

**CURRICULUM
OF
Doctor of Veterinary Medicine (DVM)
for
5-Year Composite Degree Program**

(Revised 2010)



**HIGHER EDUCATION COMMISSION
ISLAMABAD**

CURRICULUM DIVISION, HEC

Dr. Syed Sohail H. Naqvi	Executive Director
Prof. Dr. Altaf Ali G. Shaikh	Member (Acad)
Miss Ghayyur Fatima	Director (Curri)
Dr. M. Tahir Ali Shah	Deputy Director (Curri)

Composed by: Pakeeza Yousuf, HEC, Islamabad

CONTENTS

1.	Introduction	6
2.	Template for 5-year Composite Degree programme in DVM	15
3.	Scheme of Studies for 5-year in DVM	18
4.	Detail of Courses for 5-year Composite Degree Programme in DVM	21
5.	Details of Compulsory Courses	98

PREFACE

The curriculum of subject is described as a throbbing pulse of a nation. By viewing curriculum one can judge the stage of development and its pace of socio-economic development of a nation. With the advent of new technology, the world has turned into a global village. In view of tremendous research taking place world over new ideas and information pours in like of a stream of fresh water, making it imperative to update the curricula after regular intervals, for introducing latest development and innovation in the relevant field of knowledge.

In exercise of the powers conferred under Section 3 Sub-Section 2 (ii) of Act of Parliament No. X of 1976 titled “**Supervision of Curricula and Textbooks and Maintenance of Standard of Education**” the erstwhile University Grants Commission was designated as competent authority to develop review and revise curricula beyond Class-XII. With the repeal of UGC Act, the same function was assigned to the Higher Education Commission under its Ordinance of 2002 Section 10 Sub-Section 1 (v).

In compliance with the above provisions, the HEC undertakes revamping and refurbishing of curricula after regular intervals in a democratic manner involving universities/DAIs, research and development institutions and local Chamber of Commerce and Industry. The intellectual inputs by expatriate Pakistanis working in universities and R&D institutions of technically advanced countries are also invited to contribute and their views are incorporated where considered appropriate by the National Curriculum Revision Committee (NCRC).

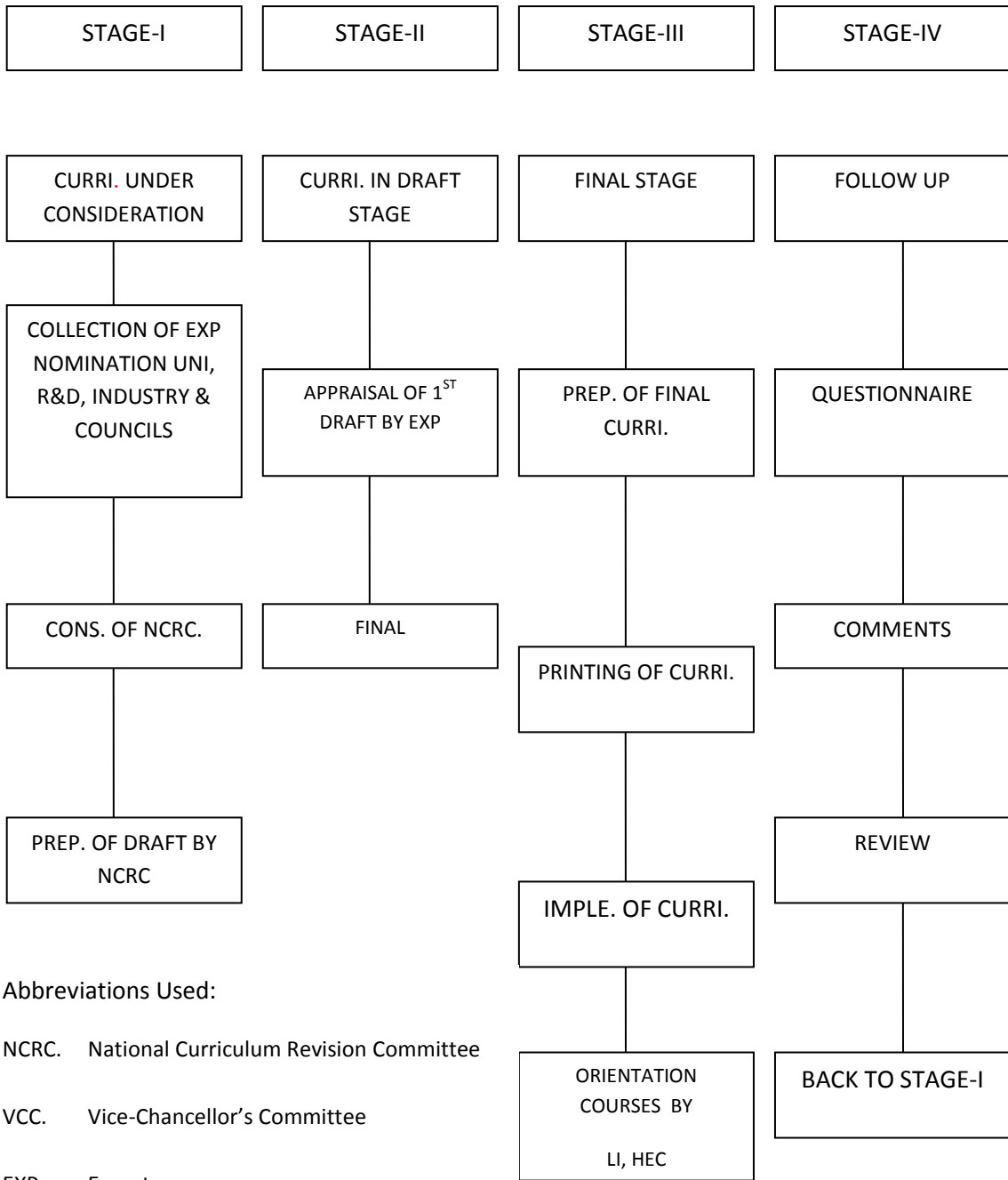
To bring international compatibility to qualifications held from Pakistani universities/DAIs for promotion of students mobility and job seekers around the globe, the DVM degree comprises 7.9% compulsory, 6.9% general / supporting, 27% foundation and courses and 58.13% major courses.

In line with above, NCRC comprising senior university faculty and experts from various stakeholders and the respective accreditation councils has finalized the curriculum for Doctor of Veterinary Medicine (DVM). The same is being recommended for adoption by the universities/DAIs channelizing through relevant statutory bodies of the universities.

