquire fundamental knowledge on poultry and poultry breeds ✓ obtain knowledge on poultry welfare, housing and rearing ✓ achieve knowledge on poultry feeds and ration ✓ gain basic information about backyard poultry and poultry products			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define poultry and poultry science ✓ explain different terms commonly used in poultry science ✓ describe the origin & domestication of poultry species and importance of poultry farming ✓ represent the statistics of poultry and poultry industry ✓ differentiate different poultry farms	**Introduction:** Terminology of poultry science; history of origin and domestication of different species of poultry; statistics of poultry and poultry industry; importance of poultry farming; different types of poultry farms	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ state the behavior of poultry at different conditions ✓ list and describe different vices of poultry birds ✓ summarize different rights of poultry ✓ outline different poultry behavior and welfare issues	**Social behavior and poultry welfare:** Social behavior of domestic poultry, growing chicks and feral chicken; vices of poultry; poultry rights and welfare issues	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Essay type answer Class attendance
✓ define poultry class, breed, variety and strain ✓ narrate about indigenous chicken ✓ classify chicken breeds on the basis of origin and purpose ✓ describe chicken breeds with chronological development. ✓ distinguish different classes of chicken	**Poultry breeds:** Definition of poultry class, breed, variety and strain. Indigenous chicken; classification of chicken breeds; description of chicken breeds with their chronological development	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ define housing with its objectives ✓ select site for commercial poultry farm ✓ explain the advantages and disadvantages of poultry housing ✓ categorize different types of poultry houses ✓ narrate the principles of housing	**Poultry housing:** Definition, site selection, objectives, advantages and disadvantages of poultry housing; different types of poultry house; principles of poultry housing	Lecture Discussion Multimedia presentation Photography Feedback	Quiz Short answer Essay type answer Class attendance
✓ classify different rearing system of poultry ✓ discuss the different methods of poultry keeping ✓ illustrate the advantages and disadvantages of different rearing system	**Poultry rearing system:** Methods of poultry rearing/keeping system; advantages and disadvantages of intensive, semi-intensive and scavenging system of poultry rearing	Lecture Discussion Multimedia presentation Photography Brain storming	Quiz Short answer Essay type answer Class attendance

✓ define food, feed and ration ✓ classify poultry feed ingredients and poultry ration ✓ select common feed ingredients used for poultry ✓ evaluate good quality ration ✓ differentiate various feeding systems	**Poultry feeds and ration:** Definition of feed and ration. Poultry feeds of plant and animal origin; different types of poultry ration; selection of feed ingredients for poultry ration; qualities of a good ration. Poultry feeding system	Lecture Discussion Multimedia presentation Poster presentation Feedback	Quiz Short answer Essay type answer Class attendance
✓ state the backyard poultry with future prospect ✓ identify the problems of backyard poultry with remedies ✓ describe breeding, feeding, housing, incubation, brooding and health management of backyard poultry ✓ discuss the role of backyard poultry to satisfy family nutrition ✓ sketch marketing channel of rural poultry and eggs	**Backyard poultry:** Concept of backyard poultry; problems and prospects of backyard poultry in Bangladesh; breeding, feeding, housing, incubation, brooding and disease management of backyard poultry; family nutrition and marketing system of backyard poultry & eggs of rural Bangladesh	Lecture Discussion Multimedia presentation Photography Brain storming	Quiz Short answer Essay type answer Class attendance
✓ define and classify feathers of fowl ✓ describe function and uses of feathers ✓ draw and label the structures of feathers ✓ discuss the different method of moulting	**Feathers of fowl:** Definition, functions and uses of feathers; different types of feathers and structures of feathers; moulting of feathers in poultry	Lecture Discussion Multimedia presentation Photography Feedback	Quiz Short answer Essay type answer Class attendance
✓ define egg and meat ✓ draw and label the structures of an egg ✓ memorize the composition of egg ✓ discuss the formation of an egg ✓ summarize food value of egg & meat ✓ explain the disadvantages of eating raw egg and cooking methods of egg	**Poultry egg and meat:** Definition, structure and composition of egg; egg formation, food value of egg and chicken meat; effect of eating raw and cooked eggs	Lecture Discussion Multimedia presentation Photography Brain storming	Quiz Short answer Essay type answer Class attendance
✓ achieve the latest research findings and information in the area of poultry science	**Latest research findings:** Information about latest research innovations in field of poultry science	Review of journals and articles	Report

Reference Books

1. A.J. Morley. Poultry Husbandry. TATA Mc GRAW-HILL Publishing Co. LTD, New Delhi, India.
2. C.G. Scanes, G. Brant and M. E. Ensminger. 2004. Poultry Science (4th Edition). Pearson Prentice Hall,2004.
3. D. Sapcota, D. Narahari and J.D. Mahanta. 2018. Avian (Poultry) Production. New Indian Publishing Agency. 2nd Revised and Enlarged Edition, New Delhi. India.
4. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
5. G.C. Banerjee. 2011. A Text Book of Animal Husbandry. Oxford & IBH Publishing CO. LTD. New Delhi, India.
6. G.C. Banerjee.1992. Poultry. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi, India.
7. M.C. Neshiem, R.E. Austic and I.E. Card. 1990. Poultry Production. Lea and Febiger, Philadelphia.
8. N. Ghosh. 2015. Poultry Science and Practice: A Text Book. CBS Pub.
9. R.A. Singh. 1990. Poultry Production. Kalyani Publishers, New Delhi, India.
10. R.L. Lakhotia. 2006. Agro's Dictionary of Poultry Science. Rajasthan Agricultural University, Agrobio's India.
11. S.K. Ranjhan. 1993. Animal Nutrition and Practices. Vikash Publisher House Pvt. Ltd., New Delhi, India.

Course Code: POSC 114 **Course Title: Fundamental Poultry Science (Practical)**	**Credit Hour: 1**	**Level:1**	**Semester: I**
Rationale: The course is designed to provide fundamental knowledge in practical poultry science.			
Course Learning Outcomes: The focal learning outcomes of this course are to- ✓ obtain fundamental skill on poultry handling and external body parts of poultry ✓ gain knowledge of different chicken breeds and poultry eggs ✓ achieve knowledge on poultry feeds and marking of poultry ✓ enrich on different poultry house and poultry rearing system			

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning strategies**	**Assessment Strategies**
✓ approach & handle of poultry birds	Holding & handling of poultry birds	Lecture Interactive discussion Demonstration Visual presentation Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ identify & labeling of external body parts of a chicken	External body parts of a chicken	Lecture Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ recognize and identify different types of comb in chicken ✓ memorize the function of comb	Different types of comb in chicken	Lecture Discussion Demonstration Use of multimedia Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ identify different feathers of poultry ✓ differentiate male & female birds by feathers	Poultry feathers	Lecture Discussion Demonstration Visual presentation Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ compare Mediterranean and Asiatic class of chicken breeds	Different class of chicken breeds	Lecture Discussion Demonstration Video clip Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance

✓ identify egg type, dual type, meat type and game type chicken breeds	Breeds of chicken on the basis of purpose	Lecture Discussion Demonstration Multimedia presentation Video clip Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ define marking ✓ recognize marking methods and advantages of marking ✓ operate marking tools on poultry wing and leg	Marking of poultry birds	Lecture Discussion Demonstration Video clip Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ identify eggs of different poultry species by its color, shell and weight	Eggs of different species of poultry	Lecture Discussion Demonstration Video clip Farm/Lab work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ identify and separate different structures of an egg ✓ draw & label the gross structures of an egg	Structures of an egg	Lecture Discussion Demonstration Video clip Group work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ classify poultry feeds ✓ prescribe inclusion level of feed ingredients in poultry ration ✓ identify poultry feed ingredients	Poultry feeds	Lecture Discussion Demonstration Visual presentation Group work Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance
✓ sketch the different types of poultry house on the basis of style ✓ recommend different types of poultry rearing system	Different types of poultry house and poultry rearing systems	Lecture Discussion Demonstration Video clip Feedback	Quiz Short answer Sample identification Skill/performance test Practical note book Viva Voce Class attendance

Reference Books

1. D. Hawksworth. 1982. British Poultry Standard (4th Edition). Butterworth Scientific; London.
2. G.C. Banerjee. 2011. A Text Book of Animal Husbandry. Oxford & IBH Publishing CO. LTD. New Delhi,India.
3. R.A. Singh. 1990. Poultry Production. Kalyani Publishers, New Delhi, India.
4. R.L. Lakhotia. 2006. Agro's Dictionary of Poultry Science. Rajasthan Agricultural University, Agrobio's India.
5. S.K. Das. 2011. Poultry Production. CBS Pub. India.

Course Code: POSC 251 **Course Title: Broiler & Layer Production (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: II**
Rationale: This course is planned to offer the scientific production concept of broiler & layer.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about broiler and layer strain development ✓ obtain knowledge on broiler & layer production ✓ achieve broiler & layer management techniques ✓ attain knowledge on processing and marketing of poultry meat & eggs			
Broiler Production			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define Broiler ✓ sketch and explain the development of broiler strain ✓ describe developmental scenario of broiler industry around the globe to Bangladesh ✓ discuss prospect and constraints of broiler industry in Bangladesh ✓ explain organic broiler farming	**Introduction to Broiler:** Definition, development of broiler strain and its industry, prospect and constraints of broiler industry, concept of organic broiler farming	Lecture Interactive discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ select broiler strain for commercial farming ✓ identify quality day-old chicks ✓ take care of chick during transportation ✓ prepare broiler house before arrival of chicks to the farm	**Broiler strain selection and house preparation:** Selection of broiler strain, chick quality, transportation and arrival of chicks, preparation of broiler house	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Essay type answer Class attendance
✓ define brooding and operate brooding system in poultry house ✓ select and place litter materials in the brooder ✓ measure stocking density, feeder and drinker space of chicks ✓ identify optimum and critical brooding temperature ✓ describe ventilation systems and lighting schedule for broilers	**Brooding of broiler chicks:** Definition, brooding equipment, litter, stocking density, feeder, drinker, temperature, ventilation and light in the broiler flock	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ list the acceptable level of different elements and organism in water. ✓ estimate the total requirement of water for broiler chicks ✓ illustrate nutriment requirements for broilers ✓ select appropriate feeding schedule	**Drinking and feeding of broilers:** Water quality and requirement, drinking system, broiler nutrition, feeding schedule, physical form of feed and phase feeding of broilers	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ define and describe flock uniformity ✓ explain the reasons of separate sex growing ✓ interpret the prediction of live weight ✓ maintain register for record keeping	**Flock measurement:** Flock uniformity, separate sex growing, live weight predictability and record keeping	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Essay type answer Class attendance
✓ define stress ✓ categorize different stress factors of broiler farm	**Stress factors in broiler farm:** Deification and types of stress factors	Lecture, Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ define bio-security ✓ discuss preventive and control measures against diseases ✓ describe different path of disease causing agents ✓ follow broiler vaccination schedule	**Bio-security in broiler farm:** General prevention, vaccination program and control measures	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ discuss catching, transportation and processing steps of live broilers ✓ separate carcass parts of dressed broiler ✓ state packaging and preservation ✓ analyze dressing percentage of broiler and modify carcass parts into value added meat products ✓ sketch out marketing channel of broiler	**Processing and Marketing of broilers:** Catching, transportation, processing, packaging and preservation of broiler meat, further processing of meat and value addition, marketing system	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance

Layer Production			
✓ define layer ✓ select breed/variety/strain for layer farming ✓ show statistical data on layer industry around the globe and Bangladesh ✓ argue the necessity of organic egg production	**Introduction:** Selection of breed or layer strain, statistics layer industry in Bangladesh, concept of organic egg production	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ classify layer house on the basis of purpose and prepare brooder house by cleaning and disinfection ✓ describe brooding practice of chicks	**Brooder house Management:** Classification of layer house, preparation of layer shed before arrival of chicks, brooding of chicks	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ list the different type of layer house equipment ✓ measure floor and cage space for layers ✓ classify and select litter for layers house and plan lighting schedule for layer house ✓ summarize ideal layer house temperature, ventilation and humidity	**Housing principles and its requirement:** Sanitation of house, stocking density, litter, light, temperature, humidity and ventilation	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ compute nutrient and water requirement for layer-starter, layer-grower and layer-layer ✓ recommend appropriate feeding and watering system ✓ explain phase feeding for layers	**Feed and water management:** Layer nutrition, drinking and feeding system, phase feeding of layers	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ determine layer flock uniformity and select desired and culling non-layer from the flock ✓ predict live weight of layer at different stages ✓ keep record of layer farm	**Flock measurement:** Flock uniformity, guidelines for selection & culling of layers, live weight predictability at different age, record keeping	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz/MCQ Short answer Essay type answer Class attendance
✓ define and explain heat stress ✓ describe the effect of heat stress in growth and production	**Heat stress:** Definition and its consequences in growth and egg production	Lecture, Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ describe the factors affecting the quality and quantity of eggs ✓ illustrate eggs collection, take care and handling and storage of eggs ✓ grade and package the eggs ✓ take precautions during egg transportation ✓ keep record of egg production	**Egg Production & Qualities:** Factors affecting egg performances, egg collection, care, handling and storage, egg grading, packaging and transportation, egg production record	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ describe different home and commercial methods of egg preservation ✓ outline commercial egg marketing channel ✓ analyze egg marketing problems ✓ recommend the solutions of egg marketing problem	**Egg Preservation & Marketing:** Home & Commercial methods of egg preservation, commercial egg marketing channel. Egg marketing problem and solutions	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ design a bio-secure layer farm ✓ describe the methods of disposal of poultry litter ✓ discuss the methods of disposal of the dead carcass of poultry birds	**Prevention and control:** General preventive measures of diseases in a layer farm, disposal of poultry litter and dead carcass	Lecture, Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Essay type answer Class attendance
✓ achieve the latest research findings and information in the area of broiler and layer production	**Latest research findings:** Information about latest research innovations in field of broiler and layer production	Review of journals and articles	Report

Reference Books

1. D. Sapcota, D. Narahari and J.D. Mahanta. 2018. Avian (Poultry) Production. New Indian Publishing Agency. 2nd Revised and Enlarged Edition, New Delhi. India.
2. D.C. Johari, and K.Q. Hussain. 2001. Commercial Broiler Production; International Book Distributing Co., Lucknow, India.
3. G.C. Banerjee. 1992. Poultry. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi, India.
4. M.O. North and D.D. Bell. 1990. Commercial Chicken Production Manual; (4th Edition); Chapman and Hall. Dept. B.C., 115 Fifth Avenue, New York, NY-10003, USA.
5. R.A. Singh. 1990. Poultry Production. Kalyani Publishers, New Delhi, India.
6. S. Leeson and J.D. Summers. 2010. Broiler Breeder Production; Nottingham University Press.
7. S.K. Ranjhan. 1993. Animal Nutrition and Practices. Vikash Publisher House Pvt. Ltd., New Delhi, India.

Course Code: POSC 252 **Course Title: Broiler & Layer Production (Practical)**	**Credit Hour: 1**	**Level: 2**	**Semester: II**
Rationale: This course is designed to provide a practical concept of broiler & layer production.			
Course Learning Outcomes: The focal learning outcomes of this course are to- ✓ acquire basic practical knowledge about of broiler and layer strain ✓ obtain knowledge on broiler & layer production ✓ achieve broiler & layer management techniques ✓ attain knowledge on broiler and layer project preparation			

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ list the name of modern broiler and layer strains ✓ identify modern broiler and layer strains	Acquaintance with modern broiler and layer strains	Lecture Interactive discussion Visual presentation Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva Voce Class attendance
✓ describe the function of modern equipment, utensils, machineries ✓ identify farm equipment	Broiler and layer farm equipment	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Practical note book Viva Voce Class attendance
✓ prepare brooder house for chicks by disinfection ✓ describe about temperature, humidity, ventilation light and litter management ✓ discuss about feeding and drinking space & type of feeder & drinkers ✓ detect the stress condition & manage the situation	Brooder house Management	Lecture Discussion Demonstration Visual presentation Farm/Lab work Brain storming	Quiz Short answer Skill test Practical note book Viva Voce Class attendance
✓ formulate broiler and layer ration using software ✓ compare starter, grower & finisher ration of broiler and layer ration ✓ identify mash, crumble and pellet feeds	Broiler and layer ration formulation	Lecture Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva Voce Class attendance
✓ perform processing of broilers ✓ calculate dressing percentage of broiler and carcass parts ✓ identify cut up parts	Determination of dressing percentage and carcass cut-parts of broiler	Lecture Discussion Demonstration Video clip Farm/Lab work Brain storming	Quiz Short answer Identification Practical note book Viva Voce Class attendance
✓ define and know the cause of debeaking ✓ apply debeaking method on layer	Debeaking of chicken	Lecture Discussion Demonstration Visual presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical note book Viva Voce Class attendance

✓ write about external characteristics of layer and non-layer ✓ locate pubic and keel bone ✓ identify laying hen from non-layer	Identification of layer and non-layer hen	Lecture Discussion Demonstration Farm/Lab work Brain storming	Quiz Short answer Identification Skill test Practical note book Viva Voce Class attendance
✓ discuss about external shape, color and internal characters of eggs ✓ identify normal and abnormal eggs	Identification of normal and abnormal eggs	Lecture Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Practical note book Viva Voce Class attendance
✓ list different expenditures of the poultry project ✓ calculate profit or loss of a broiler or layer project	Preparation of broiler and layer project	Lecture Discussion Lab work Feedback	Quiz Practical note book Viva Voce Class attendance
✓ justify modern practices using in the commercial broiler/layer farm ✓ sketch and design of a broiler processing plant	Field trip to a commercial broiler/layer farm and a broiler processing plant	Lecture Discussion Field visit Feedback	Report Viva Voce Class attendance

Reference Books

1. A.J. Morley. Poultry Husbandry. TATA Mc GRAW-HILL Publishing Co. LTD, New Delhi, India.
2. A.R. Sams. 2005. Poultry Meat Processing. CRC Press, Washington D C. USA.
3. C.R. Parkhurst and G.J. Mountney 2004. Poultry Meat and Egg Production. CBS Publishers and Distributers, New Delhi, India.
4. D.D. Bell and J.R.W.D Weaver. 2002. Commercial Chicken Meat and Egg Production. (5th Edition); Kluwer Academic Publishers, Norwell, MA 02061, USA.
5. G.C. Banerjee. 1992. Poultry. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi, India.
6. K.H. Nahm and S.B. Chung. 1995. A Text Book of Chicken Production. Munun Dang Publishing Co., 1-Ka, Chong Ro-Ku, Seoul, 110-521, Korea;1995.
7. M.C. Neshiem, R.E. Austic and I.E. Card. 1990. Poultry Production. Lea and Febiger, Philadelphia.

Course Code: POSC 311 **Course Title: Duck & Specialized Fowl Production (Theory)**	**Credit Hour: 1**	**Level: 3**	**Semester: l**
Rationale: This course is planned to provide knowledge about production of duck and other specialized fowl.			
Course Learning Outcomes: The focal learning outcomes of this course are to- ✓ obtain fundamental knowledge of duck and other specialized breeds of fowl ✓ achieve knowledge about production and management of duck and other water fowl ✓ attain basic information about some alternative poultry species ✓ acquire knowledge about prevention and control of diseases of duck and other specialized fowl			
Duck Production			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ illustrate about origin and domestication of duck ✓ discuss the prospects of duck rearing in Bangladesh ✓ compare advantages of duck rearing over chicken	**Introduction:** Origin and domestication duck; prospects of duck rearing in Bangladesh; advantages of duck rearing over chicken	Lecture Interactive discussion Use of multimedia Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
✓ discuss about indigenous duck ✓ categorize duck breeds ✓ describe different duck breeds ✓ compare breeds on the basis of purpose	**Duck Breeds:** Indigenous duck; classification of duck breeds; characteristics of egg type, meat type and ornamental type duck breeds	Lecture Discussion Video clip Poster presentation Brain storming Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
✓ state brooding system of duck ✓ differentiate rearing system of duck ✓ illustrate about duck housing ✓ estimate feed and water requirement of duck ✓ formulate duck ration ✓ discuss about integrated duck farming ✓ plan to prevent diseases away from the duck farm	**Management of Duck:** Brooding, rearing, housing, feeding and watering of ducks; integrated duck farming; general preventive measures of diseases in a duck farm	Lecture Discussion Use of multimedia Poster presentation Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
Specialized Fowl Production			
✓ memorize origin and domestication of specialized fowl ✓ describe the distribution of specialized fowl around the globe ✓ argue the economic importance of alternative poultry species	**Introduction:** Origin and domestication of specialized fowl; economic important of specialized fowl	Lecture Discussion Visual presentation Brain storming Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
✓ classify different breed and varieties of goose and swan ✓ compare and contrast goose and swan ✓ discuss housing, brooding, rearing, feeding, reproductive behavior of goose and swan ✓ justify goose production in Bangladesh	**Goose and Swan:** Different breed and varieties; characteristics and management of Goose and Swan	Lecture Discussion Use of multimedia Photography Feedback	MCQ/Quiz Short answer Essay type answer Class attendance

✓ write the name of different breed and varieties of pigeon, quail, turkey and guinea fowl ✓ state breed characteristics of pigeon, quail, turkey and guinea fowl ✓ discuss housing, brooding, rearing, feeding, reproductive behavior of pigeon, quail, turkey and guinea fowl ✓ identify problems of pigeon, quail, turkey and guinea fowl production ✓ solve the problem of pigeon, quail, turkey and guinea fowl production	**Pigeon, Quail, Turkey and Guinea fowl:** Different breed and varieties; characteristics and management of Pigeon, Quail, Turkey and Guinea fowl	Lecture Discussion Video clip Photography Brain storming Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
✓ list different breed and varieties of ostrich, peafowl, pheasant and partridge ✓ describe breed characteristics of ostrich, peafowl, pheasant and partridge ✓ compare different types of ostrich ✓ discuss housing, brooding, rearing, feeding, reproductive behavior of ostrich, peafowl, pheasant and partridge ✓ analyze ostrich, peafowl, pheasant and partridge adaptability in Bangladesh	**Ostrich, Peafowl, Pheasant and partridge:** Different breed and varieties; characteristics and management of Pigeon, Quail, Turkey and Guinea fowl	Lecture Discussion Use of multimedia Photography Feedback	MCQ/Quiz Short answer Essay type answer Class attendance
✓ plan to establish a bio-secure fowl farm ✓ take apart to control disease of specialized fowl farm	**Bio-security:** General preventive and control measures of diseases for specialized fowl farm	Lecture Discussion Visual presentation Brain storming Feedback	MCQ/Quiz Short answer Essay type answer Class attendance Assignment
✓ achieve the latest research findings and information in the area of duck and specialized fowl production	**Latest research findings:** Information about latest research innovations in field of duck and specialized fowl production	Review of journals and articles	Report

Reference Books

1. C.R. Parkurst and G.J.Mountney. 1997. Poultry Meat and Egg Production. 1st Indian Ed., CAB.
2. D. H. Sharma. 2013. Guinea Fowl Genetics and Breeding. Satish Serial Pub.
3. D. Sapcota, D. Narahari and J.D. Mahanta. 2018. Avian (Poultry) Production. New Indian Publishing Agency. 2nd Revised and Enlarged Edition, New Delhi. India
4. Duck Farming Manual. Central poultry development organisation. Hessarghatta, Bangalore-560088.
5. I.M. Bidima. Raising Geese. CTA Publishing. Collection: Pro-Agro.
6. J.C. Moreki. Guinea Fowl Production. Department of Animal Production, Private Bag 0032, Gaborone, Botswana.
7. M. Ahmed. 2004. Turkey Production Guide. Central Poultry Development Organization (SR), Hessarghatta, Bangalore-560088. Website: http://www.cpdosrbng.kar.nic.in.
8. M.C. Neshiem, R.E. Austic and I.E. Card. 1990. Poultry Production. Lea and Febiger, Philadelphia.
9. M.M. Shanaway. 1994. Quail Production Systems. A review, Food andAgricultural Organization (FAO) of the United Nations, Rome.
10. P.V. Sreenivasaiah. 2015. Text book of Poultry Science. 1st Edition. Write & Print Publications, New Delhi. Publishers and Distributions, New Delhi-110002.
11. R. Mondry. 2016. Quail Farming in Tropical Regions. CTA Publishing.

Course Code: POSC 312 **Course Title: Duck and Specialized Fowl Production (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: l**

Rationale: This course is planned to provide practical knowledge on duck and other specialized fowl.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ obtain knowledge on external body points of duck and other specialized fowl
- ✓ acquire information of different breeds or varieties of duck and other specialized fowl
- ✓ attain practical knowledge about ration formulation of duck and other alternative poultry species
- ✓ achieve knowledge about dressing percentage of duck and other specialized poultry species
- ✓ gain knowledge about application of vaccination schedule of duck

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ draw and label external points of duck ✓ identify duck and drake by its external points	External body parts of duck	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming, Feedback	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ write down the name of different breeds or varieties of ducks ✓ identify different breeds or varieties of ducks	Identification of different breeds or varieties of ducks	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming, Feedback	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ draw and label external points of goose and swan ✓ identify goose and swan by its external points	Differential external body points between goose and swan	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming, Feedback	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ list the name of different breeds or varieties of pigeons, quail, turkey and guinea fowl ✓ identify different breeds or varieties of pigeons, quail, turkey and guinea fowl	Identification of different breeds and varieties of pigeons, quail, turkey and guinea fowl	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming, Feedback	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ design and prepare of nest or cage for pigeon	Preparation of nest for pigeon	Lecture, Discussion, Use of multimedia Farm/Lab work, Brain storming, Feedback	Quiz, Short answer, Identification, Skill test, Practical Note Book, Viva Voce, Class attendance
✓ write the name feed ingredients for formulating ration of ducks, goose, pigeon, turkey and quail ✓ formulate balance ration for ducks, goose, pigeon, turkey and quail	Formulation of balance ration for ducks, goose, pigeon, turkey and quail	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ apply the formula for calculating dressing percent of fowl ✓ determine the dressing percent of duck, goose, squab and quail	Determination of dressing percent of duck, goose, squab and quail	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming, Feedback	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ write down the name of vaccines for duck ✓ demonstrate vaccine to duck	Vaccination Schedule of duck	Lecture, Discussion Use of multimedia Farm/Lab work Brain storming	Quiz, Short answer Identification, Skill test Practical Note Book Viva Voce, Class attendance
✓ justify modern practices using in the duck or any other specialized fowl farm	Field trip to a duck or any specialized fowl farm	Lecture Discussion Field visit Feedback	Report Viva Voce Class attendance

Reference Books

1. C.R. Parkurst and G.J.Mountney. 1997. Poultry Meat and Egg Production. 1st Indian Ed., CAB Publishers and Distributions, New Delhi-110002.
2. I.M. Bidima. Raising Geese. CTA Publishing. Collection: Pro-Agro. Duck Farming Manual. Central poultry Development organisation. Hessarghatta, Bangalore-560088.
3. J.C. Moreki. Guinea Fowl Production. Department of Animal Production, Private Bag 0032, Gaborone, Botswana.
4. M. Ahmed. 2004. Turkey Production Guide. Central Poultry Development Organization (SR), Hessarghatta, Bangalore-560088.
5. P.V. Sreenivasaiah. 2015. Text book of Poultry Science. 1st Edition. Write & Print Publications, New Delhi.
6. R. Mondry. 2016. Quail Farming in Tropical Regions. CTA Publishing.

Course Code: POSC 453 **Course Title: Breeder Farm & Hatchery Management (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**

Rationale: This course is intended to provide fundamental concept of breeder farm and hatchery management.

Course Learning Outcomes: The main learning outcomes of this course are to-

- ✓ achieve knowledge about breeder flock of poultry
- ✓ acquire basic information about management of grandparent stock (GPS) and parent stock (PS)
- ✓ obtain knowledge on stress management of breeder farm
- ✓ gather knowledge on hatchery management of poultry

Breeder Farm Management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ discuss the importance of breeder flock ✓ define pure line, GPS, PS and hybrid or strain ✓ select male and female chicken for breeding purpose ✓ explain and outline the systematic development of commercial strain ✓ predict population size of breeder farm	**Concept of breeder farm:** Importance of breeder flock, concept of pure line, GPS, PS and strain or hybrids, selection of parent for breeding purpose, development of commercial strain	Lecture Interactive discussion Use of multimedia Feedback	Quiz Short answer Broad answer Class attendance
✓ describe the key points of housing requirements for breeder stock management ✓ predict flock uniformity and apply feeding system to control body weight of breeder flock ✓ plan to increase mating and fertility by spiking method ✓ outline a bio-secure breeder farm ✓ explain ICT based recording system of a breeder farm	**Management of Grand Parent Stock and Parent Stock:** Housing requirements, flock uniformity, body weight control of male and female breeder, beak trimming, spiking system, bio-security and ICT based recording keeping in the breeder farm	Lecture Discussion Video clip Poster presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define stress and stressor ✓ categorize different stress factors of breeder farms ✓ detect major stress factors ✓ recommend advice to solve problems	**Stress management:** Feed stress, water stress, environment stress, stress from diseases and other stressors	Lecture Discussion Use of multimedia Feedback	Quiz Short answer Broad answer Class attendance

Hatchery Management

✓ define and classify hatchery ✓ state the history of chronological development of artificial incubation ✓ discuss the prospects of hatchery business ✓ identify and solve the problems of hatchery business	**Hatchery:** History of chronological development of artificial incubation, types of hatchery, prospects and problems of commercial hatchery business	Lecture Discussion Video clip Poster presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ define and differentiate table and hatching eggs ✓ identify the source of hatching eggs ✓ explain the factors affecting fertility and hatchability of eggs ✓ discuss the collection, care and delivery of hatching eggs ✓ select fertile eggs for incubation	**Hatching eggs:** Table and hatching eggs, source of hatching eggs, factors affecting fertility and hatchability of eggs, collection and care, delivery of hatching eggs, selection of hatching eggs for incubation	Lecture Interactive discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ define incubation and describe the principles of incubation ✓ explain the development of embryo ✓ determine the procedures of transfer of hatching eggs to hatching tray, taking and counting of chicks ✓ select quality chicks and cull disqualified chicks ✓ list the different hatchery-borne diseases and plan to maintain bio-security of hatchery plant	**Hatchery operation:** Principles of incubation, embryonic development of chicks, transfer of eggs to hatching tray, taking and counting of chicks, selection and culling of chicks, bio-security of hatchery and hatchery-borne diseases	Lecture Discussion Video clip Poster presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ achieve the latest research findings and information in the area of breeder farm and hatchery management	**Latest research findings:** Information about latest research innovations in field of breeder farm and hatchery management	Review of journals and articles	Report

Reference Books

1. A.J. Morley. Poultry Husbandry. TATA Mc GRAW-HILL Publishing Co. LTD, New Delhi, India
2. Breeder Management Guide. 2008. Cobb-Vantress.com.
3. D. Sapcota, D. Narahari and J.D. Mahanta. 2018. Avian (Poultry) Production. New Indian Publishing Agency. 2nd Revised and Enlarged Edition, New Delhi. India
4. D.D. Bell and D.W. Weaver. 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt.
5. E.M. Funk and N.R. Irwin. 1955. Hatchery Operation and Management. New York, John Wiley and Sons, Inc.
6. G.C. Banerjee. 1992. Poultry. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi, India.
7. Grandparent Management Guide, Arbor Acres. 2011. www.aviagen.com. London-Chapman and Hall Ltd., Noida.
8. M.C. Neshiem, R.E. Austic and I.E. Card. 1990. Poultry Production. Lea and Febiger, Philadelphia.
9. Management Guide, Parent Stock. 2012. LOHMANN TIERZUCTH.
10. Management Guide. Nick-Chick Parent Stock. 2012. H& N International.
11. R.C. Hartman and G.S. Vicks. 1953. Hatchery Management. New York, Orange Judd, Publication Co., Inc.;1953.
12. R.C. Hartman and G.S. Vicks. Early Embryology of the Chick. 1978. Craw Hall Publication Company Limited and Printed by Mohan Makhiyani at Rekha Printers Pvt., Ltd., New Delhi-110020.