PROF. DR. ALTAF ALI G. SHAIKH
Member Academics

March 2010

CURRICULUM DEVELOPMENT



Abbreviations Used:

NCRC. National Curriculum Revision Committee

VCC. Vice-Chancellor's Committee

EXP. Experts

COL. Colleges

UNI. Universities

PREP. Preparation

INTRODUCTION

In pursuance of the decision taken in the meeting between the representatives of HEC, PVMC and the selective members of Curriculum Revision Committee for the DVM in its meeting held on November 26, 2010 at the Mural Hall, HEC a special one day session of National Curriculum Revision Committee for the subject was held in Regional Centre, Lahore on January 13, 2011. Following attended the meeting:-

PAKISTAN VETERINARY AND MEDICAL COUNCIL (PVMC)

1. Dr. Muhammad Arshad, President, PVMC, Livestock Complex, 16-Cooper Road, Lahore
2. Dr. Maqsood Ahmed Raikhi, Acting Secretary / Registrar, PVMC, House # FA- 88, Street # 94, Main Double Road, I-8/4, Islamabad

MEMBERS NATIONAL CURRICULUM REVISION COMMITTEE IN DOCTOR OF VETERINARY MEDICINE (DVM)

- | | | |
|----|--|----------|
| 3. | Prof. Dr. Sikandar Hayat,
Dean,
Faculty of Veterinary Sciences,
Bahauddin Zakariya University,
Multan | Convener |
| 4. | Dr. Muhammad Arshad,
President,
PVMC, Livestock Complex,
16-Cooper Road,
Lahore | Member |
| 5. | Dr. Akram Munir,
MinFAL, 38-Khalid Plaza,
Blue Area, Islamabad | Member |
| 6. | Dr. Habib ur Rehman,
Professor,
Department of Physiology and Bio-Chemistry,
University of Veterinary & Animal Sciences,
Lahore | Member |
| 7. | Dr. Ahrar Khan,
Professor,
Faculty of Veterinary Science,
University of Agriculture,
Faisalabad | Member |

- | | | |
|-----|--|---------------|
| 8. | Prof. Ghulam Habib,
Advisor,
Department of Animal Health
(DVM Program), Government of the Punjab,
Lahore | Member |
| 9. | Prof. Dr. Khushi Muhammad,
Chairman,
Department of Microbiology,
University of Veterinary & Animal Sciences,
Lahore | Member |
| 10. | Prof. Dr. Azhar Maqbool,
Professor & Chairman,
Department of Parasitology,
University of Veterinary & Animal Sciences,
Lahore | Member |
| 11. | Dr. Shahan Azeem,
Assistant Professor,
Department of Clinical Medicine & Surgery,
University of Veterinary & Animal Sciences,
Lahore | Member |
| 12. | Dr. Sharif Phullan
Professor/Dean
Faculty of Veterinary & Animal Science
Lasbela University, Uthal, Baluchistan | Member |
| 13. | Dr. Mian Abdul Sattar,
Associate Professor,
Theniogenoloty
University of Veterinary & Animal Sciences,
Lahore. | Member |
| 14. | Dr, Amir Bukhsh Kalhoro,
Dean,
Faculty of Animal Husbandry & Vet. Sciences
Sindh Agriculture University,
Tandojam | Member |
| 15. | Dr. Anjum Khaliq,
Professor,
Department of Food & Nutrition,
University of Veterinary and Animal Sciences,
Lahore. | Member |
| 16. | Dr. Alamdar Hussain Malik,
Former Secretary / Registrar, PVMC,
House # FA-88, Street # 94,
Main Double Road, I-8/4,
Islamabad | Member/Secret |

Higher Education Commission

17. Prof. Dr. Altaf Ali G. Shaikh, Member (Academics), HEC
18. Mr. Muhammad Javed Khan, Adviser (Academics), HEC
19. Mr. Malik Arshad Mahmood, Director (Curriculum), HEC
20. Dr. M. Tahir Ali Shah, Deputy Director (Curriculum), HEC

The meeting was chaired jointly by Member (Academics), President PVMC and the convener of NCRC.

The meeting started with recitation of few verses from the Holy Quran. The Member (Academics) in his opening remarks referred to international norms whereby a semester of 16-18 week duration can bring maximum of 15-18 credit hours and that the grant of credit is based on number of contact hours between teachers and taught. According to him one contact hour of theory class is counted as one credit hour which 3 contact hours of practical class is counted as one credit hour. He also referred to a meeting between the Executive Director and the Members of NCRC wherein the above principle was adopted saying that the Commission has followed same practice while assigning credit hours of all its curricula being practiced in the universities. According to Prof. Shaikh, the extent of number of credit for DVM course which spreads over 5 years/10 semesters can range between 170-175 credit hours.

The members deliberated at length the mode of grant of Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) as well as reflecting the same in the diploma supplement or the transcript. After discussing pros and cons of the issue, the Committee agreed to recommend the following;

1. That the Doctor of Veterinary Medicine Degree shall comprise 5 years/10 semesters and shall be awarded upon qualifying 170-175 credits hours.
2. That three contact hours in practical classes per week per semester will be counted as one credit hour and one contact hour in theory.
3. That the Diploma Supplement/Transcript for the students admitted from spring session of 2011 shall carry contact hours instead of credit hours and shall bears following footnote.
 - **One contact hour for theory equals to 1 credit hour**
 - **Three contact hours for practical equal to 1 credit hour**

All the Members except Dr. Habib-ur-Rehman, Professor of Physiology and Biochemistry, from University of Veterinary and Animal Science, Lahore agreed to the above. Dr. Habib, however, referred his own point of view and did not agree to the recommendations.

Minutes of Final meeting February 9, 2010

The National Curriculum Revision special meeting was held on February 9, 2010 at Higher Education Commission, Islamabad to resolve the issue of credit hours and finalize the draft curriculum revised on 9 February 2010 at HEC , Islamabad. The following comprise the committee.

- | Sr. | Name |
|-----|--|
| 1. | Dr. Habib ur Rehman,
Professor,
Department of Physiology and Bio-Chemistry,
University of Veterinary & Animal Sciences,
Lahore |
| 2. | Dr. Muhammad Younas,
Professor / Dean,
Faculty of Animal Husbandry,
University of Agriculture,
Faisalabad |
| 3. | Prof. Ghulam Habib,
Professor & Chairman,
Department of Animal Health (DVM Program),
NWFP Agricultural University,
Peshawar |
| 4. | Prof. Dr. Khushi Muhammad,
Chairman,
Department of Microbiology,
University of Veterinary & Animal Sciences,
Lahore |
| 5. | Prof. Dr. Azhar Maqbool,
Professor & Chairman,
Department of Parasitology,
University of Veterinary & Animal Sciences,
Lahore |
| 6. | Dr. Shahan Azeem,
Assistant Professor,
Department of Clinical Medicine & Surgery,
University of Veterinary & Animal Sciences,
Lahore |

- Sr. Name
7. Prof. Dr. M. Athar Khan,
Associate Professor (T.T),
Department of Epidemiology & Public Health,
University of Veterinary & Animal Sciences,
Lahore

 8. Dr. Sharif Phullan
Professor/Dean
Faculty of Veterinary & Animal Science
Lasbela Univeristy, Uthal,
Balochistan

 9. Dr. Mian Abdul Sattar,
Associate Professor,
Theniogenoloty
University of Veterinary & Animal Sciences,
Lahore.

 10. Dr. Anjum Khalique,
Professor,
Department of Food & Nutrition,
University of Veterinary and Animal Sciences,
Lahore

 11. Dr. Ahrar Khan,
Faculty of Veterinary Sciences,
University of Agriculture,
Faisalabad

Prof. Dr. Sohail H. Naqvi, Executive Director, HEC presided over the meeting. He emphasized that the component of social sciences. English and Mathematics must be included in the final version of the curriculum. He asked the members of the committee to follow the approved HEC template while finalizing the draft curriculum.