Course Code: POSC 454 **Course Title: Breeder Farm & Hatchery Management (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**
Rationale: This course is designed to provide a practical concept of breeder farm and hatchery management.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire basic practical knowledge about of breeder farm ✓ obtain knowledge about disinfection of hatchery ✓ achieve practical knowledge about incubator, incubation and hatchery operation ✓ gain practical knowledge on hatchery services			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ illustrate behavior and body characteristics of breeder male and female ✓ differentiate breeder cock and hen	Behavior and body characteristics of Breeder cock and hen	Lecture Discussion Use of multimedia Farm/Lab work Brain storming Feedback	Quiz Short answer Identification Skill test Practical Note Book Viva Voce Class attendance
✓ compare standard weight of breeder flock ✓ determine flock uniformity of breeder flock	Flock uniformity of breeder flock	Lecture Discussion Use of multimedia Farm/Lab work Brain storming	Quiz Short answer Skill test Practical Note Book Viva Voce Class attendance
✓ define breeder ration ✓ compute nutrient requirements for breeder ration ✓ formulate balance ration for breeder flock	Breeder ration-Starter, grower, layer and for cock	Lecture Discussion Use of multimedia Farm/Lab work Brain storming Feedback	Quiz Short answer Identification Skill test Practical Note Book Viva Voce Class attendance
✓ identify different parts of incubator ✓ explain the functions of different parts of incubator	Different parts of incubator	Lecture Discussion Use of multimedia Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical Note Book Viva Voce Class attendance
✓ perform cleaning, washing and fumigation of hatchery and incubator	Disinfection of hatchery and incubator	Lecture Farm/Lab work Brain storming Feedback	Quiz Short answer Practical Note Book Viva Voce Class attendance
✓ detect hatching eggs ✓ identify abnormal eggs for reject	Selection of hatching eggs	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical Note Book Viva Voce Class attendance

✓ discuss principles of incubation ✓ operate the incubator ✓ perform candling of hatching eggs	Principles of incubation	Lecture Discussion Video clip Farm/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical Note Book Viva Voce Class attendance
✓ perform sexing, debeaking and culling of day old chicks ✓ apply vaccine to the chicks ✓ explain the grading and packing of day old chicks	Hatchery services	Lecture Discussion Video clip Farm/Lab work Feedback	Quiz Short answer Identification Skill test Practical Note Book Viva Voce Class attendance
✓ discuss the transportation of day old chicks ✓ advise farm owner to take precautions during carrying of day- old chicks	Transportation of day- old chicks	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Skill test Practical Note Book Viva Voce Class attendance
✓ apply knowledge to keep different records in hatchery	Record keeping in hatchery	Lecture Discussion Multimedia presentation Farm/Lab work Feedback	Quiz Short answer Skill test Practical Note Book Viva Voce Class attendance
✓ justify modern practices using in the breeder farm and hatchery	Field trip to a breeder farm and hatchery	Lecture Discussion Field visit Feedback	Report Viva Voce Class attendance

Reference Books

1. A.J. Morley. Poultry Husbandry. TATA Mc GRAW-HILL Publishing Co. LTD, New Delhi, India
2. Breeder Management Guide. 2008. Cobb-Vantress.com.
3. D.D. Bell and D.W. Weaver. 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
4. E.M. Funk and N.R. Irwin. 1955. Hatchery Operation and Management. New York, John Wiley and Sons, Inc. London-Chapman and Hall Ltd.
5. G.C. Banerjee. 1992. Poultry. Oxford & IBH Publishing CO. Pvt. Ltd., New Delhi, India.
6. Grandparent Management Guide, Arbor Acres. 2011. www.aviagen.com.
7. M.C. Neshiem, R.E. Austic and I.E. Card. 1990. Poultry Production. Lea and Febiger, Philadelphia.
8. Management Guide, Parent Stock. 2012. LOHMANN TIERZUCTH.
9. Management Guide. Nick-Chick Parent Stock. 2012. H& N International.
10. R.C. Hartman and G.S. Vicks. 1953. Hatchery Management. New York, Orange Judd, Publication Co., Inc., 1953.
11. R.C. Hartman and G.S. Vicks. Early Embryology of the Chick. 1978. Craw Hall Publication Company Limited and Printed by Mohan Makhiyani at Rekha Printers Pvt., Ltd., New Delhi-110020.

Department of Surgery and Theriogenology (SUTH)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1	SUTH 331: General Surgery (Theory)	2	3	I
2	SUTH 332: General Surgery (Practical)	1	3	I
3	SUTH 367: Anesthesiology (Theory)	1	3	II
4	SUTH 368: Anesthesiology (Practical)	1	3	II
5	SUTH 433: Farm Animal Surgery (Theory)	2	4	I
6	SUTH 434: Farm Animal Surgery (Practical)	1	4	I
7	SUTH 474: Radiology, Clinics Surgery & Theriogenology (Practical)	2	4	II
8	SUTH 523: Pet, Zoo and Aquatic Animal Surgery (Theory)	2	5	I
9	SUTH 524: Pet, Zoo and Aquatic Animal Surgery (Practical)	1	5	I
10	SUTH 427: Gynaecology (Theory)	3	4	I
11	SUTH 428: Gynaecology (Practical)	1	4	I
12	SUTH 465: Obstetrics (Theory)	2	4	II
13	SUTH 466: Obstetrics (Practical)	1	4	II
14	SUTH 527: Andrology and Clinical Reproductive Technology (Theory)	2	5	I
15	SUTH 528: Andrology and Clinical Reproductive Technology (Practical)	1	5	I
Total (Theory + Practical) 14+9 = 23				

Total Credit Hour	
Theory	14
Practical	9
Total	**23**

Course Code: SUTH 331 **Course Title: General Surgery (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: I**
Rationale: This course is planned to offer the general concept of general surgery.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire basic knowledge about general surgical terms ✓ obtain knowledge about different types of surgical affections in different animals ✓ achieve knowledge about different types of surgical techniques ✓ gather knowledge how to manage a surgical case with pre and post-operative care			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define common surgical terms ✓ explain different types of therapy	**Introduction:** Definition of common surgical terms and methods of therapy	Lecture Interactive Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ select the diseases affected animals for surgical operation ✓ identify inflammatory & suppurative condition ✓ know the cause of different types of surgical affections	**Principles of surgery:** Preoperative consideration of animals, inflammation, suppuration and abscess formation, affections of uropygeal gland in bird contusions, fibrosis and sclerosis	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ define wound its classification & characterizations ✓ to know how a wound is heal ✓ provide quality treatment of different types of wound	**Wound**: Wound classification, characterization and treatment of wounds, healing of wounds, complications of wound healing	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ identify the different types of pathological conditions ✓ manage the different hemorrhage, fracture and its complications ✓ achieve knowledge how hemorrhage, homeostasis, edema, emphysema, physical lesions, affections of joints are controlled by various method ✓ manage fractures, complications of fractures	**Pathological disorders:** Ulceration, necrosis, gangrene, sinus, fistula, cysts, tumors, haematoma, lymphangitis, edema, emphysema, physical lesions, affections of joints, fractures and repair of bones, complications of fractures, yoke gall, hemorrhage and homeostasis	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ define and determine burns and scalds, frost bite, shock and its management ✓ explain the paracentasis, asepsis and antisepsis ✓ explain about cryosurgery	Burns and scalds, frost bite, shock and its management, cryosurgery, paracentasis, asepsis and antisepsis	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

✓ explain different types of surgical affections of tissues, their cause, types, pathogenesis, prognosis and treatments	**Surgical affections of tissues:** Etiology, classification, symptoms, diagnosis, prognosis and treatment of skin and subcutaneous connective tissues, arteries, veins, lymphatics, nerves	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ explain different types of surgical affections of legs, their cause, types, pathogenesis, prognosis and treatments	**Surgical affections causing lameness:** Definition, classification, etiology, clinical signs, diagnosis, prognosis and treatment of different affections causing lameness	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ discuss about fluid and blood therapy before and after any surgery	**Surgical aspect of fluid therapy:** Indications, different types of fluid used, administration of fluids, transfusion of blood and blood plasma	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. D.H. Slatter. 1985. Textbook of Small Animal Surgery Vol I & II W B Saunders Company,Philadelphia.
2. J.J. O'Connor. 1980. Dollar's Veterinary Surgery 1st edn CBS Publisher and Distributors, New Delhi.
3. M.Bynaher, Clarke and Waterman. 1985 Veterinary Fluid Therapy Blackwell Scientific Publication, London.
4. O.R. Adams. 1974. Lameness in Horses 3rd edn.
5. R. Paul Greenough. 1972. Lameness in Cattle.

Course Code: SUTH 332 **Course Title: General Surgery (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**

Rationale: This course is designed to provide a practical concept of general veterinary surgery.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire basic practical knowledge about general surgery
- ✓ obtain knowledge about different types of surgical affections in different animals
- ✓ achieve practical knowledge about different types of surgical techniques
- ✓ gather practical knowledge how to manage a surgical case with pre and post-operative care

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ performed different types of operative surgery ✓ identify the various types of surgical site ✓ control the animal during surgery	Proficiency in operative surgery, clinical examination of the patient, surgical anatomy, preparation of patient, restraint of animals	Lecture Interactive Discussion Visual presentation OT visit/Lab work Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance Oral test
✓ describe the function of modern surgical equipment and appliances ✓ identify various suturing materials ✓ acquire knowledge about different types of hemostats	Identification and sterilization of instruments, dressing, bandaging, sutures and suture materials, different types of knots, operative technique, homeostasis	Lecture Discussion Multimedia presentation OT visit/Lab work Lab work Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance Oral test
✓ discuss about practical application of fluid and blood therapy before and after any surgery	Practice of fluid therapy and blood transfusion	Lecture Discussion Demonstration Visual presentation Lab work Brain storming	Quiz Short answer Skill test Practical note book Viva voce Class attendance Oral test
✓ achieve knowledge about use of stomach tube, catheter and different types of emergency drugs	Passing of stomach tube, probe and catheter in domestic animals, nerve blocking, parental injection of drugs	Lecture Discussion Demonstration Visual presentation Lab work Brain storming	Quiz Short answer Skill test Practical note book Viva voce Class attendance Oral test
✓ achieve major and minor surgery ✓ gather knowledge about different types of sera and vaccines ✓ compare starter, grower & finisher ration of broiler and layer ✓ identify mash, crumble and pellet feeds	Sera and vaccines, diagnosis of lameness, common minor operations (abscess, cyst) in domestic animals, paracentesis abdominis in bovine	Lecture Discussion Demonstration Multimedia presentation Lab work/OT visit Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. D.H. Slatter. 1985. Textbook of Small Animal Surgery Vol I & II W B Saunders Company, Philadelphia.
2. J.J. O'Connor. 1980. Dollar's Veterinary Surgery 1st edn CBS Publisher and Distributors, New Delhi.
3. M. Bynaher, Clarke and Waterman. 1985 Veterinary Fluid Therapy Blackwell Scientific Publication, London.
4. O.R. Adams.1974. Lameness in Horses 3rd edn.
5. R. Paul Greenough. 1972. Lameness in Cattle.

Course Code: SUTH 367 **Course Title: Anesthesiology (Theory)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is planned to offer the general concept of Anesthesiology.			
Course learning outcomes: The major learning outcomes of this course are to- ✓ acquire basic knowledge about local & general anesthesia ✓ obtain knowledge about different types of anesthesia ✓ achieve knowledge about different types of anesthetic techniques ✓ gather knowledge how to manage a anesthetic emergency & hazards			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define common terms of anesthetics ✓ explain different types of anaesthesia & their mode of action ✓ describe the stages of anaeasthesia	**Introduction:** Common terms, general consideration for anaesthesia, classification of anaesthesia and anaesthetics, mode of action of anaesthetics, stages of anaeasthesia	Lecture Interactive Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about sedatives & their use, dose in different animals ✓ acquire knowledge about premedicants & their use, dose in different animals	**Principles of sedation and premeditation:** Indication, agents used and their doses in different species	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ define muscle relaxants and their uses ✓ acquire knowledge about various local and regional anaesthesia ✓ describe different types of anaesthetic technique	**Muscle relaxants:** Drugs used and their doses in various species, local and regional analgesia, topical analgesia, paravertebral, field block, epidural, corneal, auriculopalpebral, supra-orbital, mandibular, infra-orbital, planter, perineal, pudic nerve block, intravenous regional analgesia	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about general anaesthetics & their use, dose in different types of animals ✓ discuss about euthanasia ✓ gather knowledge about barbiturate, inhalation anaesthetics ✓ describe how zoo & lab animals anaesthetized and what kind of anaesthetics is used	**General anaesthesia and anaesthetics:** Injectable Agents- chloral hydrate, barbiturates, dissociative agents, steroid and other agents, inhalation agents- chloroform, diethylether, halothane, methoxyflurane, enflurane, isoflurane, isoflaurane, nitrous oxide, and cychlopropane Anaesthsia of zoo and laboratory animals and birds, hazards of anesthesia and their management	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ explain about indications, various methods and agents used in euthanasia	**Euthanasia:** Indications, various methods and agents used	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. J.F. Nunn and B.R. Brown. 1989. General Anesthesia 5th edn, Butterworths, London.
2. L.R. Soma. 1971. Texbook of Veterinary Anesthesia,The Williams &wilkins Company, Balt.
3. L.W. Hall and K.W. Clark. 1991. Veterinary Anaesthesia, 9thedn, Bailliere Tindall, London.
4. L.W. Hall, ELBS and Bailliere Tindall. 1978. Wright's Veterinary Anaesthesia and Analgesia, London.
5. M.D. Vickers, H. Schnieden and F.G. Wood-Smith. 1984. Drugs in Anaesthetic Practice, Butterworths London.
6. R.R. Paddeford. 1988. Manual of Small Animal Anesthesia 1st edn, Churchill Livingston, New York.
7. W.B. Saunders and Sawyer. 1984. The practice of Small Animal Anaesthesia, London.

Course Code: SUTH 368 **Course Title: Anesthesiology (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: II**
Rationale: This course is planned to offer the practical concept of Anesthesiology.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire basic practical knowledge about general anesthesiology ✓ obtain practical knowledge about different types of anesthesia ✓ achieve practical knowledge about different types of anesthetic techniques ✓ gather knowledge how to manage an anesthetic emergency & hazards			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ examine an animal before a surgery ✓ know how animal should be prepare before surgery	Preanaeshetic examination and preparations of the animal	Lecture Interactive Discussion Multimedia presentation Anesthetic machine demonstrations Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ identify different types of anaesthesia & their mode of action	Orientation with different anaesthetics and devices used for administration of anaesthetics	Lecture Interactivediscussion Multimedia presentation Anesthetic machine demonstrations Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ use of sedatives and premedicants & apply dose in different animals	Demonstration of local, regional and general anesthesia in various species	Lecture Discussion Multimedia presentation Anesthetic demonstrations Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ manage animal before and after surgery	Management of anesthetic hazards	Lecture Interactivediscussion Multimedia presentation Anesthetic machine demonstrations Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. J.F. Nunn and B.R. Brown. 1989. General Anesthesia 5th edn, Butterworths, London.
2. L.R. Soma. 1971. Texbook of Veterinary Anesthesia,The Williams &wilkins Company, Balt.
3. L.W. Hall and K.W. Clark. 1991. Veterinary Anaesthesia, 9thedn, Bailliere Tindall, London.
4. L.W. Hall, ELBS and Bailliere Tindall. 1978. Wright's Veterinary Anaesthesia and Analgesia, London.
5. M.D. Vickers, H. Schnieden and F.G. Wood-Smith. 1984. Drugs in Anaesthetic Practice, Butterworths London.
6. R.R. Paddeford. 1988. Manual of Small Animal Anesthesia 1st edn, Churchill Livingston, New York.
7. W.B. Saunders and Sawyer. 1984. The practice of Small Animal Anaesthesia, London.

Course Code: SUTH 433 **Course Title: Farm Animal Surgery (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: I**
Rationale: This course is planned to offer the general concept of Farm Animal & Clinics Surgery.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire basic knowledge about farm animal & their surgical affections ✓ obtain knowledge about different types of farm animal & clinical surgery ✓ achieve knowledge about different types of farm animals & clinical surgery and their management			
Intended Learning Outcomes (ILOS) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify the various types of eye diseases and their surgical affections ✓ performe various surgical operation of eyes ✓ describe & manage of eye operation	**Ophthalmic surgery in farm animals:** Examination of eye, ectropion,entropion, ocular foreign keratitis, keratocele, keratoconjunctivitis, corneal opacity, periodic opthalmia, uveitis, cataract, glaucoma, hydropthalmia, panophthalmia, parasite in the eye, dermoid eyst	Lecture Interactive Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance Practical notebook
✓ acquire knowledge about respiratory affections of farm animals and their managements by surgical procedure	**Respiratory affections of farmanimals:** Epistaxis, haemoptysis, foreign bodies and parasites in the nostrils, retropharyngeal abscess, roaring	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ obtain knowledge about gastrointestinal surgery in farm animals ✓ acquire knowledge about abomasal displacement, torsion, intestinal obstruction, intussusceptions	**Gastrointestinal surgery in farm animals:** Ranula, chocking, oesophageal stricture and diverticulum, surgical approaches to the abdomen, foreign bodies in the stomach, bloat, impaction, crop impaction in birds, traumatic reticuloperitonitis, abomasal displacement and torsion, intestinal obstruction, intussusceptions, volvulus	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ gather knowledge about surgical affections of anus ✓ acquire knowledge about different types of hernias	**Surgical affections of anus**: rectal prolapse, atresia coli, atresia recti, atresia ani, other surgical diseases of abdomen and various hernias	Lecture Discussion Video clip Photography Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about urogenital surgery in farm animals ✓ obtain knowledge about male reproductive tract diseases	**Urogenital surgery in farm animals:** Pyelonephritis, hydronephrosis, obstruction of urethra, urolithiasis, various types of calculi, rupture of the bladder and urethra, retention of urine, urinary fistula, surgical affections of the penis and prepuce, phymosis, paraphimosis and posthitis, caponisation	Lecture Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance

✓ acquire knowledge about udder and teat surgery in farm animals	**Udder and teat surgery in farm animals:** Supernumerary teats, imperforate teats, of teats, obstruction in the teat, duct, fistula, papilloma, abscess and diseases	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about different types of general surgery	**Miscellaneous affections:** Hydrocephalus, empyema of sinus, sinusitis, disbudding and dehorning, actinomycosis, cleft palate, contracted tendon, sinus affections, neoplasm and their modern therapy, fistula withers, poll evil, humpsore, yoke gall, fracture of the horn, botryomycosis	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. C. Cox. 1987. Surgery of the Reproductive Tract, JE 3rdeditoin, Liverpool.
2. F.A. Harrison. 1995. Surgical Techniques in Experimental Farm Animals, Blackwell publishing.
3. J. Plunkett Signe. 2000. Emergency Procedure for the Small Animal Veterinarian, WB Saunders.
4. K. Knetch, Allan, Williums and Johnson. 1987. Fundamental Techniques in Veterinary Surgery, 3rd edition, WB Saunders Company, Philadelphia.
5. M. Melling, M. Alder. 1998. Bovine Practice 2, WB Saunders.
6. M.Bynaher, Clarke and Waterman.1985. Veterinary Fluid Therapy, Blackwell Scienctific Publication, London.
7. P.R. Greenough, MaCallum, F.J, D. Weavar, Oliver and Boid. 1972. Lameness in Cattle, Edinburgh.
8. R.P.S. Tyagi and J. Singh. 1996. Ruminant Surgery, 1st Edition, CBS Publisher and Distributors, Delhi.

Course Code: SUTH 434 **Course Title: Farm Animal Surgery (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: I**

Rationale: This course is planned to offer the practical concept of farm animal & clinics surgery.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge about farm animal & their surgical affections
- ✓ obtain practical knowledge about different types of clinical surgery
- ✓ achieve practical knowledge about different types of farm animal's surgery & clinical surgery and their management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ performe various types surgery of different system like tail, limb, respiratory system	**Locomotor & respiratory system surgery:** Amputation of tail, digit, limb, trephining of sinuses	Lecture Interactive Discussion Visual presentation OT visit/Lab work Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ apply various types surgery of digestive system	**Digestive system surgery:** Tracheotomy, oesophagetomy, gastrotomy, rumenotomy, enterotomy, enterectomy, intestinal anastomoses, spleenectomy	Lecture Interactive Discussion Visual presentation OT visit/Lab work Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ performed the various types surgery of eye	**Surgery of eye:** Entropion and ectropion operation, enucleation of eyeball	Lecture Interactive Discussion Visual presentation OT visit/Lab work Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ performe various types surgery of genital and urinary system	**Surgery of genital and urinary system:** Castration and caponisation, urethrotomy, ligation fo Stenson's ducts, opening of guttural pouch, roaring operation, penile deviation, vasectomy, cystotomy, amputation of penis, caslick'soperation, episisotomy, tenotionies, nephrectomy in farm animals	Lecture Interactive Discussion Visual presentation OT visit/Lab work Farm visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ practicing various clinical surgical cases at veterinary clinic, hospital & field level	**Clinical practice**: Clinical practice of surgical cases at veterinary clinic	Lecture Interactive Discussion Visual presentation OT visit/Lab work Brain storming Feedback Farm visit	Quiz Short answer Skill test Practical note book Viva voce Class attendance

✓ diagnose various clinical surgical cases at veterinary clinic, hospital & field level	**Clinical diagnosis and treatment**: diagnosis and treatment of surgical disease and disorders in animals and birds at the veterinary clinic, ambulatory surgical services at various farms and field stations, clinical practices of surgical cases at various government and private veterinary hospitals, clinics and zoo	Lecture Interactive Discussion Visual presentation OT visit/Lab work Brain storming Feedback Farm visit	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. C. Cox. 1987. Surgery of the Reproductive Tract, JE 3rdeditoin, Liverpool.
2. F.A. Harrison. 1995. Surgical Techniques in Experimental Farm Animals, Blackwell publishing.
3. J. Plunkett Signe. 2000. Emergency Procedure for the Small Animal Veterinarian, WB Saunders.
4. K. Knetch, Allan, Williums and Johnson. 1987. Fundamental Techniques in Veterinary Surgery, 3rd edition, WB Saunders Company, Philadelphia.
5. M. Melling, M. Alder. 1998. Bovine Practice 2, WB Saunders.
6. M.Bynaher, Clarke and Waterman.1985. Veterinary Fluid Therapy, Blackwell Scienctific Publication, London.
7. P.R. Greenough, MaCallum, F.J, D. Weavar, Oliver and Boid. 1972. Lameness in Cattle, Edinburgh.
8. R.P.S. Tyagi and J. Singh. 1996. Ruminant Surgery, 1st Edition, CBS Publisher and Distributors, Delhi.

Course Code: SUTH 474 **Course Title: Radiology, Clinics Surgery & Theriogenology (Practical)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**

Rationale: This course is planned to offer practical concept of Radiology, Soundness and Certificate writing.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge about X-ray, Ultra sonography and other radiological practice
- ✓ obtain practical knowledge about different types radiological techniques
- ✓ achieve practical knowledge about Clinics Surgery & Theriogenology

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define veterinary radiology ✓ acquire knowledge about radiological techniques ✓ diagnose a disease by radiological techniques	Introduction of veterinary radiology as diagnostic and therapeutic aid scope and limitation in veterinary practice, methods of taking and processing radiographs, preparation of animals for taking radiographs, interpretation of radiographs, general principles and application of radio therapy in veterinary practice	Lecture Interactive Discussion Multimedia presentation Practical session Demonstration of radiological equipment, Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ explain clinical surgical cases ✓ check surgical affections of forelimbs and hind limbs define various common terms related to	Introduction unsoundness due to hereditary and acquired diseases causes of unsoundness eyes, limbs, respiration, and conformation, vices, blemishes and diseases surgical affection of forelimbs and hind limbs	Lecture Discussion Multimedia presentation Practical session Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ define various common terms related to theriogenology	Aberrations of estrus and estrus cycle, seasonal breeding Superfoetation and super fecundation Fertility, infertility, and sterility	Lecture Discussion Multimedia presentation Practical session Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. A. Venugopalan. 1994. Essential of Veterinary Surgery, Oxford and IBH Publishing Co Pvt Ltd New Delhi.
2. J.J. O'Connor. 1980. Dollar's Veterinary Surgery 1st edn CBS Publisher and Distributors, New Delhi.

Course Code: SUTH 523 **Course Title: Pet, Zoo & Aquatic Animal Surgery (Theory)**	**Credit Hour: 2**	**Level: 5**	**Semester: I**
Rationale: This course is planned to offer the concept of Pet Zoo & Aquatic Animal Surgery.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about Pet, Zoo & Aquatic Animals ✓ obtain knowledge about different types of Pet, Zoo & Aquatic Animals ✓ achieve knowledge about different types of Pet, Zoo & Aquatic Animals surgical pre&post-operative management			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify the various types of eye diseases of a pet and zoo animals and their surgical affections ✓ perform various surgical operation of eyes of pet and zoo animals	**Eye surgery:** Ophthalmic and aural surgery in pet and zoo animals: examination of the eye and ear and their surgical affections in pet and zoo animals	Lecture Interactive Discussion Multimedia presentation Brain storming Feedback	Quiz Short answer Broad answer Class attendance
✓ perform various clinical surgical cases of pet and zoo animal at veterinary clinic, hospital, zoo, safari park & field level ✓ performed various surgical operation of aquatic animals	**Surgical affections of mouth and teeth of Pet and zoo animals**: Parrot mouth, pig mouth, sharp mouth dental tarter, dental carries, pyorrhea, dental fistula, dentigerous cysts, extraction of teeth, dental abscess, epulis, Surgical affections of respiratory system in pet and zoo animals: tracheotomoy, stricture	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ perform various gastrointestinal surgical cases of pet and zoo animal at veterinary clinic, hospital, zoo, safari park & field level ✓ perform various gastrointestinal surgical cases or surgical operation of aquatic animals	**Gastrointestinal surgery in pet and zoo animals:** Salivary mucocele, sailcloth's, chocking, gastro-oesophageal reflux, haematemesis, foreign body, oesophageal stricture, Gastric dilation-torsion syndrome, delayed gastric emptying, traumatic gastritis, intussusceptions, strangulation, mega colon, intestinal anastomosis, anal sac disease, cholelithiasis, peritonitis, various hernias etc.	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ perform various urogenital surgery of pet and zoo animal at veterinary clinic, hospital, zoo, safari park & field level	**Urogenital surgery pet and zoo animals:** Pyelonephritis, hydronephrosis, obstruction of urethra, feline urologic syndrome, urolithiasis, retention of urine, urinary fistula, surgical affections of the penis and prepuce, persistent frenulum, hypospadiasis, cryptorchidism,	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

	fracture of the ospenis, castration, scrotal abrasion, canine venereal granuloma, hyperplasia of the prostate gland, spaying, neoplasm and other diseases		

Reference Books

1. A. Venugopalan. 1993. Essentials of Veterianry Surgery, Oxford and IBH Publishing Company Pvt Ltd, New Delhi.
2. D.H. Slatter. 1985. Text Book of Small Animal Surgery Vol-I and II W/ B, Saunders Company, Philadelphia.
3. J.J. O'Connor. 1980. Dollar's Veterinary Surgery 1st edn CBS Publisher and Distributors, New Delhi.
4. J.W. Alexander. 1985. Leonard's Orthopedic Surgery of the Dog and Cat W B/ Saunders Company, Philadelphia, London.
5. K.N. Gelatt.1991. Veterinary Ophthalmology 2nd edn Lea and Febiger, Philadelphia, London.
6. M.Bynaher, Clarke and Waterman. 1985. Veterinary Fluid Therapy Blackwell Scientific Publication, London.

Course Code: SUTH 524 **Course Title: Pet, Zoo and Aquatic Animal Surgery (Practical)**	**Credit Hour: 1**	**Level: 5**	**Semester: I**

Rationale: This course is planned to offer the practical concept of Pet and Zoo Animal Surgery.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge about Pet, Zoo & Aquatic Animals
- ✓ obtain practical knowledge about different types of Pet, Zoo & Aquatic Animals
- ✓ achieve practical knowledge about different types of Pet, Zoo & Aquatic Animals surgical pre & post-operative management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ perform various clinical surgical cases at veterinary clinic, hospital & field level	**Clinical practices**: Clinical practices of surgical cases at veterinary clinic, Government and private veterinary hospitals and clinics, zoo and different farms	Lecture Interactive Discussion Visual presentation OT visit/Lab work Zoo & safari park visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ perform the various types surgery of different system at Veterinary Clinic, Government and private veterinary hospitals and clinics, zoo and different farms ✓ practice various types of anaesthesia of pet & zoo animals	**Anaesthesia and analgesia**: Anaesthesia and analgesia related to specific operation Amputation of tail, digit, dewclaw, entriculochordectomy (debarking), tracheotomy, oesophagotomy, antireflux surgery, gastrotomy, entrotomy, entrectomy	Lecture Interactive Discussion Visual presentation OT visit/Lab work Zoo & safari park visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ perform various types of male reproductive tract, digestive tract surgery	**Male reproductive & digestive tract surgery:** Intestinal anastomoses, typhlectomy, colopexy, spleenectomy, cholecystectomy, entropion and ectropion operation, enucleatoin of eyeball, abscess, uretrotomy, castratio, vasectormy, custotomy, amputation of penis, nephrectomy, aural rejection	Lecture Interactive Discussion Visual presentation OT visit/Lab work Zoo & safari park visit Brain storming Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. A. Venugopalan. 1993. Essentials of Veterinary Surgery, Oxford and IBH Publishing Company Pvt Ltd, New Delhi.
2. D.H. Slatter. 1985. Text Book of Small Animal Surgery Vol-I and II W/ B, Saunders Company, Philadelphia.
3. J.J. O'Connor. 1980. Dollar's Veterinary Surgery 1st edn CBS Publisher and Distributors, New Delhi.
4. J.W. Alexander. 1985. Leonard's Orthopedic Surgery of the Dog and Cat W B/ Saunders Company, Philadelphia, London.
5. K.N. Gelatt.1991. Veterinary Ophthalmology 2nd edn Lea and Febiger, Philadelphia, London.
6. M. Bynaher, Clarke and Waterman. 1985. Veterinary Fluid Therapy Blackwell Scientific Publication, London.

Course Code: SUTH 427 **Course Title: Gynaecology (Theory)**	**Credit Hour: 3**	**Level: 4**	**Semester: I**

Rationale: This course is planned to offer concept of Gynaecology.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge about female reproductive system of various animal species
- ✓ obtain knowledge about different types female reproductive system disorders
- ✓ achieve knowledge of gynaecological disorders management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define various common terms related to gynaecology	**Introduction of Gynaecology**: Aberrations of estrus and estrus cycle, seasonal breeding superfoetationand super fecundation fertility, infertility, and sterility	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ evaluate the of reproductive tract in domestic animals	**Reproductive tract problems:** Clinical evaluation and abnormalities of reproductive tract in domestic animals, Reproductive Cycles of different species, Delayed puberty, sexual maturity, estrus detection	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ explain various ovulatory defect and their management ✓ describe repeat breeding, fertility failure, embryonic mortality	**Reproductive defect & management:** Anatomical, hereditary, nutritional, managerial, hormonal and infectious causes of anestrus, ovlulatory defects and cystic ovarian degeneration Repeat breeding: Fertility failure, early embryonic mortality	Lecture, Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate various specific annital diseases ✓ maintain healthy genital halth	**Genital diseases**: Specific and non-specific infections affecting genital organs- endomettrities, cervicitis, vaginitis Fertility parameters, sexual health control and reproductive health management	Lecture Discussion, Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ elucidate various reproductive hormone & their deficiency diseases ✓ discuss estrus synchronization & embryo transfer	**Reproductive hormone:** Clinical use of hormones in female fertility, breeding management, mismating, pseudopregnancy, TVT in bitches Induction of estrus, synchronization of estrus, follicular dynamics, ovulation, embryo transfer	Lecture, Discussion, Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. D.E. Jones and J.O. Joshua 1988. Reproductive Clinical Problems in the Dog, 2nd, Wright, London.
2. F.S.E. Hafex, Lea and Febizer. 2000. Reproduction in Farm Animals, USA.
3. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the Mlae) Churchill Livingstone, London Melboruyrne and New York.
4. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California London.
5. R.S.Y. Youngquist. 1997. Current therapy in large Animal Theriogenology, WB Saunders Companry, Philadelphia.
6. W.B. Salisbury, N.I. Vandemark and J.R. Ledge. 1978. Physiology of Reproduction and Artifical Insemination in Cattle, 2ndedn, Freeman and Company, Sanfransisco, USA.

Course Code: SUTH 428 **Course Title: Gynaecology (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: I**

Rationale: This course is planned to offer practical concept of Gynaecology.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge about female reproductive system of various animal species
- ✓ obtain practical knowledge about different types female reproductive system disorders
- ✓ achieve practical knowledge of gynaecological disorders management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquire knowledge how detect estrus ✓ describe about various hormonal preparation & their uses	Estrus detection & hormonal use: study of female genitalia and its biometry, methods of estrus detection in farm and companion animals including vaginal cytology, collection and examination of vaginal mucus by various techniques, demonstration of different hormonal preparation and their uses	Lecture Interactive Discussion Multimedia presentation Practical session Dairy Farm visit Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance
✓ acquire knowledge how to use different gynaecological instrument & appliances ✓ explain the protocol of induction & synchronization of estrus	Different protocols for induction and synchronization of estrus, super ovulation and embryo transfer, use of gynaecological instruments and appliances, evaluation of female animals for breeding soundness, demonstration of reproductive pathological conditions using museum specimens	Lecture Interactive Discussion Multimedia presentation Practical session Dairy Farm visit Feedback	Quiz Short answer Skill test Practical note book Viva voce Class attendance

Reference Books

1. D.E. Jones and J.O. Joshua 1988. Reproductive Clinical Problems in the Dog, 2nd, Wright, London.
2. F.S.E. Hafex, Lea and Febizer. 2000. Reproduction in Farm Animals, USA.
3. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the Mlae) Churchill Livingstone, London Melboruyrne and New York.
4. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California London.
5. R.S.Y. Youngquist. 1997. Current therapy in large Animal Theriogenology, WB Saunders Companry, Philadelphia.
6. W.B. Salisbury, N.I. Vandemark and J.R. Ledge. 1978. Physiology of Reproduction and Artifical Insemination in Cattle, 2ndedn, Freeman and Company, Sanfransisco, USA.