Dr. Altaf Ali G. Sheikh, Member Academics, HEC proposed to convert the credit hours, allocated to each course, into contact hours so that it may fit into the HEC approved Template without compromising on the course requirements. The committee after a detailed deliberation agreed upon and the Scheme of Studies and template for the 5-year composite degree program for the Doctor of Veterinary Medicine was redesigned in the light of Dr. Sheikh's proposal.

Minutes of Previous Meetings

The National Curriculum Revision meeting was held on 17-19 August 2009 at HEC RC Lahore to finalize the draft curriculum revised in preliminary meeting of NCRC in DVM . The following comprise the committee.

Sr.	Name	
12.	Prof. Dr. Skindar Hayat, Dean, Faculty of Veterinary Sciences, Bahaudding Zakariya University, Multan	Convener
13.	Dr. Muhammad Arshad, President, PVMC, Livestock Complex, 16-Cooper Road, Lahore	Member
14.	Dr. R. H. Usmani, Animal Husbandry Commissioner, MinFAL, 38-Khalid Plaza, Blue Area, Islamabad	Member
15.	Dr. Habib ur Rehman, Professor, Department of Physiology and Bio-Chemistry, University of Veterinary & Animal Sciences, Lahore	Member
16.	Dr. Muhammad Younas, Professor / Dean, Faculty of Animal Husbandry, University of Agriculture, Faisalabad	Member
17.	Prof. Ghulam Habib, Professor & Chairman, Department of Animal Health (DVM Program), NWFP Agricultural University, Peshawar	Member
18.	Prof. Dr. Khushi Muhammad, Chairman, Department of Microbiology, University of Veterinary & Animal Sciences, Lahore	Member

Sr.	Name	
19.	Prof. Dr. Azhar Maqbool, Professor & Chairman, Department of Parasitology, University of Veterinary & Animal Sciences, Lahore	Member
20.	Dr. Shahan Azeem, Assistant Professor, Department of Clinical Medicine & Surgery, University of Veterinary & Animal Sciences, Lahore	Member
21.	Prof. Dr. M. Athar Khan, Associate Professor (T.T), Department of Epidemiology & Public Health, University of Veterinary & Animal Sciences, Lahore	Member
22.	Dr. Ahmad Ali, Assistant Professor (Tenure Track System), Department of Livestock Production, University of Veterinary and Animal Sciences, Lahore	Member
23.	Dr. Sharif Phullan Professor/Dean Faculty of Veterinary & Animal Science Lasbela University, Uthal, Balochistan	Member
24.	Dr. Mian Abdul Sattar, Associate Professor, Theriogenology University of Veterinary & Animal Sciences, Lahore.	Member
25.	Dr. Amir Bukhsh Kalhoro, Dean, Faculty of Animal Husbandry & Vet. Sciences Sindh Agriculture University, Tandojam	Member
26.	Dr. Anjum Khaliq, Professor, Department of Food & Nutrition, University of Veterinary and Animal Sciences, Lahore	Member

Sr. Name

27. Dr. Alamdar Hussain Malik,
Secretary / Registrar, PVMC,
House # FA-88, Street # 94,
Main Double Road, I-8/4,
Islamabad

Member/Secretary

In 2008, the Higher Education Commission initiated an exercise to review and revise the scheme of studies and curricula of the 5 year composite degree program of DVM in collaboration with the Pakistan Veterinary Medical Council (PVMC). The first meeting was held in this regard on 07-09 August, 2008 in the Higher Education Commission Regional Centre, Lahore under the chairmanship of Prof. Dr. Sikandar Hayat, Dean, Faculty of Veterinary Sciences, Bahauddin Zakaryia University, Multan and co-chairmanship of Dr. R. H. Usmani, Animal Husbandry Commissioner, MINFAL. Dr. Alamdar Hussain Malik, Registrar of PVMC, was assigned to act as Secretary of the committee. An effort has been made to include HEC recommended compulsory courses like English, Pakistan Studies, Islamic Studies, Computer Science and Statistics etc. The committee finalized The DVM 5-years degree program which was also approved by the council in its 28th meeting held on 14-04-09. The 5-year DVM degree comprises of 10 semesters. The 10th semester is exclusively devoted to internship by the students at various animal production and veterinary science related institutes in the private and public sector.

To implement the scheme of study and contents of courses of 5-years DVM degree program, number of meetings were held between HEC and PVMC authorities with the sole objective to have the backup supports of both the regularity authorities for its successful implementation.

HEC organized another PVMC – HEC joint curriculum committee on 7-8 September 2009 in the Higher Education Commission Regional Centre, Lahore before implementing the revised scheme of study. The inaugural session was presided by Prof. Dr. Altaf Ali G. Sheikh Member (Acad.). The member academic welcomed all the participants who came over from all parts of the country. The session started with the recitation of Talawat Quran. Prof. Dr. Altaf Ali G. Sheikh shared his views with the members of the committee that HEC is also after the quality of Veterinary Education in Pakistan i.e. the reason the HEC joined hand with the PVMC to achieve the common goal to strengthen the Veterinary Education which will in return enhance the productivity in general and to counter the Veterinary diseases in particular. He further stressed that the total credit hours 199 proposed in the last meeting was acknowledge by the HEC authorities with the observation that the credit hours of English may be enhanced and a new course of mathematics may also be included in the scheme of study for the uniformity of the curriculum with other discipline. He further said that the

committee may discuss the internship program placement and the contact hour formula recommended by the HEC.

Responding to the Prof. Dr. Altaf Ali G. Sheikh Member (Acad.) the convener of the committee Prof. Dr. Sikandar Hayat appreciated the support and concern of the member academic HEC and also appraised the house regarding the background of the previous efforts of the committees of PVMC – HEC in the regard. The convener of the committee further assured that the house will discuss the suggestions of HEC. Dr. Alamdar Hussain Malik Secretary Committee on the behalf of the president council welcomed all the participants and loudly acknowledged the developmental efforts of HEC to promote and strengthen the DVM degree program. Dr. Alamdar also acknowledged the unprecedented accommodative support of Prof. Dr. Altaf Ali G. Shiekh Member Acad. for the implementation of the DVM degree program. Dr. Alamdar further said that the way HEC is extended its support to PVMC shall definitely enable the organization to implement its mandates given by the National Parliament.

After inaugural session, the meeting was chaired by the convener of the committee Prof. Dr. Sikandar Hayat and Dr. Alamdar Hussain Malik Registrar of PVMC acted as Secretary of the Committee. The committee discussed in detail the lecture wise contents of each subject and finally approved 202 credit hours with the inclusion of one new subject i.e. Mathematics of two credit hours and addition of one credit hour of English. The committee discussed in detail the contact hour formula and internship program placement with the decision that the PVMC authorities may convene a special meeting with the HEC in this regard and convey the observation of the committee members regarding it implementation. It may however, be kept in mind that the credit hours requirement are linked with the first nine semester. Dr. Muhammad Arshad President PVMC discussed with the Member (Acad.) HEC regarding the background of the up-gradation of curriculum of the DVM degree program. President council also appreciated the positive role of the HEC to strengthen the Veterinary Education and further discussed with the Member Acad. that who further PVMC – HEC can move forward in this regard.