Course Code: SUTH 465 **Course Title: Obstetrics (Theory)**	**Credit Hour: 2**	**Level: 4**	**Semester: II**
Rationale: This course is planned to offer the concept of Obstetrics.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge about female pregnancy of various animal species ✓ obtain knowledge about post-partum period various animal species & their management ✓ achieve knowledge about pregnancy & birth disorders management			
Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define various common terms related to obstetrics in different animal species	**Introduction and definition:** natural regulation of cyclic activity of cows, mares, ewes, goats, dogs, and cats, artificial control of cyclic reproductive activity (nonhormonal and hormonal methods)	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ illustrate pregnancy and various methods of pregnancy detection	**Pregnancy and methods of its detection:** Development of concepts, placentation, placentation, fetal fluids, forms and features of the fetal sacs, fetal mobility during pregnancy, maternal recognition of pregnancy, pregnancy and different methods of its detection in female animals, endocrinology of pregnancy, gestation periods	Lecture Discussion, Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ describe about various teratological defect and their managements	**Teratology:** Schistosoma reflexes, perosomacolumbis, double monsters, bull dog calf, white heifer diseases, free martin, hermaphroditis, fetal meaceration, fetal mummification, hydrollantois, hydrocephalus, fetalascitis, fetal anasarca, prolonged gestation, superfecundation, superfetation, phantom pregnancy, twins,	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about parturition, their stages & how to care of new born	**Parturation:** Initiation of parturition, stages of parturition, induction, of parturition, care of parturient animals, puerperium, factors affecting the puerperium and postpartum period, onset of spontaneous respiration and thermoregulation in the newborn Colostrums feeding and care of newborn	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about pregnancy disorder ✓ acquire knowledge about pregnancy disorder their managements	**Dystocia:** Maternal dystocia: Causes, incidence and treatment: pelvic constricdtion, incomplete dilatation of cervix, ring womb, vaginal cystocele, vaginal prolapse, neoplasm, pelvic, obstruction by the distended urinary baldder, torsion of the uterus, displacement of the gravid uterus, uterine inertia, nervous voluntary inhibition of labour	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

✓ achieve knowledge about obstetrical disorders ✓ acquire knowledge how management of obstetrical disorders	**Fetal dystocia:** Cause, incidence and treatment manipulative delivery per vaginum: farm animals and the hitch: general consideration, obstetrical equipment Obstericalmanoeurre, obstetric anaesthesia for vaginal delivery by forced traction	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about injury occurred during delivery & its management	**Injuries and diseases incidental to parturition:** Post-partum hemorrhage, metritis, endometritis, haematoma of the vulva, perineal injuries at parturition, gluteal paralysis, obturator paralysis, rupture of the uterus and vagina Prolapse of the rectum, partum	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ manage new born and their diseases, & managements	**Calf diseases:** Puerpeural laminitis, milk fever, puerperal tetanus, ketosis, retention of the fetal membranes: its incidence, causes, clinical features, treatment and prognosis, prolapse of the uterus and bladder, causes and treatment	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about surgery of reproductive tract	**Surgery of the reproductive tract**: large and small animals Infertility, sub fertility, sterility, clinical use of hormones, veterinary control of herd fertility	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ achieve knowledge about the possible cause of abortion ✓ gather knowledge about udder health, its diseases and management	**Abortion:** Cause and diagnosis, treatment, prevention and control, male sexual physiology, clinical examination of stud bull for breeding sounders, normal semen, mastitis and under health control, diseases associated with chemical and physical agents, poisons, allergy, inheritance of undesirable characters and unknown etiology in goats and sheep	Lecture Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. F.S.E. Hafex, Lea and Febizer. 2000. Reproductive in Farm Animals, USA.
2. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the male) Churchill Livingstone, London Melbourne and Yew York.
3. G.H. Arthur, D.E. Noakes and I.I. Pearson. 1998. Veterinary Reproduction and Obstetrics (Theriogenology) 3rdedn, Bailliere Tindal, London, Sydney, Tokyo.
4. K. McEnteem.1990. Reproductive Pathology of Domestic Mammals, 1stednAcademic Press, Inc San Diego, New York.
5. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California, London.
6. R.S.Y. Youngquist. 1997. Current Therapy in Large Animals Theriogenology, W B Saunders Company, Philadelphia.
7. S.J. Roberts. 1998. Veterinary Obstetrics and Genital diseases (Theriogenology), 3rdedn, by GB Saunders Company, US.
8. W.B. Salisbury, N.I. Vandemark and J.R. Lidge. 1978. Physiology of Reproduction and Artificial Insemination in Cattle, 2ndedn, freeman and Company, Sanfransisco, USA.

Course Code: SUTH 466 **Course Title: Obstetrics (Practical)**	**Credit Hour: 1**	**Level: 4**	**Semester: II**

Rationale: This course is planned to offer the practical concept of Obstetrics.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire practical knowledge about female pregnancy of various animal species
- ✓ obtain practical knowledge about post-partum period various animal species & their management
- ✓ achieve practical knowledge about pregnancy & birth disorders management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquire knowledge of different obstetrical diseases and their management	Clinical investigations of different diseases and performance problems and their management	Lecture Interactive Discussion Multimedia presentation Practical demonstration Feedback	Quiz Short answer Class attendance Practical Notebook Viva voce

Reference Books

1. F.S.E. Hafex, Lea and Febizer. 2000. Reproductive in Farm Animals, USA.
2. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the male) Churchill Livingstone, London Melbourne and Yew York.
3. G.H. Arthur, D.E. Noakes and I.I. Pearson. 1998. Veterinary Reproduction and Obstetrics (Theriogenology) 3rdedn, Bailliere Tindal, London, Sydney, Tokyo.
4. K. McEnteem.1990. Reproductive Pathology of Domestic Mammals, 1stednAcademic Press, Inc San Diego, New York.
5. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California, London.
6. R.S.Y. Youngquist. 1997. Current Therapy in Large Animals Theriogenology, W B Saunders Company, Philadelphia.
7. S.J. Roberts. 1998. Veterinary Obstetrics and Genital diseases (Theriogenology), 3rdedn, by GB Saunders Company, US.
8. W.B. Salisbury, N.I. Vandemark and J.R. Lidge. 1978. Physiology of Reproduction and Artificial Insemination in Cattle, 2ndedn, freeman and Company, Sanfransisco, USA.

Course Code: SUTH 527 Course Title: Andrology and Clinical Reproductive Technology (Theory)	**Credit Hour: 2**	**Level: 5**	**Semester: I**

Rationale: This course is planned to offer practical concept of Andrology and Clinical Reproductive Technology.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ acquire knowledge about anatomy, function & disorder of male reproductive system
- ✓ obtain knowledge of male & female reproductive system and their management

Intended Learning Outcomes (ILOs) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquire knowledge of anatomy, function & disorder of male reproductive system ✓ know the semen abnormalities	**Introduction:** Scope of Andrology in veterinary medicine semen formation and related abnormalities, clinical examination of males for breeding sounding soundness evaluation	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about infertility, AI ✓ gather knowledge about semen borne & AI related diseases	**AI & its related diseases:** Infertility and uterine infections due to faulty AI veterinary management of semen borne and AI-related diseases	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ determine the reproductive & AI parameters ✓ maintain the heath of AI stud	**Recording AI & maintain AI stud:** Recording and clinical analysis of reproductive and AI parameters, diseases of male reproduction, health management of AI stud males	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance
✓ acquire knowledge about reproductive biotechnology	**Reproductive biotechnology**: Reproductive biotechnology to maximize reproduction and control reproductive diseases	Lecture Interactive Discussion Multimedia presentation Feedback	Quiz Short answer Broad answer Class attendance

Reference Books

1. F.S.E. Hafex, Lea and Febizer. 2000. Reproductive in Farm Animals, USA.
2. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the male) Churchill Livingstone, London Melbourne and Yew York.
3. G.H. Arthur, D.E. Noakes and I.I. Pearson. 1998. Veterinary Reproduction and Obstetrics (Theriogenology) 3rdedn, Bailliere Tindal, London, Sydney, Tokyo.
4. K. McEnteem.1990. Reproductive Pathology of Domestic Mammals, 1stednAcademic Press, Inc San Diego, New York.
5. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California, London.
6. R.S.Y. Youngquist. 1997. Current Therapy in Large Animals Theriogenology, W B Saunders Company, Philadelphia.
7. S.J. Roberts. 1998. Veterinary Obstetrics and Genital diseases (Theriogenology), 3rdedn, by GB Saunders Company, US.
8. W.B. Salisbury, N.I. Vandemark and J.R. Lidge. 1978. Physiology of Reproduction and Artificial Insemination in Cattle, 2ndedn, freeman and Company, Sanfransisco, USA.

Course Code: SUTH 528 Course Title: Andrology and Clinical Reproductive Technology (Practical)	**Credit Hour: 1**	**Level: 5**	**Semester: I**
Rationale: This course is planned to offer practical concept of andrology and clinical reproductive technology.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire practical knowledge about anatomy, function & disorder of male reproductive system ✓ obtain practical knowledge of male & female reproductive system and their management			
Intended Learning Outcomes (ILOS) The students will able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ acquire knowledge about stud males, bull station & semen laboratory examination	**Clinical& Lab examination:** Clinical of stud males, clinical practice of the evaluation of bull station and semen laboratory to certify semen to be microbiological examination	Lecture Interactive Discussion Multimedia presentation Practical demonstration Feedback	Quiz Short answer Class attendance Practical Notebook Viva voce
✓ achieve knowledge how to prepare a teaser bull ✓ how to manage injuries & affections of male reproductive system	**Teaser bull**: Preparation of teaser bull, operative techniques for the corrections of injuries and affections of male reproductive system	Lecture Interactive Discussion Multimedia presentation Practical demonstration Feedback	Quiz Short answer Class attendance Practical Notebook Viva voce

Reference Books

1. F.S.E. hafex, Lea and Febizer. 2000. Reproductive in Farm Animals, USA.
2. G.E. Lamming. 1990. Marshall's Physiology of Reproduction, 4thedn, Vol-2, (Reproduction in the male) Churchill Livingstone, London Melbourne and Yew York.
3. G.H. Arthur, D.E. Noakes and I.I. Pearson. 1998. Veterinary Reproduction and Obstetrics (Theriogenology) 3rdedn, Bailliere Tindal, London, Sydney, Tokyo.
4. K. McEnteem.1990. Reproductive Pathology of Domestic Mammals, 1stednAcademic Press, Inc San Diego, New York.
5. P.T. Cupps. 1991. Reproduction in Domestic Animals, 4thedn, Academic Press, Inc California, London.
6. R.S.Y. Youngquist. 1997. Current Therapy in Large Animals Theriogenology, W B Saunders Company, Philadelphia.
7. S.J. Roberts. 1998. Veterinary Obstetrics and Genital diseases (Theriogenology), 3rdedn, by GB Saunders Company, US.
8. W.B. Salisbury, N.I. Vandemark and J.R. Lidge. 1978. Physiology of Reproduction and Artificial Insemination in Cattle, 2ndedn, freeman and Company, Sanfransisco, USA.

Department of Agricultural Economics (AGEC)
Course Layout

Sl. No.	Course Code and Course Title	Credit Hour	Level	Semester
1.	AGEC 225: Livestock Economics (Theory)	2	2	I
Total (Theory + Practical) 2+0= 2				

Total Credit Hour	
Theory	2
Practical	0
Total	**2**

Course Code: AGEC 225 **Course Title: Livestock Economics (Theory)**	**Credit Hour: 2**	**Level: 2**	**Semester: I**
Rationale: The course is designed to understand the optimal resource utilization for profit maximization, efficient and effective farm management, and livestock policy initiatives as well as other economic concepts related to livestock sector.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ introducing students with the basics of economics and livestock economics concepts ✓ developing the students' understanding about optimal utilization of scares resources and profit maximization in the field of livestock sector ✓ improving students' understanding regarding agricultural market, livestock market and different market behavior ✓ introducing knowledge on different macroeconomics variables such as money and financial market, inflation, national income, etc., and their relation to the livestock sector ✓ understanding agricultural project planning and policy implications			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategy**	**Assessment Strategy**
✓ recall the definition, scope and theories of economics as well as their practical implications	**Concepts of Economics:** Basic concepts of economics, definition of livestock economics, approaches to the study of economics	Lecture Multimedia presentation and Interactive discussion	Quiz/ assignment Short answer Class attendance
✓ explain demand and supply curve through Marshallian analysis as well as indifference curve technique	**Utility Analysis of Demand:** Marginal utility exposition versus indifference curve analysis, law of equi-marginal utility, laws of demand and supply	Lecture, Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ assess elasticity of demand and supply, and consumer's equilibrium as well as interpret the result	**Elasticity:** Measurement of elasticity, elasticity of demand and supply, consumer's surplus	Lecture, Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ describe production function, laws of return, factors of productions and their application, and importance in agriculture	**Factors of Production and Production Function:** Production function, laws of returns, iso-product curve, factors of production: Land, labor, capital and organization	Lecture Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ assess the output level for	**Market, Cost and**	Lecture	Quiz / assignment

profit maximization under different market structure through cost and revenue analysis	**Revenue:** Cost and revenue analysis, markets and its types, determination of price under perfect and imperfect competition	Multimedia presentation and Interactive discussion	Short answer Essay type Class attendance
✓ describe the concept of money, its evolution and functions, different theories of money, and the concept, causes and consequences of inflation	**Money and Inflation:** Definition and functions of money, value of money, inflation: its causes and consequences	Lecture Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ understand about capital market and financial institutions through their functions	**Commercial Bank and Central Bank:** Different types of banking and their functions, specialized banking	Lecture Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ explain the concept of national income, different techniques of its computation with constrains of each technique	**National Income:** Basic concept of national income, methods and problems of its computation	Lecture, Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance
✓ illustrate the concepts and scopes of agricultural marketing, livestock marketing, marketing channel of livestock products ✓ describe the importance of agricultural insurance in sustainable development of agricultural sector and livestock sector ✓ prepare and manage livestock project ✓ determine the importance of livestock sector ✓ illustrate the porters' five forces model for dairy and poultry sector ✓ justify the importance, prospects and problems of livestock sector	**Agricultural, Livestock Marketing and Marketing Channel:** Agricultural marketing, Livestock marketing, marketing channel, marketing channel of milk and egg, agricultural insurance **Project Analysis:** Definition, project cycle management stages, project concept note, project evaluation **Role of Livestock Sector:** Role of livestock sector in the economy of Bangladesh, SWOT analysis of dairy	Lecture Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance

	and poultry industry of Bangladesh, problems and prospects of dairy and poultry sector		
✓ explain the concepts of public revenue, public finance, sources of revenue, and objectives of taxation system ✓ explain the characteristics and importance of a good tax system in developing economies. ✓ describe the roles and effects of public expenditure in a developing economy	**Public Revenue:** Sources of revenue, social and economic objectives of taxation, characteristics of a good tax system, role of taxation in developing economies **Public Expenditure:** Concepts of public expenditure, causes of increase in public expenditure, effects of public expenditure, role of public expenditure in a developing economy	Lecture Multimedia presentation and Interactive discussion	Quiz / assignment Short answer Essay type Class attendance

Reference Books

1. A.N. Sadhu and A. Singh. 1989. Fundamentals of Agricultural Economics. Himalaya Publishing House, Mumbai, India.
2. C. Ritson. 1977. Agricultural Economics - Principles and Policy, Crosby Lockwood and Staples, London.
3. H.L. Ahuja. 2004. Modern Microeconomics-Theory and Applications. S.Chand and Company Pvt. Ltd., New Delhi, India.
4. J.P. Doll, and Orazem, F. 1984. Production Economics - Theory with Applications, 2nd edn., John Wiley, New York.
5. J.R Anderson, Dillon, J.L. and Hardaker, J.B. 1977. Agricultural Decision Analysis, Iowa State University Press, Ames.
6. K.K. Dewett and M.H. Navalur. 2006. Moodern Economic Theory. S.chand and Co. Ltd. Newdelhi, India.
7. P.A. Samuelson and W.D. Nordhaus. 2009. Economics. 19th Edition. McGraw-Hill Publishers' Pvt. Ltd., New Delhi, India.
8. R.K. Lekhi and J. Singh. 1999. Agricultural Economics. Kalyani Publishers, New Delhi, India.
9. W.J. Baumol. 1978. Economic Theory and Operations Analysis. Fourth edition, Prentice-Hall, New Delhi.