At the end of the meeting the members unanimously approved the curriculum for 5-year composite DVM degree. It may however be kept in mind that the contact hours requirements are linked with the first nine semesters and certain compulsory courses have been added which were previously not included in the scheme of studies of 5-year DVM program.

TEMPLATE FOR 5 YEAR DOCTOR OF VETERINARY MEDICINE (DVM) DEGREE PROGRAM

1. Compulsory Courses:

These are the courses which are compulsory to the students of DVM program:

Subject	Contact Hours	
	Theory	Practical
Islamic Studies / Ethics	1	0
English – I (Functional)	2	0
Pakistan Studies	1	0
English – II (Communication Skill)	2	0
Biostatistics	2	2
Computer applications	0	2
English – III (Technical Report Writing and Presentation)	2	0
Extension Education of Livestock	2	0
Mathematics	2	0
Total Compulsory Courses (contact hours)	14	4

It comprises 7.92 % of the program.

2. General / Supporting Courses:

These are interdisciplinary courses which provide basis for other more important courses of the degree.

Subject	Contact Hours	
	Theory	Practical
General biochemistry	2	2
Biochemistry of Metabolism	2	0
Molecular Biology	2	2
Introduction to Fisheries and Aquaculture	1	2
Livestock Economics and Business Management	3	0
Lab and Zoo Animal Management	1	0
Total General / Supporting Courses (contact hours)	11	6

It comprises 6.93 % of the program.

3. Foundation courses:

These courses provide students with fundamental concepts needed to take major course of study for the degree.

Subject	Contact Hours	
	Theory	Practical
General and Systemic Anatomy	1	6
General Histology and Embryology	1	4

Comparative Anatomy	1	6
Introduction to livestock Management	0	2
Systematic Histology	1	4
Cardiovascular, Respiratory and Renal Physiology	2	2
Physiology of Digestion and Lactation	2	2
Endocrinology and Neuromuscular Physiology	1	2
Introduction to Poultry Production	1	2
General Microbiology	2	2
Introduction to Animal Breeding and Genetics	3	2
Principles of Animal Nutrition	2	2
General Pathology	3	2
General Parasitology	1	2
Fundamentals of Immunology	1	2
General Pharmacology and Pharmaceutics	2	2
General medicine	2	2
General surgery & Anesthesiology	1	4
Introduction to Reproductive Biotechnology	2	0
Total Foundation Courses (contact Hours)	29	50

It comprises 26.73 % of the program.

4. Major Courses:

These are specialized courses that form the pivot of the degree.

Subject	Contact Hours	
	Theory	Practical
Veterinary Protozoology	1	2
Animal Feed Resources and Forage Conservation	2	2
Poultry breeding and hatchery Management	1	2
Systemic Veterinary Pathology	3	2
Veterinary Helminthology	3	2
Veterinary Bacteriology and Mycology	2	2
Small Ruminant Production	1	2
Ruminant Nutrition	1	2
Feed Evaluation, Formulation and Processing	2	2
Systematic Pharmacology and Therapeutics	2	2
Systemic Veterinary Virology	2	2
Veterinary Entomology	2	2
Necropsy Practices	0	2
Poultry Nutrition	1	2
Beef Production	1	2
Dairy Production	2	2
Dairy Technology	1	2
Dairy Herd Health	1	2
Animal Reproduction & Artificial Insemination	2	2
Veterinary Toxicology and Chemotherapy	1	2

Diagnostic Imaging	1	2
Poultry Housing and Farm Management	2	2
Large Animal Surgery	1	2
Systemic Veterinary Medicine – I	3	0
Meat Hygiene and Public Health	1	2
Milk Hygiene and Public Health	1	2
Animal Breeding Plans and Policies	2	2
Equine and Camel Production	0	4
Reproduction Clinic – I	0	4
Medicine Clinic – I	0	4
Surgery Clinic – I	0	4
Veterinary Obstetrics and Genital Diseases	2	4
Systemic Veterinary Medicine – II	3	0
Forensic Medicine & Jurisprudence	1	0
Shoeing and Soundness	1	2
Small Animal Surgery	1	4
Reproduction Clinic – II	0	4
Medicine Clinic – II	0	4
Surgery Clinic – II	0	4
Livestock Farm Operations	0	4
Veterinary Clinical Pathology	0	4
Veterinary Epidemiology and Public Health	2	2
Poultry Pathology	1	4
Meat and Slaughter Byproducts Technology	2	2
Reproduction Clinic – III	0	4
Medicine Clinic – III	0	4
Surgery Clinic – III	0	4
Poultry Farm Operations	0	4
Feed Mill Operation	0	4
Total Major Courses (contact hours)	55	126

It comprises 58.41% of the program

1. Elective Courses:

These courses are not applicable to Doctor of Veterinary Medicine degree program.

2. Research Project:

Internship program is conducted in the 10th semester which is a compulsory component of DVM degree program.

**SCHEME OF STUDIES
FOR FIVE YEARS DVM COMPOSITE DEGREE PROGRAMME
(MODIFIED)**

COURSE NO.	COURSE TITLE	Contact Hours	
		Theory	Practical
ANAT	General and Systemic Anatomy	1	6
ANAT	General Veterinary Histology and Embryology	1	4
BIOCHEM	General Biochemistry	2	2
PHYSIOL	Cardiovascular, Respiratory and Renal	2	2
IT	Computer applications	0	2
LM	Introduction to Livestock Management	0	2
PH	Introduction to Poultry Production	1	2
SS	Islamic Studies/Ethics	1	0
SS	English - I (Functional English)	2	0
	Total	10	20
ANAT	Comparative Anatomy	1	6
ANAT	Systemic Veterinary Histology	1	4
MICRO	General Veterinary Microbiology	2	2
PHYSIOL	Physiology of Digestion and Lactation	2	2
BIOCHEM	Biochemistry of Metabolism	2	0
ABG	Introduction to Animal Breeding and Genetics	3	2
AN	Principles of Animal Nutrition	2	2
SS	Pakistan Studies	1	0
	Total	14	18
PATH	General Veterinary Pathology	3	2
PARA	General Veterinary Parasitology	1	2
PARA	Veterinary Protozoology	1	2
MICRO	Molecular Biology	2	2
MICRO	Fundamentals of Immunology	1	2
AN	Animal Feed Resources and Forage	2	2
PHYSIOL	Endocrinology and Neuromuscular Physiology	1	2
PH	Poultry breeding and Hatchery Management	1	2
SS	English - II (Communication Skills)	2	0
MATH	Mathematics	2	0
	Total	16	16
PATH	Systemic Veterinary Pathology	3	2
PARA	Veterinary Helminthology	3	2
MICRO	Bacteriology and Mycology	2	2
PHARMA	General Veterinary Pharmacology and	2	2
FISH	Introduction to Fisheries and Aquaculture	1	2
LM	Small Ruminant Production	1	2

AN	Feed Evaluation, formulation and Processing	2	2
STAT	Biostatistics	2	2
	Total	16	16
PHARMA	Systemic Veterinary Pharmacology and	2	2
MICRO	Systemic Veterinary Virology	2	2
PARA	Veterinary Entomology	2	2
LM	Livestock Economics and Business	3	0
PATH	Necropsy Practices	0	2
AN	Poultry Nutrition	1	2
AN	Ruminant Nutrition	1	2
LM	Dairy Production	2	2
EXT	Livestock Extension Education	2	0
	Total	15	14
MED	General Veterinary Medicine	2	2
SURG	General Veterinary Surgery & Anesthesiology	1	4
APT	Dairy Technology	1	2
MED / EPI	Dairy Herd Health	1	2
AR	Animal Reproduction & Artificial Insemination	2	2
PHARMA	Veterinary Toxicology and Chemotherapy	1	2
SURG	Diagnostic Imaging	1	2
PH	Poultry Housing and Farm Management	2	2
LM	Beef Production	1	2
	Total	12	20
SURG	Large Animal Surgery	1	2
MED	Systemic Veterinary Medicine - I	3	0
PATH	Meat Hygiene and Public Health	1	2
EPI	Milk Hygiene and Public Health	1	2
ABG	Animal breeding Plans and Policies	2	2
LM	Equine and Camel Production	0	4
AR	Reproduction Clinic - I	0	4
MED	Medicine Clinic - I	0	4
SURG	Surgery Clinic - I	0	4
AR	Veterinary Obstetrics and Genital diseases	2	4
	Total	10	28
AR	Introduction to Reproductive Biotechnologies	2	0
MED	Systemic Veterinary Medicine - II	3	0
PATH	Forensic Medicine & Jurisprudence	1	0
SURG	Shoeing and Soundness	1	2
SURG	Small animal Surgery	1	4
AR	Reproduction clinic - II	0	4
MED	Medicine Clinic - II	0	4
SURG	Surgery Clinic - II	0	4
PATH	Veterinary Clinical Pathology	0	4
	Total	8	22
EPI	Veterinary Epidemiology and Public Health	2	2
PATH	Poultry Pathology	1	4
ZOOLOGY	Lab and Zoo animal Management	1	0

APT	Meat and Slaughter Byproducts Technology	2	2
AR	Reproduction Clinic - III	0	4
MED	Medicine Clinic – III	0	4
SURG	Surgery Clinic – III	0	4
AN	Feed Mill Operation	0	4
	Total	6	24
PH	Poultry Farm Operations	0	4
LM	Livestock Farm Operations	0	4
SS	English – III (Technical Report Writing and Presentation)	2	0
	Internship		
	Total	2	8

Total Contact Hours: Theory- 109 Practical- 186

One contact hour for theory equals to 1 credit hour.

Three contact hours for practical equal to 1 credit hour.

Total Credit hours = 171 (Theory +Practical)

DETAIL OF COURSES FOR 5-YEAR COMPOSITE DVM DEGREE PROGRAM

General/Supporting Courses

GENERAL BIOCHEMISTRY

4(2-2)

THEORY

Introduction to Biochemistry, Biochemical properties and function of Water. Biochemical properties and function of Water, pH, Buffer, Buffer solutions, Regulation of acid base balance, Henderson-Hasselbalch equation, Buffer systems of body fluids. Respiratory acid base balance, Renal regulation of hydrogen ion concentration, Biomembrane, structure, functions, mechanism of transport across the membrane, Passive diffusion, facilitated diffusion, active transportation, osmosis and osmotic pressure, Introduction to carbohydrates and their classification; monosaccharide, oligosaccharide and polysaccharide. Glycosidic linkages. Stereoisomerism, optical isomerism, optical activity sp. Rotation and mutarotation., Chemical properties of monosaccharides, Cyclic forms of sugar and Heteropolysaccharides, Introduction to proteins, classification of amino acids and Peptide linkage, Physiological significance, amphoteric properties Isoelectric pH, Primary, Secondary Tertiary and Quaternary structure of proteins, Classification of proteins; conjugated and derived proteins, Functions of proteins, introduction to Enzymes, general characteristics, Enzyme activity, specific activity, turns over number. Chemical nature and difference with non biological catalysts, Michaelis-Menten equation, Importance of K_m and V_{max} , Classification of enzymes, Co-enzymes, Chemical and clinical importance of enzymes, Factors affecting enzymes activity, inhibition, Introduction to lipids, Classification of lipids; fatty acids, saturated, unsaturated & essential., Physical and Chemical properties of fatty acids and triglycerides, Steroids, sterols and cholesterol, Prostaglandins and their physiological role, Introduction to nucleic acids Chemical composition and structures of DNA and RNA, Functions of DNA & RNA, Central Dogma and its significance.

PRACTICAL

Preparation of solution of different normalities, molarities and back titration, Preparation of buffers of definite pH. Determination of pH values of biological fluids, Demonstrate the practical application of Henderson-Hasselbalch's equation. To detect the carbohydrate in the given solution by Molisch's test, To detect the presence of reducing monosaccharides in the given solution. To detect polysaccharide by Iodine test, To detect the presence of reducing sugar in the given solution, To detect the presence

of Ketose sugar in the given solution by Selivanoff's test, Phenyl Hydrazine Test, Hydrolysis Of Sucrose. Hydrolysis Of Starch, Identification scheme for carbohydrates (To Identify An Unknown Carbohydrate In The Given Solution), Biuret Test (To Detect The Presence Of Protein In The Given Solution), Precipitation Of Casein At Its Isoelectric Point. Heat Coagulation Test. Salt Saturation Tests, Identification Scheme For Proteins (To Identify An Unknown Protein In The Given Solution) Properties of lipids (To Demonstrate That Lipids Do Not Wt Paper And They Are Greasy In Nature). To Demonstrate The Solubility Of The Given Lipid In Various Cold And Hot Solvents. To Demonstrate The Emulsification Of Neutral Fat In Water And Solutions Of Sodium Carbonate, Soap And Bile Salt, To Detect The Presence Of Cholesterol In The Given Solution By Salkowski's Reaction.

BOOKS RECOMMENDED

1. Ahmad Mushtaq, A. (2003). essential of medical biochemistry, Vol I, 7th Ed. Ilmi book house urdu bazaar, Lahore
2. Murray, R. K, D. K. Granner, P.A Mayes and V.W Redwell. (2000). Harper's Biochemistry, 25th Ed. Appleton & Lange Inc. USA
3. Stryer, L. 1995. Biochemistry. W. H. Freeman Pub. Co. USA.
4. Nelson, D. L & M M. Cox (2000). Lehninger Principles of Biochemistry. 3rd Ed., Livingston Pub, Inc, USA.
5. Brown, T. A. (2001). Gene cloning and DNA analysis: An Introduction. 4th Ed. Blackwell science Ltd., U.K.