Department of Agricultural Extension & Information System (AEIS)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	AEIS 529: Livestock Extension & Information System (Theory)	2	5	I
2.	AEIS 530: Livestock Extension & Information System (Practical)	1	5	I
Total (Theory + Practical) 2+1= 3				

Total Credit Hour	
Theory	2
Practical	1
Total	**3**

Course Code: AEIS 529 **Course Title: Livestock Extension & Information System (Theory)**	**Credit Hour: 2**	**Year: 5**	**Semester: I**
Rationale: This course is designed to furnish fundamental concept of livestock extension communication, transfer of technologies and programme planning.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ obtain knowledge about fundamental concept of livestock extension and information system ✓ enhance knowledge on principles of extension education ✓ acquaint with livestock extension activities in Bangladesh ✓ use extension teaching methods in disseminating technologies ✓ transfer of livestock technologies to the farmers' level			
Intended Learning Outcomes (ILOs) At the end of the course the students will be able to-	**Course Content**	**Teaching-Learning Strategy**	**Assessment Strategy**
✓ define livestock extension ✓ describe the principles and importance of livestock extension	**Livestock Extension:** Concept, meaning and principles of agricultural extension; Importance of livestock extension in Bangladesh	Lecture Discussion Multimedia presentation Exercises	Quiz Short answer Essay type Assignment
✓ apply the concept and principles of learning in extension work ✓ motivate the farmers to adopt livestock technologies	**Learning and Motivation:** Teaching-learning process; Principles and laws of learning with their implication in extension work; Concept and meaning of motivation; Maslow's need theory of motivation		
✓ enrich communication efficiency in livestock extension, ✓ apply extension teaching methods in dissemination technologies to potential adopters	**Extension Communication & Teaching Methods:** Meaning, importance, types and forms of communication; models of communication; elements of communication process; feedback of communication; critical factors of communication in livestock extension, Meaning & classification of teaching method		
✓ describe and apply the process of livestock technology for the farmers	**Transfer of Technologies:** Meaning of technology and innovation; innovation diffusion process; innovation-decision process; innovativeness and adopter categories; factors influencing adoption of innovation; barriers in adoption and diffusion of innovations in Bangladesh		
✓ explain programme planning and evaluation ✓ apply the principles and steps of livestock programme planning and evaluation	**Extension Project/Programme Planning, Monitoring and Evaluation:** Concept, importance, principles and steps of project/programme planning; Concepts of monitoring and evaluation; Principles and steps of project/programme evaluation		

✓ articulate the importance of ICT in livestock sector ✓ use different ICT applications in livestock management	**Livestock Information System:** Concept of information system, application of ICTs in livestock management, emerging trend of ICT application in livestock extension, ICT for technology transfer in livestock		

Reference Books

1. A.S. Sandhu. 1994. Extension Programme Planning, Calcutta, India: Oxford & IBH Publisher Co. Pvt. Ltd.
2. G.L. Ray. 2011. Extension Communication and Management. Kalyani Publishers, New Delhi, India.
3. M.H. Bhuiyan, Miah MAM, Akanda MGR, Bashar MA (2014) Agricultural Extension Education, g-Science Implementation & Publication, Karwanbazar, Dhaka, Bangladesh.
4. O.P. Dahma, Bhatuagar, O.P. (2010), Education and Communication for Development, Oxford & Publishing Co. Pvt. Ltd. New Dehli, India.

Course Code: AEIS 530 **Title: Livestock Extension & Information System (Practical)**	**Credit Hour: 01**	**Level: 05**	**Semester: I**

Rationale: This course is designed to provide practical knowledge on agricultural organizations, teaching aids, lecturing, interview schedule, plan of work & calendar of work and extension field trip.

Course Learning Outcome: The major learning outcomes of this course are to-

- ✓ distinguish about various GOs and NGOs working for agricultural development
- ✓ demonstrate the procedure of lecturing
- ✓ familiar with the approaches of teaching aids
- ✓ acquire knowledge about data collection instruments and methods and their application
- ✓ comprehend plan of work and calendar of work and extension field trip

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategy**	**Assessment Strategy**
✓ describe the role and responsibility of DAE, DLS, DF, BRDB, BADC, BARD, RDA, CARE, BRAC, PROSHIKA and RDRS in agricultural development	An introduction to different organizations related to agricultural development in Bangladesh	Lecture Discussion Multimedia presentation	Quiz/MCQ, Class test, Essay type, Practical note book, Viva Voce
✓ prepare some common visual teaching aids and their use in lecture	Preparation and use of some selected low-cost teaching aids: Poster, Flash Cards, Charts and Graphs	Lecture Discussion Multimedia Presentation Assignment	Quiz/MCQ, Class test, Essay type answer, Practical note book, Viva voce, Report
✓ demonstrate the procedure of formal lecture	Lecture and its practice	Lecture Discussion Individual presentation	Quiz/MCQ, Class test, Essay type, Practical note book, Viva voce, Presentation performance
✓ describe and apply different instruments for data collection ✓ illustrate types and forms of questionnaire ✓ prepare a good questionnaire ✓ conduct an interview	Data collection instruments: preparation of interview schedule for data collection from livestock farmers and procedure of interviewing	Lecture Discussion Class room exercise Assignment	Quiz/MCQ, Class test, Essay type, Practical note book, Viva voce, Report
✓ prepare a plan of work and calendar of work ✓ prepare and present a plan of work and calendar of work	Preparation of plan of work and calendar of work	Lecture Discussion Assignment	Quiz/MCQ, Class test, Essay type, Practical note book, Viva voce, Report
✓ plan an extension field trip at Upazila level ✓ gather hands-on training on data collection, and experience on meeting with field level extension personnel ✓ acquire with agricultural extension activities at the upazila and block levels ✓ write a survey report, incorporating data and experiences gathered from field trip	Extension field trip to an upazila headquarters	Visit Upazila Extension activities Assignment	Report

Reference Books

1. Agricultural Extension Manual, 2000.
2. M.H. Bhuiyan, M.A.M. Miah, M.G.R. Akanda and M.A. Bashar. 2014. Agricultural Extension Education. G-Science Implementation and publication, Dhaka, Bangladesh.
3. M.H. Bhuiyan. 2012. Generation and Diffusion of Agricultural Innovation. G-Science Implementation and publication, Dhaka, Bangladesh.
4. Statistical Pocket Book, 2015. Bangladesh Bureau of Statistics, Ministry of Agriculture, Dhaka, Bangladesh.

Department of Agricultural Statistics (AGST)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
10.	AGST 327: Biostatistics (Theory)	2	3	I
11.	AGST 328: Biostatistics (Practical)	1	3	I
Total (Theory + Practical) 2+1= 3				

Total Credit Hour	
Theory	2
Practical	1
Total	**3**

Course Code: AGST 327 **Course Title: Biostatistics (Theory)**	**Credit Hour: 2**	**Level: 3**	**Semester: I**

Rationale: This course provides a broad introduction to statistical concepts and techniques for data analysis. The subject is basically concerned with understanding of statistical practice in the field of animal science and veterinary medicine.

Course Learning Outcome: The major learning outcomes of this course are to-

- ✓ acquiring knowledge on the concepts of statistical methods and statistical inference that would help them in understanding the importance of statistics
- ✓ understanding the concepts involved in data presentation, analysis, interpretation and drawing inference
- ✓ obtaining knowledge about probability theory, tests of significance, parameter estimation, regression and correlation analytical techniques
- ✓ understanding basic experimental designs; how to plan, conduct, analyze and interpret results of basic experiments

Intended Learning Outcomes (ILOs) At the end of the course the students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ construct and interpret properties of measurement scales ✓ organize the data into a table or chart (frequency distribution) ✓ interpret graphical methods for summarizing data	**Introduction:** Definition, application, importance and uses of bio-statistics in the field of Veterinary & Animal Science, variables, scales of measurement., construction of frequency distribution from raw data, graphical representation of data	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ demonstrate the odds ratio and risk ratio ✓ differentiate the incidence and prevalence	**Concepts of Basic Quantities:** Case-control, odds ratio, risk ratio, cohort, survival function, hazard function, incidence, prevalence	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ calculate measures of central tendency for different types of variables ✓ calculate measures of variability ✓ quantify the shape of the distribution	**Measures of Central Tendency and Dispersion:** Definition of central tendency and dispersion. Different measures of central tendency and dispersion. Moments, Skewness and Kurtosis	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ demonstrate an understanding of the basic concepts of probability ✓ understand and apply the laws of probability	**Probability Theory:** Basic concepts of probability, definition of probability, variable and random variable, laws of probability	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ recognize and interpret probability distributions and their properties ✓ apply the probability distributions in relevant field	**Probability Distribution:** Binomial distribution, Poisson distribution and Normal distribution, properties and application of these distributions	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ identify a possible relationship between two continuous variables from a scatter plot. ✓ understand and interpret correlation coefficient. ✓ estimate linear regression line by OLS method and interpret	**Correlation and Regression:** Bi-variate simple linear correlation & regression, Definitions, assumptions, properties, purposes and uses, limitation	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ decide whether you will use a sample or the whole	**Sampling:** Definition, purpose of sampling, sampling methods: simple	Lecture, white board,	Class test, quiz/ assignment,

population ✓ choose an appropriate sampling method ✓ apply an appropriate method of sampling for any given set of sampling objectives	random sampling, systematic random sampling, stratified random sampling and cluster sampling	multimedia interactive discussions and problem solving	semester final examination
✓ demonstrate an understanding of the basic concepts of hypothesis testing ✓ select a proper hypothesis test and how to interpret the data. ✓ estimate and interpret p-values ✓ draw conclusions and derive meaningful information from the data	**Test of Hypothesis:** Definition, Assumption, Prerequisites of test of hypothesis, Application of Z, t, F and chi-square (χ^2) test, Significance test for (i) Correlation & Regression (ii) Specified mean (iii) Equality of two means (iv) Test of variability (v) Specified proportion (vi) Independence of attributes	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination
✓ apply and interpret the methods of analysis of variance (ANOVA) for basic designs ✓ understand strategy in planning and conducting experiments ✓ perform and interpret the F test in ANOVA ✓ analyze data and interpret the experimental results in relevant field	**Design of Experiment:** Basic ideas of an experimental design, principle of experimental design, layout, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD). Multiple comparison tests	Lecture, white board, multimedia interactive discussions and problem solving	Class test, quiz/ assignment, semester final examination

Reference Books

1. B L Agrawal. 1996. Basic statistics 3rd edition, New Age International Pvt. Ltd. New Delhi.
2. G.H. Goulden 1952. Methods of Statistical Analysis, John Wiley, New York.
3. M. Kaps & William R Lamberson 2014. Biostatistics for Animal Science, 3rd Edition
4. M.A. Ali 1969, 1973. Theory of Statistics Vol. 1 & 2, Dhaka Book Mart 38, Banglabazar, Dhaka.
5. Methods of Statistics 2017. A R Ahmed, Z A Reza, M Z Hossain
6. R.N. Shil and S.C. Debnath 1992. An Introduction to the Theory of statistics, Minati Shil and Amita, Debnath, Mymensingh.
7. S.C. Gupta & V.K. Kapoor 1982. Fundamentals of Mathematical Statistics, S. Chand and Company Ltd, Ramnagar, New Delhi.

Related Teaching References

1. G.U. Yule & M. G. Kendall. 1965. An introduction to the Theory of Statistics, Charles Griffin, London.
2. R.G.D. Steel and J.H. Torrie. 1960. Principles and Procedures of Statistics. McGraw –Hill INc. New York.
3. S. Singh and R P S. Verma. 1982. Agricultural statistics, Rama Publishers Meerut.
4. S.C. Gupta,.and V.K. Kapoor. 1988. Fundamentals of applied statistics, Chand and Com. New Delhi,
5. S.M.H. Zaman *et al*. Simple Lessons From Biometry, Published by BRRI.

Course Code: AGST 328 **Course Title: Biostatistics (Practical)**	**Credit Hour: 1**	**Level: 3**	**Semester: I**

Rationale: This course is designed to develop students' knowledge through hands on exercise about statistical methods used in the field of animal science and veterinary medicine.

Course Learning Outcome: The major learning outcomes of this course are to-

- ✓ analyzing different types of data, apply appropriate statistical techniques to summarize information usefully and informatively
- ✓ understanding the concepts of probability distributions and random variables then apply these concepts to real life situations and evaluate the conclusions
- ✓ calculating and interpret various relevant statistics from a sample and make inferences with regard to the population they represent
- ✓ testing hypothesis regarding populations by analyzing sample information and draw conclusion regarding the underlying population

Intended Learning Outcomes (ILOs) At the end of the course the students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ construct frequency distribution ✓ interpret frequency distributions for summarizing data ✓ demonstrate graphical methods for summarizing	**Frequency Distribution:** Construction of frequency distribution from raw data and graphical representation of frequency distribution.	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ calculate measures of locations ✓ interpret summary statistics for typical data ✓ calculate measures of variability ✓ assess which methods for summarizing a data set are most appropriate ✓ recognize and interpret the shape characteristic of the distribution	**Central Tendency and Dispersion:** Calculation of different measures of central tendency, dispersion, skewness and kurtosis.	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ draw and interpret scatter diagram for bivariate data ✓ calculate and illustrate the linear relationship of variables ✓ estimate the linear regression line by OLS method ✓ select, apply and interpret the results of regression methods for the analysis of data	**Correlation and Regression:** Least squares fitting of the simple linear regression line. Computation of correlation coefficient and coefficient of determination.	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ compute probabilities for binomial and Poisson distributions ✓ explain the difference between the binomial and Poisson distributions ✓ solve the problems using normal curve	**Probability Distribution:** Fitting of Poisson distribution. Solution of problems using normal curve	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ identify and state null and alternative hypotheses ✓ compute different tests statistic by hand and using statistical software ✓ explain p-values	**Test of Hypothesis:** Test of hypothesis regarding mean, variance, correlation coefficient, regression coefficient and independence of attributes	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ construct ANOVA for CRD and RBD in the relevant fields ✓ develop an experimental design that will be useful in testing the hypothesis and making conclusion ✓ identify the best treatment among the treatments and interpret the results	**Design of Experiment:** Analysis of variance and interpretation of data for CRD and RBD. Multiple comparison tests	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)
✓ construct odds and risk ratio from categorical data ✓ interpret the values for odds ratio and risk ratio in different situations	**Basic Quantities:** Computation of odd ratio, risk ratio, survival function and hazard function	Lecture, white board, multimedia, group discussions, using calculator and problem solving	Practical Examinations (Exercise solving, viva-voce and practical note book)

Reference Books

1. G.H. Goulden 1952. Methods of Statistical Analysis, John Wiley, New York.
2. J.N. Kapur & H. Sexena 1976. Mathematical Statistics, S. Chand & Company Ltd., Ramnagar, New Delhi.
3. M.A. Ali 1969, 1973. Theory of Statistics Vol. 1 & 2, Dhaka Book Mart 38, Banglabazar, Dhaka.
4. R.N. Shil and S.C. Debnath 1992. An Introduction to the Theory of statistics, Minati Shil and Amita, Debnath, Mymensingh.
5. S.C. Gupta & V.K. Kapoor. 1982. Fundamentals of Mathematical Statistics, S. Chand and Company Ltd, Ramnagar, New Delhi.
6. S.R.S. Chandel. 1984. A hand book of agricultural statistics, Achal, Prakashan Mandir Kanpur, India.

Related Teaching References

1. G.U. Yule & M. G. Kendall. 1965. An introduction to the Theory of Statistics, Charles Griffin, London.
2. R.G.D. Steel and J.H. Torrie. 1960. Principles and Procedures of Statistics. McGraw -Hill INc. New York.
3. S.M.H. Zaman *et al.* Simple Lessons from Biometry, Published by BRRI.

Department of Agronomy (AGRO)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1.	AGRO 119: Fodder Production and Management (Theory)	1	1	I
2.	AGRO 120: Fodder Production and Management (Practical)	1	1	I
Total (Theory + Practical) 2+1= 3				

Total Credit Hour	
Theory	1
Practical	1
Total	**2**

Course Code: AGRO 119 **Course Title: Fodder Production and Management (Theory)**	**Credit Hour: 1**	**Level -1**	**Semester-I**
Rationale: This course is designed to provide fundamental concepts of Agronomy, and different agronomical practices involved in fodder production and management.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ illustrate agronomy, fodder crops, cropping seasons, seed, tillage, manures and fertilizers, and intercultural operation ✓ operate fodder crop production and their management ✓ describe pasture and its establishment, management, and feasibility in Bangladesh			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategy**	**Assessment Strategy**
✓ explain agronomy ✓ identify fodder crops ✓ compare cropping seasons ✓ interpret seed and seeding, and tillage and tilth ✓ recognize manures and fertilizers ✓ describe intercultural operations	**Introduction:** Introduction to Agronomy, scope of Agronomy and fodder crops, relationship of Agronomy with crop-livestock interactions, cropping seasons of Bangladesh, agronomic classification of crop and forage, tillage and tilth, seed and seeding, management of manures and fertilizer, intercultural operations of forage crops	Class lecture, Discussion, Question & Answer, Assignment, Group discussion, Feedback, Reporting	Class test, Quiz, Report writing, Class attendance, Evaluation
✓ classify fodder crops ✓ recognize origin and distribution, botanical description of fodder crops ✓ predict climate and soil requirements ✓ demonstrate production technologies for different fodder crops	**Production technology of fodder crops** **Forage crops:** Napier grass, para grass, german grass, star grass, guinea, splendida, pangola, triticale, barseem, lucern or alfalfa, etc**.** **Cereal crops:** Maize, barley, oat, etc. **Millet crops:** Sorghum, bajra, cheena, kaon, etc. **Pulse crops:** Cowpea, grasspea, fieldpea, soybean, black gram, etc. Fodder tree: Ipil-Ipil, babla, jackfruit tree leaves, etc.	Class lecture, Discussion, Question & Answer, Assignment, Group discussion, Feedback, Reporting	Class test, Quiz, Report Writing, Class attendance, Evaluation
✓ classify pasture ✓ operate pasture and its management, and establishment ✓ predict feasibility of pasturing in Bangladesh	**Pasture and pasture management**: Concept, classification and importance of pasture, pasture establishment, management of pasture and pasture herbage utilization, feasibility of pasturing in Bangladesh	Class lecture, Discussion, Question & Answer, Assignment, Group discussion, Feedback, Reporting	Class test, Quiz, Report Writing, Class attendance, Evaluation
Reference Books 1. A. Goffart. 2017. The Ensilage of Maize, and Other Green Fodder Crops. WENTWORTH Press, Paris. 2. A. Kumar, M.A. Khan and Singh, S. 2013. Forages and Fodder: Indian Perspective. Daya Publishing House, India. 3. B. Boller, U.K. Posset and Veronesi F. (Eds.). 2009. Fodder Crops and Amenity Grasses. Springer, New York. 4. G. D. Chandra. 1997. Fundamentals of Agronomy. Oxford & IBH Publishing Company Private, Limited. 5. J.J.B. Jones. 2002. Agronomic Handbook: Management of Crops, Soils and Their Fertility, CRC Press. 6. L.R. Humphreys. 1987. Tropical Pastures and Fodder Crops. Longman Scientific & Technical. 7. S.C. Panda. 2011. Crop Production and Tillage, AGROBIOS Publication, New Delhi, India. 8. S.C. Panda. 2014. Agronomy, AGROBIOS Publication, New Delhi, India. 9. V.C. Srivastava. 2014. Modern Principles of Agronomy, AGROBIOS (India).			