BIOCHEMISTRY OF METABOLISM

2(2-0)

THEORY

Introduction of metabolism, Glycolysis, regulation, and energy production, Kreb's cycle, regulation and energy production, Pentose phosphate shunt, Glucuronic acid pathway, Glucogenesis, glycogenesis, glycogenolysis, gluconeogenesis, Metabolism of fructose, galactose and lactose, Introduction to protein metabolism and plasma amino acids Synthesis of non-essential amino acids, Fate of ammonia and keto-acids, Urea cycle and its importance, glutathione and creatinine formation, Catabolism of non-essential amino acids, Introduction to lipid metabolism, Beta-oxidation of even chained-fatty acids, Beta-oxidation of odd-chained fatty acids, Omega-oxidation of fats, Alpha-oxidation of fats, Oxidation of respiratory chain, Biosynthesis of fatty acids, Biosynthesis of triglycerides, Biosynthesis of triglycerides, Biosynthesis of prostaglandins, Biosynthesis of cholesterol, Factors affecting cholesterol level in plasma, Transportation of lipids, Role of adipose tissue in fat metabolism, Ketogenesis and use of ketone bodies, Metabolism of bile salts and bile acids, Intermediary metabolism of carbohydrates, fats and proteins,

Bioenergetics, Introduction to fermentation, Use of agro-industrial wastes for production of antibiotics, enzymes and steroids,

BOOKS RECOMMENDED

1. Ahmad Mushtaq, A. (2003). essential of medical biochemistry, Vol I, 7th Ed. Ilmi book house urdu bazaar, Lahore
2. Murraray, R. K, D. K. Granner, P.A Mayes and V.W Redwell. (2000). Harper's Biochemistry, 25th Ed. Appleton & Lange Inc. USA
3. Stryer, L. 1995. Biochemistry. W. H. Freeman Pub. Co. USA.
4. Nelson, D. L & M M. Cox (2000). Lehninger Principles of Biochemistry. 3rd Ed., Livingston Pub, Inc, USA.
5. Brown, T. A. (2001). Gene cloning and DNA analysis: An Introduction. 4th Ed. Blackwell science Ltd., U.K.

MOLECULAR BIOLOGY

4(2-2)

THEORY

Introduction to Molecular Biology: Why we need to study molecular biology, Genes and chromosomes, Identification of DNA as the genetic material, Structure of DNA, Replication of DNA, Expression of genetic information, Vectors and their uses in molecular biology: composition of a plasmid vector, M 13 and lamda Phages as vectors in molecular biology, Modifications of phage vectors and their uses, DNA modification enzymes, linkers, adaptors and their uses, Specialized libraries: chromosomal, deletion enrichment, subtractive hybridization libraries, Screening libraries: screening strategies I, Library screening strategies II, Hybridization of nucleic acids, Principle of polymerase chain reaction, Principles of primer designing for PCR, DNA sequencing: principle and methods, Finding of open reading frame in a cloned gene, Introducing mutations in DNA, Cite directed mutagenesis in a given gene, Expression systems and their uses, Promoters and gene expressions, Regulation of gene expression, How to study promoters? How to make fusion proteins, Satellite, minisatellite and micorsattelite DNA, Restriction fragment length polymorphism, How to prepare a transgenic animal?

PRACTICAL

Good lab practices, Genomic DNA extraction from eukaryotic and prokaryotic cells, Plasmid DNA extraction, RNA extraction, Estimation of nucleic acids, Reverse Transcriptase of RNA, PCR, Restriction of DNA, Electrophoresis of DNA in agarose gel, Preparation of cell lysate, Protein estimation, SDS-PAGE, Staining of gel and its documentation, Transformation of host cells, Selection of transformants, Use of computers for DNA and protein sequence data from world wide web.

BOOKS RECOMMENDED

1. Bell, D.D. and W.D. Weaver. 2002. Commercial Chicken Meat and Egg Production. 5th Edition. Kluwer Academic Publishers, Norwell Massachusetts 02061 USA.
2. Crawford, R.D. 1990. Poultry Breeding and Genetics. Elsevier Science Publishers, Amsterdam. The Netherlands.
3. Etches, R. J. 1996. Reproduction in Poultry. CAB International, UK.
4. Ensminger, M.E. 1992. Poultry Science. The Interstate Printers and Publishers Inc. Danville. Illinois. USA.
5. Muir, W.M. and S.E. Aggrey. 2003. Poultry Genetics. Breeding and Biotechnology. 1st Edition. CAB International, UK.
6. Parkhurst, C.R. and G.J. Mountney. 1997. Poultry Meat and Egg Production. Chapman and hall Inc., New York, USA.
7. Taylor, L.W. 2003. Fertility and Hatchability of Chicken and Turkey Egg. Greenword Publishers. Lucknow. India.

INTRODUCTION TO FISHERIES AND AQUACULTURE

3(1-2)

THEORY

Introduction to fisheries, national and international trends, Fish morphology and diversity in size and shape, distribution of fishes in Pakistan (marine and freshwater), Fishing gears, fishing methods, techniques, fishing communities, Fish habitat, ecology and extant of distribution, Food and feeding habit, feeding types, Commercial fishes, marine and freshwater, Problems in fisheries and management in Pakistan (marine and inland), Introduction to Aquaculture, systems of Aquaculture, Types of ponds, planning construction, pond preparation, etc, Pond fertilization, application, Water quality parameters (abiotic: temperature, light, salinity, pH, turbidity, etc.) and their effect on fish production, Biotic parameters (Plankton, insects, aquatic vegetation, etc) of ponds, lakes, rivers, and impact on growth, Artificial and natural fish food, feed ingredients, Fish diseases and their control, Induced breeding, fish genetics and recent practices and potentials, Fish preservation, processing and transportation fish marketing.

PRACTICAL

Morphological characters of typical fish, morphometrics, Species identification, fin formula, etc., key to identification of commercial fishes, Visit wetland/lake/river/coastal areas to study fish diversity and distribution, Dissection of common fish to study digestive system, Dissection of common fish to study circulatory system, Dissection of common fish to study reproductive system, Practical demonstration of induced breeding, Introduction to artificial feed ingredients, Visit to

aquaculture farms, Visit to fish hatchery, Measurements of water quality parameters, Measurements of biotic parameters (phytoplankton & zooplankton) slides, Pond construction and design criteria, Fish market visit, Fish diseases (bacterial, fungal) samples study, slides. Fish diseases (parasitic, etc.) samples study, slides.

BOOKS RECOMMENDED

1. Pillay, T.V.R. 2002. Aquaculture: Principles and Practices. Blackwell Science Limited. 5

LIVESTOCK ECONOMICS AND BUSINESS MANAGEMENT

3(3-0)

THEORY

Scope & Definition of Economics, Needs and law of marginal utility revised Demand & supply, Elasticity of Demand & supply, Aggregate demand and Aggregate Supply, Growth and Economic Development, Share of Livestock Poultry Dairy Industry in Pakistan Economy, Employment opportunities in Livestock Poultry Milk and Meat production system in Pakistan and their Economics. Identification of Factors of Production and production function for milk meat and poultry, Feasibilities for Livestock poultry and related businesses, Financial and Economic analysis of agro Livestock Business, Project cycle, preparation of project, Sheep, Goat production system, Inflation, and Monetary policy deflation – stagflation, National Income accounting GDP GNP NNP and, Partial budgeting of Livestock Enterprises. Economic Systems. Business & Entrepreneurship Business ethics and social responsibility. Types of Business. Management & organization, types of Manager, Leadership, Trade, law of comparative and absolute advantage- International Trade and barrier, Trade Agreements, Alliance, organization and WTO, Nature of Human Relation, moral, motivation and commitment theories of motivation., Feasibility studies of livestock and poultry business. Entrepreneurship, Technological innovation, Small Business Role. Product Development and patents trade mark, Model for New venture planning Business cycle, Supply chain Management., Project Cycle and stages, Evaluation of development project & Management. Banking, Definition, nature & scope of marketing, Product, Planning & marketing, Livestock & Poultry Products market and Functions, Milk production and marketing system and Dairy Industry in Pakistan, Poultry Feed Industry, whole sale and distribution & marketing of eggs and Broilers. Market segmentation & targeting market. Marketing Mix and Four Ps of Marketing., Advertising, sales promotion strategy. Supply chain Management and channels for value addition of Livestock and poultry product. Brands, packaging and other product feature. Services Marketing. Companies Micro & Macro

Environments. International Economic Integration and Cooperation., W.T.O Liberalization and International Trade.

BOOKS RECOMMENDED

1. Nickels G.W., McHugh M.J. and McHugh Susan. Understanding Business. 7th Edition. McGraw Hill Irwin.
2. Business the changing world Ferrel Hirt Ferrel

REFERENCE BOOKS

1. Etzel M.J., Walker, J.B., Stanton, J. Marketing 14th Edition McGraw-Hill Irwin.
2. Koontz H., Cannice M.V. and Wehrich H. Management A global and entrepreneurial perspective 12th Edition.
3. Downey, W.D. & S.P. Enieson, 1998. Agricultural Business Management, McGraw Hill Book Co; Singapore.
4. Terry G.R. and Franklin, 1992. Principles of Management, Interstate Printers and publishers, Illinois, U.S.A.
5. Reddy., P.N. and S.S. Gulshan, 1990. Principles of Business Organization and Management, Eurasia Publishing House, New Delhi, India.
6. Akhtar S.M., 1990. Essentials of Economics. Vol. 1, Publishers United, Lahore, Pakistan.
7. Barnard C.S. and J.S. Nix, 1990. Farm Planning and Control, Cambridge University Press, New York, U.S.A.
8. Ahmad, B., M. Ahmad, and M.A. Chaudhry, 1996. Economics of Livestock production and Management, University of Agriculture, Faisalabad, Pakistan.

LAB AND ZOO ANIMAL MANAGEMENT

1(1-0)

PRACTICAL

Introducing lab animals: A Visit to laboratory animal housing facilities like VRI, Lahore., Ethical, welfare, and legislative aspects of using animals for research. Capture and handling of small mammals (eg. Rats, mice, rabbits and guinea pig): A visit to NIH Islamabad. A hands-on training of the foot prints, scates, skull bones, dental wear patterns identification techniques. Design, equipment, environment control and hygiene of animal house: A visit to Animal House at Ravi Campus. Monitoring the care and use of animals. Animal Environment, Housing and Management. Veterinary care of lab animals. An Introduction to Zoo Animals: A Visit to Lahore Zoo. Behavioral management (structural environment, social environment). An Introduction to Zoo Animals: A Visit to Lahore Zoo. Animal Husbandry (food, water, bedding, sanitation, waste disposal, pest control, emergency, weekend and holiday care). Institutional policies and responsibilities: A visit to Zoological Garden. Construction guidelines (Corridors, animal room doors, exterior windows, floors, drainage, walls, ceilings). Discussion for

life patterns of different lab and zoo animals. Compilation of animal inventory report.

BOOKS RECOMMENDED

1. Pool, T.B., 1989. The UFAW Handbook on the Care and Management of Laboratory Animals. Longman Scientific and Technical Publishers, England. UK.
2. Clark, J. D., Baldwin, K. A., Bayne, M. J. Brown, G. F., Gebhart, J. C. Gonder, J. K. Gwathmey, M. E. Keeling, D. F. Kohn, J. W. Robb, O. A. Smith, W. J. White, 1996. Guide for the Care and Management of Laboratory Animals. National Research Council, National Academic Press, Washington, D. C. 6th edition.

REFERENCE BOOKS

1. Fowler, M.E., 1978. Zoo and Wild Animal Medicine. W.B. Saunders Publisher Company, Philadelphia, U.S.A.
2. Melby, E.C. and N.H. Altman, 1974. Hand Book of Laboratory Animal Science. CRC Press, Inc. Ohio, U.S.A.
3. Prakash, M. and C.K. Arora, 1998. Birds in Laboratory. Anmol Publications (PVT). Ltd, India.
4. Singler, W.F., 1995. Wildlife- Law Enforcement. Wm. C. Brown Publishers.
5. Worden, A. N., 1989. Hand book of Laboratory Animals (Care and management). Anmol Publication, New Delhi, India.
6. Miller, A. S. and Harley, J.B. 2000 Zoology 5th Ed. McGraw-Hill, Singapore NAP, 1996 Guide for the care and use of Laboratory Animals, National Research Council, National Academy Press, Washington D.C.

FOUNDATION COURSES

GENERAL AND SYSTEMIC ANATOMY

7(1-6)

THEORY

Introduction, Terminologies, Skeletal system; classification of bones, Muscular system; structural classification, Arthrology; classification and associated structures, Gait Mechanics, Respiratory system; its components and topography, Heart; Blood Vascular System, Digestive system; its components and topography, Digestive system; associated glands, Urinary system, Male Genital system, Female Genital System, Endocrine System; Lymphatic System, Nervous System; Central and Peripheral, Special Senses, Integumentary system; its modifications; any special mention.