Course Code: AGRO 120 **Course Title: Fodder Production and Management (Practical)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**
Rationale: This course provides practical knowledge on fodder crops, seeds, weeds, manures and fertilizers, farm implements, intercultural operations, silage, hay and raising fodder crops			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ recognize fodder crops, seeds, related weeds, manures and fertilizers and farm implements ✓ calculate seed germination and seed rate of fodder crops ✓ perform fodder crop raising ✓ recommend different intercultural operations ✓ invent preparation of silage and hay			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify fodder crops, seeds and related weeds ✓ predict manures and fertilizers ✓ operate agricultural implements and their functions	Identification of fodder crops, seeds and related weeds, manures and fertilizers, farm implements	Class lecture, Visual presentation, Field visit, Discussion, Field work, Feedback	Practical examination Oral examination Practical Note Book, Class attendance Report writing
✓ compute seed germination percentage and seed rate of fodder crops	Germination test of fodder seed, Determination of seed rate of fodder crops	Class lecture, Discussion, Question & Answer, Group discussion, Problem calculation Laboratory experiment, Feedback	Practical examination Oral examination, Practical Note Book, Class attendance Report writing
✓ demonstrate fodder crop raising and relevant agronomic operations	Cultivation of fodder crops in the agronomy field, Practicing weeding, roguing, thinning, gap filling, mulching and top-dressing	Class lecture, Discussion, Question & Answer, Group discussion, Field work, Feedback	Practical examination, Oral examination, Practical Note Book, Class attendance Report writing
✓ implement silage and hay preparation	Preparation of silage, hay	Class lecture, Multimedia presentation, Visual presentation, Demonstration, Group discussion, Feedback	Practical examination, Oral examination, Practical Note Book, Class attendance Report writing
✓ investigate fodder production and processing farm/Research Institute	Visit to a fodder production farm/Research Institute	Class lecture, Visual presentation, Group discussion Demonstration, Visit, Feedback	Practical examination Oral examination Class attendance, Practical Note Book, Report writing

Reference Books

1. B. Boller, Posset, U.K. and Veronesi F. (Eds.). 2009. Fodder Crops and Amenity Grasses. Springer, New York
2. BARI. 2017. Krishi Projukti Hat Boi. Bangladesh Agricultural Research Institute. Joydebpur, Gazipur.
3. BRRI. 2017. Adunik Dhaner Chash (Modern rice cultivation). 20th edition Booklet no. 5, Bangladesh Rice Res. Inst. Joydebpur, Gazipur
4. O. CopelandL. 2005. Principles of Seed Science and Technology (4th Ed.). Bargress Publishing Co. Minnesota, USA.
5. S.S. Ranaand and Rana, M.C. 2011. Cropping System. Department of Agronomy, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India.
6. S.S. Singh. 2008. Principle and Practices of Agronomy. Kalyani Publishers. New Delhi, India
7. V.C. Srivastava. 2014. Modern Principles of Agronomy, AGROBIOS (India).

Department of Biochemistry (BIOC)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
14.	BIOC 161: Chemistry of Biomolecules (Theory)	3	1	II
15.	BIOC 162: Chemistry of Biomolecules (Practical)	2	1	II
Total (Theory + Practical) 3+2= 5				

Total Credit Hour	
Theory	3
Practical	2
Total	**5**

Course Code: BIOC 161 **Course Title: Chemistry of Biomolecules (Theory)**	**Credit Hour: 3**	**Level: 1**	**Semester: II**
Rationale: The course is designated to provide knowledge on understanding the chemical basis of life and metabolism process of biomolecules with emphasis on animals.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire knowledge on biomolecules ✓ implement different modern techniques of molecular biology ✓ paraphrase different process of metabolism in living system ✓ conceptualize enzyme, vitamins relevant animal hormone			
Intended Learning Outcome (ILOs) At the end of the course student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ define biochemistry ✓ describe different cell organelle ✓ explain necessity of biochemistry and molecular biology	**Introduction to biochemistry**: Scope and importance, cell organelles and their functions, water and life	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final
✓ state biochemistry ✓ conceptualize carbohydrates and its sources ✓ classify different carbohydrates and their function in living system ✓ compare different carbohydrates related to the function ✓ explain carbohydrates metabolism and different biochemical pathway	**Chemistry of carbohydrates**: Occurrence, definition, classification, physical and chemical properties, chemistry of monosaccharides, disaccharides and polysaccharide, composition- chemical linkages of disaccharide, oligosaccharide and polysaccharide with special reference to starch, glycogen, cellulose, inulin, chitin and cell wall polysaccharides **Metabolism of Carbohydrates (Ruminent and non-ruminent animal):** TCA cycle, gluconeogenesis, anaplerotic pathway, hexos monophosphate shunt, cori cycle, regulation of TCA cycle and glycolysis, glycogenesis, glycogenolysis, electron transport chain and oxidative phosphorylation	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final
✓ identify proteins and their sources ✓ compare different types of proteins and their function ✓ knowing protein synthesis process in living system	**Chemistry of proteins**: Classification, amino acids and their classification, reactions in protein chemistry, food protein quality evaluation, denaturation, Proteome of animal proteins **Metabolism of Proteins**: Basic processes of amino acid catabolism,	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final

✓ explain details about amino acid and biochemical pathway of proteins	nitrogen excretory products in ruminant and nonruminent animals, Transamination, deamination, decarboxylation		
✓ discuss different lipids and their sources ✓ explain how lipid metabolism occur ✓ summarize saturated and unsaturated fatty acids and their importance in living system	**Chemistry of lipids**: Classification and biological functions, fatty acids, their classification and distribution, Omega 3- and omega 6-fatty acids, importance of polyunsaturated fatty acids, rancidity **Metabolism of lipids**: Fatty acid oxidation, biosynthesis of fatty acids and cholesterol, role of free radicals in lipid oxidation, antioxidant and lipoproteins	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final
✓ recall nucleic acid, molecular biology and its implementation ✓ describe different molecular techniques. ✓ explain different steps and molecular tools related to the recombinant DNA technology, gene expression and replication technique	**Molecular biology**: Concepts of molecular biology, Composition and structural features, physic-chemical functions of nucleic acids, replication, transcription and translation, biological function of restriction enzymes, concept of recombinant DNA and cloning, comparative study of DNA and RNA, Codon and their representing amino acids, Gene and gene expression, Extraction of DNA form fish fins, PCR, Gel electrophoresis	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final
✓ understanding enzymes and its classification ✓ comparison among coenzyme, prosthetic group, Isozyme, zymogen	**Enzymes**: Classification, elements of kinetics, mode of action and inhibition, coenzyme and prosthetic groups, allosteric enzyme, lysozymes, enzyme immobilization	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final
✓ understanding vitamins, their sources and deficiency symptoms ✓ compare different vitamins, their biochemical function and dietary allowance in human body	**Vitamins**: Definition, classification, food sources, dietary allowance, deficiency, structure and biochemical functions, co-enzyme activities	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final

✓ explain different animal hormones and their biochemical functions	**Animal Hormones:** Chemical nature, classification and biochemical functions	Lecture Discussion Multimedia Presentation Video-clip	Quiz Class test Assignment Semester final

Reference Books

1. E. Eric Conn, K. Paul Stumpf, G. Brueming and H. Roy Doi. 1987. 0utlines of Biochemistry. John Wiley and Sons, New York.
2. E.S. West, R. Wilber Todd, S. Haward Mason and T. John Van Bruggan. 1966. Text Book of Biochemistry. 4th, Edition. The Macmillan Company. Collier-MaCmillan Ltd. London.
3. L. Albert Lehninger. 2008. Biochemistry. 5th edition. Kalyani Publishers. Ludhiana, New Delhi.
4. L. Stryer. 1986. Biochemistry. Published by S.K. Jain for CBS Publishers and Distributors, 485 Jain Bhawan, Bola Nath Nagar, Delhi, India.
5. W. David Martin, Jr. Peter A. Mayes, Victor W. Rodwell and Davy K. Harper's. 1983. Review of Biochemistry. Granner. 20th Edition, 1983. Lange Medical Publication. Drawer L. Los, Altos, California, USA.

Course Code: BIOC 162 **Course Title: Chemistry of Biomolecules (Practical)**	**Credit Hour: 2**	**Level: 1**	**Semester: II**
Rationale: This course is designed to provide a practical concept of different biomolecules.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ acquire practical knowledge on different biomolecules ✓ distinguish different techniques on biomolecules and metabolism ✓ detect and interpret different biomolecules in blood and urine			

Intended Learning Outcome (ILOs) At the end of the course student will be able to-	**Course content**	**Teaching Strategies**	**Assessment Strategies**
✓ convert different concentration of solutions ✓ crepare solutions of different concentration	Preparation of solutions.	Discussion Demonstration Multimedia presentation Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ compare among different solutions ✓ implement pKa value of solutions	Determination of pKa value.	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ construct buffer solutions ✓ execute pH of different solutions	Preparation of buffer solutions and determination of pH.	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ isolate starch from different sources ✓ interpret the activity of enzyme of carbohydrate	Starch isolation and Activity of salivary amylase	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ distinguish among different tests related to the carbohydrates and proteins ✓ demonstrate qualitative tests	Qualitative tests of carbohydrates and proteins.	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ formulate solutions related to the sugar separation ✓ paraphrase the procedure of using TLC	Separation and identification of sugars and amino acids by TLC	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance

✓ compare reducing and non-reducing sugars ✓ implement the procedure of estimating reducing sugars	Determination of reducing sugars	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ identify sugars and protein from animal source ✓ sketch sugars and proteins in blood and urine	Detection of sugars and proteins in blood and urine	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ show tests related to the fats solubility ✓ summarize different soluble fats	Solulbility tests for fats.	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance
✓ apply procedure of determining vit-c and thiamine. ✓ represent vitamin-c and thiamine status	Estimation of vitamin C and thiamine.	Discussion Demonstration Multimedia presentation Farm/Lab work Feedback	Quiz, Demonstration, Skill test, Practical note book, Presentation, Oral test, Class attendance

Reference Books

1. Biochemical Calculations. How to Solve Mathematical Problem in General Biochemistry, by Irwin H. Segel 1968. John Wiley and Sons, Inc. New York.
2. D.C. Washington. 1990. Association of Official Analytical Chemists (AOAC), Official Methods of Analysis.
3. F. M. Strong 1965. Biochemistry Laboratory Manual. WM.C. Brown Company Publishers, USA.
4. G. Litwack. 1960. Experimental Biochemistry. A Laboratory Manual. John Liley and Sons. Inc, New York.
5. H. Varley, Gowelock, A.H. and Bell, M. 1980. Practical Clinical Biochemistry. Vol. 1. William Heinemann Medical Books Ltd. London, U.K.
6. S. Chaykin. 1970. Biochemistry Laboratory Techniques. Wiley Eastern Private Limited, New Delhi.
7. T. Davit Plummer.1995. An introduction to practical Biochemistry. Tata McGraw-Hill Publishing Company Limited, New Delhi.

Department of Development and Poverty Studies (DEPS)
Course Layout

Sl. No.	Course Code and Course Title	Credit Hour	Level	Semester
1.	DEPS 121. Rural Sociology (Theory)	2	1	I
Total (Theory + Practical) 2+0= 2				

Total Credit Hour	
Theory	2
Practical	0
Total	**2**

Course Code: DEPS 121 **Course Title: Rural Sociology (Theory)**	**Credit Hour: 2**	**Level: 1**	**Semester: I**
Rationale: The sociology course is accommodating contemporary socio-cultural, economical and human relationships under diversified socio-cultural system. This course will enrich students' knowledge to overcome their prejudices, misconceptions, egoistic ambitions, class and religious hatreds as well as boost up the level of tolerance among multicultural communities.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ develop knowledge on diversified cultures and overall socio-economic issues and its changes ✓ enhance the analytical thinking regarding human interaction, social organization, collective behavior, aspects of the total social system ✓ address the human relationships and emerging contemporary social problems under changing society			
Intended Learning Outcomes (ILOs) The student will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ describe rural sociology its meaning origin and development ✓ comprehend the role of rural sociologists and their relation with rural community ✓ explore socio-economic and cultural significance of animal husbandry its tradition and changes	**Rural Sociology:** Origin, Meaning, Importance and nature of rural sociology, role of rural sociologists and rural community, relevance of rural sociology in animal husbandry	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type
✓ discuss about society, ✓ community and association ✓ develop knowledge on institution, social groups ✓ isolations, group's networks	**Primary Concepts:** Basic concepts of society, institution and social groups	Lecture, Visual presentation Feedback assessment	Quiz Short answer Essay type
✓ acquire knowledge on culture and its diversity. ✓ boost up level of tolerance and maintain socio cultural harmony among multicultural environment	**Culture**: Culture and its elements; norms, values, folkways, mores, cultural traits, cultural unity and diversity	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type
✓ realize the concepts and meaning of social interaction and its role in society	**Social Process:** Human interaction as the base of a society and its development	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type

✓ realize family, kinship relationships and its importance under changing situation ✓ develop respect, sympathy and ethical values among the family members	**Social Institutions:** Family, types and its functions, role of family and kinship bondage	Feedback assessment Lecture Interactive discussion	Quiz, Short answer Essay type
✓ describe social structure and class relations ✓ elicit transformation of social structure over time	**Social Stratification:** Definition, types of social stratification, the caste and class system	Lecture Interactive discussion	Quiz Short answer Essay type
✓ explain population growth, its mechanism and consequence ✓ extract the ideas about migration and its consequences in society ✓ realize gender and its changing role in population growth	**Population:** Concept of demography, fertility, mortality, migration, theories of population, gender and sexuality	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type
✓ analyze contemporary social problems its nature, scope and causes ✓ find the path to way out of these problems	**Social problems**: Overpopulation, slums, women harassment, corruption, and social unrest	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type
✓ evaluate the structural change of the society ✓ explain the path of social change its mechanism and related eminent theories	**Social Change:** Definition, causes and Factors of social change, theories of social change	Lecture Interactive discussion	Quiz, Short answer Essay type
✓ explain rural and urban society and livelihood ✓ illustrate economic and cultural significance of animal husbandry ✓ describe social capital, trust and fatalism	**Rural Society:** Rural community and livelihood, rural farming, and urban society	Lecture Visual presentation Interactive discussion	Quiz Short answer Essay type

Reference Books

1. A. Giddens. Sociology.2014. Simon Griffiths Polity. UK.
2. C.N.S. Rao. Sociology. 2012. S. Chand & Company ltd. New Delhi.
3. H.B. Frederick, O. F. Larson, G. W. Gillespie Jr. The Sociology of Agriculture. 1990.

Greenwood Press. New York.
4. J.B. Chitamber. Introductory Rural Sociology. 2003. New Age International (P) Limited, New Delhi.
5. R.T. Schaefer. Sociology. 2010. McGraw Hill, New York.
6. T.B. Bottomore. Sociology: A Guide of Problem and Literature.1972. Allen and Unwin, London.

Department of Language (ENGL)
Course Layout

Sl. No.	Course Code and Title	Credit Hour	Level	Semester
1	ENGL 123: Advanced English Language Skills (Theory)	1	1	I
2	ENGL 124: Advanced English Language Skills (Practical)	1	1	1
Total (Theory + Practical) 1+1 = 2				

Total Credit Hour	
Theory	1
Practical	1
Total	**2**

Course Code: ENGL 123 **Course Title: Advanced English Language Skills (Theory)**	**Credit Hour: 1**	**Level: 1**	**Semester: I**

Rationale: This course is designed to make students develop their communicating skills in English language in both academic and practical life.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ make students attain basic competence in English language that includes all the four skills i.e. listening, speaking, reading and writing
- ✓ improve grammatical knowledge and vocabulary
- ✓ emphasize particular focus on writing skills
- ✓ prepare students competent in communicative skills

Intended Learning Outcomes (ILOs) The students will be able to -	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ communicate with english speakers' speech correctly and contact without inhibition ✓ learn the technique of listening	**Listening:** Listening to isolated words, utterances; listening to connected speech	Lecture Discussion Group works Pair works using audio cassettes of pronunciation regarding course book	Quiz/MCQ Short answer Essay type answer Oral test Class attendance
✓ communicate fluently with correct pronunciation and without grammatical mistakes ✓ learn how to frame w/h questions ✓ perform better in speech delivery	**Speaking:** Functions (practical usage e.g. agreement, disagreement, order, request, apology); dialogues; story telling	Lecture Discussion Multimedia Group works Pair works	Quiz/MCQ Short answer Essay type answer Oral test Class attendance
✓ join sentences and construct sentences according to different grammatical context ✓ explain both academic and nonacademic reading in time constraint ✓ predict information by using different types of reading strategy	**Reading:** Reading for specific information, general information, text organization, grammar in context, subject-verb agreement, sentence structures, modals, conditionals, degree of comparison, knowing vocabulary items: technical words, confusing foreign words and phrases, British and American words, apostrophes, prefix, suffix, preposition, phrasal verbs, conditional sentences, homophones, homograph	Lecture Discussion Multimedia presentation Group works Pair works	Quiz/MCQ Short answer Essay type answer Class attendance
✓ practice different techniques of creative writing ✓ demonstrate knowledge of writing skill in formal as well as informal way ✓ interpret data and graphics text ✓ summarize broad version of writing piece within limited sentences	**Writing:** Writing paragraphs using different techniques, summary writing, story writing; letters: formal letter, informal letter, inquiry letter, cover letter, CV, resume; report: report to newspaper, writing agendas, press release, memorandum; writing essays: argumentative, expository, descriptive, narrative, creative writing; story completing, describing picture, interpret data	Lecture Discussion Multimedia presentation Group works Pair works Assignment	Quiz/MCQ Short answer Essay type answer Class attendance Report

Reference Books

1. A. Baker. 2006. Ship or Sheep? An Intermediate Pronunciation Course. 3rd Edn. Cambridge University Press, Cambridge.
2. A. Mountford. 1995. English in Agriculture. 8th Edn. Oxford University Press, Oxford.
3. A.M. Pyle and M.E. Munoz. 1995. CLIFFS TOEFL Preparation Guide. 4th Edn. Cliffs Cassettes Publication.
4. A.S. Hornby. 2010. Oxford Advanced Learners Dictionary. 7th Edn. Oxford University Press, Oxford.
5. Barry and S. MaCarter. 2007. Improve your IELTS: Listening and Speaking Skills. Macmillan Education, Towns Road, Oxford.
6. D. Hopkins and M. Nettle. 2006. Passport to IELTS. New Revised Edn. Pearson Education Limited.
7. D. Hopkins and P. Cullen. 2007. Cambridge Grammar for IELTS. Cambridge University Press, Cambridge.
8. J. Seely. 2005. Oxford Guide to Effective Writing and Speaking. 2nd Edn. Oxford University Press, Oxford.
9. J.D. O'Conner. 1980. Better English Pronunciation. 2nd Edn. Cambridge University Press, Cambridge.
10. M. Maniruzzman. 2002. Basic English Language Skills. Friends Book Corner, Dhaka.
11. Q.M. Billah, G.S. Chowdhury and M. Alam. 2005. Foundation English for Undergraduates. 2nd Edn. Friends Publication, Dhaka.
12. R.R. Jordan. 1986. Academic Writing Course. Collins Publication.
13. Sheikh Mujibor Rahman. 2016. The Unfinished Memoirs. 2nd Edn. University Press Limited, Dhaka.

Course Code: ENGL 124 **Course Title: Advanced English Language Skills (Practical)**	**Credit Hour: 01**	**Level: 1**	**Semester: I**

Rationale: This course is designed to make students develop their communicating skills in English language in both academic and practical life.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ make the students fluent in speaking in English language
- ✓ emphasize on accurate pronunciations
- ✓ enrich the listening skills
- ✓ practice other communicative and creative skills
- ✓ build up the quality of leadership

Intended Learning Outcomes (ILOs) The students will be able to -	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ learn the techniques of listening ✓ listen to the speakers perfectly	**Listening:** Listening to utterances and connected speech	Lecture Discussion Dialogue Group works Pair works using audio cassettes/CDs of pronunciation regarding course book	Quiz Short answer Oral test Class attendance
✓ develop pronunciation skills ✓ speak fluently ✓ learn to make questions ✓ increase the extrovert qualities	**Speaking:** IPA symbols; dialogues; story telling; W/H questions	Lecture Discussion Multimedia Group works Pair works	Quiz Short answer Practical note book Oral test Class attendance
✓ explain both academic and nonacademic reading in time constraint ✓ increase vocabulary	**Reading:** Reading comprehension; reading for specific information, general information; knowing vocabulary items	Lecture Discussion Group works Pair works	Quiz Short answer Oral test Class attendance
✓ practice different types of creative and writing methods ✓ develop different strategies of writing	**Writing:** Movie review; story completion; report writing; describing picture	Lecture Discussion Multimedia Group works Pair works	Quiz Short answer Essay type Practical note book Report Class attendance
✓ improve the leadership quality ✓ present any topic perfectly ✓ overcome the introvert attitude	**Presentation:** Presenting selected topics individually and in a group	Lecture Discussion Multimedia Group works Pair works Individual work	Presentation Questioning Answering Class attendance

Reference Books

1. A. Baker. 2006. Ship or Sheep? An Intermediate Pronunciation Course. 3rd Edn. Cambridge University Press, Cambridge.
2. A. Mountford. 1995. English in Agriculture. 8th Edn. Oxford University Press, Oxford.
3. A.M. Pyle and M.E. Munoz. 1995. CLIFFS TOEFL Preparation Guide. 4th Edn. Cliffs Cassettes Publication.
4. A.S. Hornby. 2010. Oxford Advanced Learners Dictionary. 7th Edn. Oxford University Press, Oxford.
5. Barry and S. MaCarter. 2007. Improve your IELTS: Listening and Speaking Skills. Macmillan Education, Towns Road, Oxford.
6. D. Hopkins and M. Nettle. 2006. Passport to IELTS. New Revised Edn. Pearson Education Limited.
7. D. Hopkins and P. Cullen. 2007. Cambridge Grammar for IELTS. Cambridge University Press, Cambridge.

8. J. Seely. 2005. Oxford Guide to Effective Writing and Speaking. 2nd Edn. Oxford University Press, Oxford.
9. J.D. O'Conner. 1980. Better English Pronunciation. 2nd Edn. Cambridge University Press, Cambridge.
10. M. Maniruzzman. 2002. Basic English Language Skills. Friends Book Corner, Dhaka.
11. Q.M. Billah, G.S. Chowdhury and M. Alam. 2005. Foundation English for Undergraduates. 2nd Edn. Friends Publication, Dhaka.
12. R.R. Jordan. 1986. Academic Writing Course. Collins Publication.

Internship Program

Sl. No.	Course code and Title	Credit Hour	Level	Semester
17.	INCP 552: Veterinary Clinical Practices (Practical)	7	5	II
18.	INFP 554: Farm Management Practices (Practical)	6	5	II
19.	INLP 556: Laboratory, Development & Extension Practices (Practical)	5	5	II
20.	INLP 558: Seminar & Report Writing (Practical)	3	5	II
Total (Theory + Practical) 0+21 = 21				

Total Credit Hour	
Theory	0
Practical	21
Total	**21**

Course Code: INCP 552 **Course Title: Veterinary Clinical Practices (Practical)**	**Credit Hour: 7**	**Level: 5**	**Semester: II**

Rationale: This course is designed to offer real life work experience as well as to develop skill and confidence on veterinary clinical practices.

Course Learning Outcomes: The major learning outcomes of this course are to-

- ✓ employ and refine skills on clinical restraining, physical and clinical examination, field-based diagnosis and prognosis in different clinical cases
- ✓ develop clinical skill on field cases in terms of diagnosis, treatment, control and prevention of diseases in different animals and birds
- ✓ solve clinical cases with their diagnosis, treatment, control & prevention in different animals and birds
- ✓ improve surgical skill in field cases in different animals and birds
- ✓ demonstrate public health practices in the field
- ✓ interpret slaughter houses hygiene practices in relation to public health aspect
- ✓ develop network with professionals in the field

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ perform clinical restraining, physical and clinical examination ✓ interpret field-based diagnosis and prognosis in different clinical cases ✓ solve clinical cases with their diagnosis, treatment, control & prevention	Farm Animal Clinical Medicine Practices	Lecture Interactive discussion Demonstration Visual presentation Clinical work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ perform clinical restraining, physical and clinical examination ✓ interpret field-based diagnosis and prognosis in different clinical cases ✓ solve clinical cases with their diagnosis, treatment, control & prevention	Pet & Avian Clinical Medicine Practices	Lecture Interactive discussion Demonstration Visual presentation Clinical work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ perform clinical restraining, physical and clinical examination ✓ interpret field-based diagnosis and prognosis in different clinical cases ✓ solve clinical cases with their diagnosis, treatment, control & prevention	Zoo, Lab, Wild & Aquatic Animal Clinical Medicine Practices	Lecture Discussion Demonstration Visual presentation Clinical work Brain storming	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ translate farm animal anesthesia ✓ perform localized and generalized surgeries ✓ implement post-operative surgical management	Farm Animal Clinical Surgery Practices	Lecture Interactive discussion Visual presentation Clinical work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ translate pet & avian anesthesia ✓ perform localized and generalized surgeries ✓ implement post-operative surgical management	Pet & Avian Clinical Surgery Practices	Lecture Interactive discussion Visual presentation Clinical work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ perform physical, clinical and gynecological examination ✓ interpret diagnosis & prognosis ✓ plan treatment and prevention of reproductive clinical cases ✓ perform obstetrical surgeries in clinical cases	Reproductive Health Clinical Practices	Lecture Interactive discussion Visual presentation Clinical work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Skill Test
✓ demonstrate public health practices in the field ✓ describe occupational health hazards and environmental pollution ✓ explain one health concept to human, animal and environmental aspects ✓ distinguish food borne diseases ✓ interpret slaughter houses hygiene practices in relation to public health aspect	Public Health & Slaughter Houses Hygiene Practices	Lecture Interactive discussion Visual presentation Field work Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer Report

Reference Books

7. A. Chakrobarti. 2007. A Textbook of Clinical Veterinary Medicine. 2nd Edn. Kalyani Publishers, India.
8. A. Venugopalon. 2009. Essentials of Veterinary Surgery. 8th Edn. CBS, India
9. A.H. Anderews. 1990. Outline of Clinical Diagnosis in Cattle. 1st Edn. Butterworths and Company, UK.
10. J.J. Oconnor. 1980. Dollar's Vetrinary Surgery. CBS, India
11. L.F. Susan Norm and N.G. Ducharme. 2016. Farm Animal Surgery. 2nd Edn. Elsevier. USA
12. O.M. Radostits, C.C. Gay, K.W. Hinchcliff and P.D. Constable. 2006. Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats (Radostits, Veterinary Medicine) 10th Edn. Saunders Ltd. (Elsevier) USA.
13. P.J.N. Pinsent and C.J. Fuller. 1997. Outline of Clinical Diagnosis in Horse. 1st Edn. Blackwell Science, Oxford, U.K.
14. S.E. Aiello & Michael A. Moses. 2016. The Merck Veterinary Manual. 11th Edn., John Wiley & Sons, Inc. USA.

Course Code: INFP 554 **Course Title:** Farm Management Practices (Practical)	**Credit Hour: 06**	**Level: 5**	**Semester: II**
Rationale: This course is designed to offer practical work experience as well as to develop skill and confidence on farm management practices.			
Course Learning Outcomes: The major learning outcomes of this course are to- ✓ develop entrepreneurship and managerial skill for managing various livestock-oriented farms and industry ✓ make the skilled personnel or consultant for solving the various problems in the farms and industry			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ plan and design beef cattle and dairy farm ✓ perform all kinds of operations practiced in beef cattle and dairy farms ✓ develop farm managerial skill	Beef catlle & dairy farm practices	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test
✓ plan and design various types of poultry farms ✓ perform all kinds of operations practiced in various poultry farms ✓ develop farm managerial skill	Poultry farm practices	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test
✓ plan and design sheep and goat farm & zoo ✓ perform all kinds of operations practiced in sheep and goat farm & zoo ✓ develop managerial skill for sheep and goat farm & zoo	Sheep, goat & zoo animal management practices	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test
✓ plan and design meat, milk, egg & by-products processing plants ✓ perform all kinds of operations practiced in various processing plants ✓ develop managerial skill for processing plant	Meat, milk, egg processing and livestock by-products technology	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test
✓ plan and design feed mill industry ✓ cultivate, harvest and process of fodder ✓ perform all kinds of operations practiced in feed mill industry ✓ develop managerial skill for feed mill industry	Feeds & fodder processing and feed industry	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test
✓ plan and design A.I. & breeding center ✓ perform A.I. & breeding techniques ✓ perform all kinds of operations practiced in A.I. & breeding center ✓ develop managerial skill for A.I. & breeding center	A.I. & breeding practices	Lecture Visual presentation Interactive discussion Brain storming Feedback	Attendance Assignment Presentation Logbook Question & Answer Skill Test

Reference Books

1. G.C. Benerjee. 2011. A Text Book of Animal Husbandry. 8th edition, Oxford and IBH publishing Co. New Delhi, 11001 India.
2. M.K. Rai. 2012. Textbook of Animal Husbandry. Oxford Book Co.
3. J.W. Copland. 1985. Evaluation of large ruminants for the tropics, ACIAR Proceeding series no. 5.
4. T.N. Edey. 1983. Tropical Sheep and Goat Production. AUIDP, Canberra, Australia.
5. P.K. Tripathi, Goel. 2013. Small Ruminant Production and Health. Satish Serial Pub.
6. J.V. Cheeran. 2008. Text Book of Wild and Zoo Animals: Care and Management. International Book Distribution Co.
7. F. Toldra. 2010. Hand book of Meat Processing. Wiley-Blackwell.
8. H.W. Ockerman & C.L. Hansen. 2000. Animal By-product Processing and Utilization. Technomic Publishing Co.

Course Code: INLP 556 **Course Title: Laboratory, Development & Extension Practices (Practical)**	**Credit Hour: 5**	**Level: 5**	**Semester: II**

Rationale: The course is designed to provide internship knowledge of laboratory, development & extension practices.

Course Learning Outcomes: The prime learning outcomes of this course are to-

- ✓ acquire fundamental knowledge on clinical pathology of animal and bird
- ✓ obtain knowledge on vaccine production & lab techniques
- ✓ achieve knowledge on public health & slaughter houses practices
- ✓ gain basic information about clinical pharmacy
- ✓ attain knowledge on rural camp (motivation, extension, treatment & vaccination)

Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ identify different pathological conditions of external & internal body parts and organs ✓ interpret different disease conditions by observing pathological situation	Clinical Pathology of animal and bird	Lecture Interactive discussion Demonstration Visual presentation Clinical work Brain storming Video clip Photography Feedback	Attendance Assignment & presentation Logbook Question & Answer
✓ explain skill of manufacturing protocol of vaccines ✓ perform different lab techniques	vaccine production & lab techniques	Lecture Interactive discussion Visual presentation Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer
✓ express knowledge about public health consequence ✓ demonstrate slaughter house practices	public health & slaughter houses practices	Lecture Interactive discussion Visual presentation Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer
✓ apply different aspect of clinical pharmacy	Clinical Pharmacy	Lecture Interactive discussion Visual presentation Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer
✓ perform motivation, extension, treatment and vaccination	Rural Camp (Motivation, Extension, Treatment & Vaccination)	Lecture Interactive discussion Visual presentation Brain storming Feedback	Attendance Assignment & presentation Logbook Question & Answer

Reference Books

12. A.J. Morley. Poultry Husbandry. TATA Mc GRAW-HILL Publishing Co. LTD, New Delhi, India.
13. C.G. Scanes, G. Brant and M. E. Ensminger. 2004. Poultry Science (4th Edition). Pearson Prentice Hall,2004.
14. D. Sapcota, D. Narahari and J.D. Mahanta. 2018. Avian (Poultry) Production. New Indian Publishing Agency. 2nd Revisedand Enlarged Edition, New Delhi. India.
15. G.C. Banerjee. 1988. Feeds and Principles of Animal Nutrition. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.
16. G.C. Banerjee. 2011. A Text Book of Animal Husbandry. Oxford & IBH Publishing CO. LTD. New Delhi, India.

Course Code: INLP 558 **Course Title: Seminar & Report Writing (Practical)**	**Credit Hour: 3**	**Level: 5**	**Semester: II**
Rationale: The course is designed to provide internship knowledge of seminar and report writing.			
Course Learning Outcomes: The prime learning outcomes of this course are to- ✓ obtain fundamental knowledge on seminar and report writing			
Intended Learning Outcomes (ILOs) The students will be able to-	**Course Content**	**Teaching-Learning Strategies**	**Assessment Strategies**
✓ present seminar and prepare report ✓ write down the report on seminar in accordance with standard way	Seminar and Report Writing	Interactive discussion Demonstration Multimedia presentation Feedback	Attendance Assignment & presentation Logbook Question & Answer