PRACTICAL

Demonstration of Topographic Terminologies, Demonstration of Topographic Terminologies, Osteology; Scapula and Humerus, Osteology; Radius and Ulna, Osteology; Carpals, Osteology; Metacarpals and Phalanges, Forelimb Arthrology, Osteology; Pelvic Girdle, Osteology; Femus, Patella, Osteology; Tibia and Fibula, Osteology; Tarsals, Metatarsals, Phalanges, Hindlimb Arthrology, Osteology; Skull, Osteology; Mandible and Hyoid Apparatus, Osteology; Vertebral Column, Ribs and Sternum and Axial Arthrology, Myology; Extrinsic Muscles of the forelimb, Myology; Muscles of the Shoulder and Arm, Myology; Muscles of the forearm, terminal tendons, Myology; Muscles of the croup and caudal thigh, Myology; Muscles of lateral, medial and cranial thigh, Myology; Muscles of the leg and terminal tendons, Myology; Muscles of the thorax and abdomen, Myology; Superficial Muscles of the neck, Myology; Deep muscles of the neck, Myology; Facial Muscles, Respiratory System; Nasal Cavity, larynx, Trachea, Lungs and associated details, Heart and vessels cranial to the heart, Major Blood vessels of thorax, head and neck, Major Blood Vessels of abdomen, fore and hind limbs, Digestive System; oral cavity, esophagus, stomach, Digestive System; intestines, associated organs etc, Peritoneum and its folds; surgical importance, Urinary system, Male Genital System, Female Genital System, Pelvic Cavity; an overview, Endocrine Glands, Lymphatic system, major vessels, Cranial Cavity, spinal canal and spinal cord, meninges, Brain, ventricles, Spinal and cranial nerves, Special Senses; eye, Special Senses; eye, Integumentary system and its modification, Surface Anatomy.

BOOKS RECOMMENDED

1. Howard E. Evans, 1993 (3rd Ed.). **Miller's Anatomy of the Dog.** W B Saunders Co. USA

FURTHER READING:

1. Dyce, K.M., Sack, W.O., Wensing, C.J.W., 2002 (3rd Ed.). Textbook of Veterinary Anatomy. W B Saunders Co. USA
2. Evans, H.E., de Lahunta, A., 2009. Guide to the Dissection of the Dog. W B Saunders Co. USA
3. Koenig, H.E., Liebich, H-G., 2009 (4th Ed.). Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. Manson Publishing Ltd.
4. Getty, R., 1975 (5th Ed.). Sisson and Grossman's The Anatomy of the domestic Animals Volume II. W B Saunders Co. USA
5. Boyd, J. S, Paterson, C, May, A. H., 1992. Color Atlas of Clinical Anatomy of the Dog and Cat. C. V. Mosby.

THEORY

Introduction: Policies, Microscopy and Interpretation Methods of Histology: Tissue Preparation Technique, Principles of Staining, **Cell Biology:** Ultrastructure of Cell, Cytoplasmic Organelles, Protein Synthesis, Inclusions and cytoskeleton, Nucleus, Nuclear envelop, Nucleoplasm, Nucleoli, **Epithelial Tissue:** Morphology and classification of Surface Epithelia, Morphology and classification of Glandular Epithelia and Glands, **Connective and Supportive Tissues:** Microscopic structure of components of Connective Tissue: cells, fibers and amorphous ground substance, Microscopic slides of different types of supportive tissues: Cartilage and Bone, Osteogenesis, Synovial Joint, Light Microscopic and Fine Structure of formed elements of mammalian and avian blood., **Muscular Tissue:** Light Microscopic and Fine Structure of Smooth and Skeletal, Muscle contraction mechanism, Light Microscopic and Fine Structure Cardiac Muscles, Impulse Conduction Mechanism and Impulse Conduction Fibers, **Nervous Tissue:** Light Microscopic and Fine structure of Neurons, Neuroglial cells, Synapses, Central and Peripheral Nervous System, Peripheral Nerves, Ganglia, Meninges, **Embryology:** Gametogenesis , Fertilisation, Cleavage, Gastrulation, Primitive streak Formation, Differentiation of Germ Layers, Formation of Extra-embryonic cavities, Circulatory changes at birth, Age determination of Embryo and Fetus

PRACTICAL

Microscopy: Identification of different parts of Microscope and Practical use of Microscope. **Tissue Preparation Technique and Staining:** Practical demonstration of Tissue preparation technique and Staining Procedures. **Ultra structure of Cell:** Identification of Electron Micrographs of different components of cell. **Epithelium:** Identification of different types of surface epithelium. **Epithelium:** Identification of different types of glandular epithelium. **Connective Tissue:** Identification of different types of cells and fibers of connective tissue. **Connective Tissue:** Identification of different types of connective and supportive tissue: Loose and Dense connective tissue, Reticular tissue, Adipose tissue, Cartilage, Bone. **Blood:** Identification of different types of Blood cells: Monocytes, Lymphocytes, Eosinophils, Basophils, Neutrophils. **Muscular Tissue:** Identification of tissue sections of Smooth and Skeletal Muscles. **Muscular Tissue:** Identification of tissue sections of Cardiac Muscles. **Nervous System:** Identification of Neurons and Neuralgia. **Nervous System:** Identification of tissue sections of Central and Peripheral Nervous System: Brain and Spinal Cord and Peripheral Nerves. Demonstration of process of mitosis and meiosis with help of Models. **Embryology:** Identification of different stages of Embryo.

BOOKS RECOMMENDED

1. Alberts et al., 1983. Molecular Biology of Cell. Garland Pub. Inc, London.
2. Bacha, W.J. (1990). Color Atlas of Veterinary Histology, Lea & Febiger, USA.
3. Banks, W. J., 1993. Applied Veterinary Histology, 3rd Ed., Mosby Year Book, London.
4. McGaedy, T. A., P.J. Quinn, E.S. Fitzpatrick, and M.T. Ryan, 2006. Veterinary Embryology, Blackwell Publishing, UK
5. Qureshi, A. S. and Chaudhry, M.N., 2007. Illustrated Vet. Histology, MAS Publishers, Faisalabad..
6. Eurell, J. A., and B. L. Frappier, 2007. Dellmann's Textbook of Veterinary Histology, Blackwell Publishing, UK.
7. Patten, 1964. Foundations of Embyology, McGraw-Hill Book Company, New York.

COMPARATIVE ANATOMY

7(1-6)

THEORY

Introduction to comparative vertebrate anatomy, Skeletal system; comparative notes, Muscular system; comparative notes, Arthrology; comparative notes and implications on movement pattern, Gait Mechanics; comparison of various modes of locomotion, Respiratory system; comparative notes and implications, Heart; Blood Vascular System; species specific patterns of development, Digestive system; species specific differences, Digestive system; associated glands; comparative notes, Urinary system; species specific differences, Male Genital system; species specific differences and their implications, Female Genital System; species specific differences, Comparative notes on Endocrine System, Comparative notes on Central and Peripheral Nervous System, Special Senses in different species, Integumentary system; its modifications in various species; structure of hoof; any special mention.

PRACTICAL

Comparative Osteology; Scapula and Humerus, Comparative Osteology; Radius and Ulna, Comparative Osteology; Carpals, Comparative Osteology; Metacarpals and Phalanges, Comparative Forelimb Arthrology, Comparative Osteology; Pelvic Girdle, Comparative Osteology; Femus, Patella, Comparative Osteology; Tibia and Fibula, Comparative Osteology; Tarsals, Metatarsals, Phalanges, Comparative Hindlimb Arthrology, Comparative Osteology; Skull, Comparative Osteology; Mandible and Hyoid Apparatus, Comparative Osteology; Vertebral Column, Comparative Osteology; Ribs and Sternum and Axial Arthrology, Comparative Myology; Extrinsic Muscles of the forelimb, Comparative Myology; Muscles of the Shoulder and Arm, Comparative Myology; Muscles of the forearm,

terminal tendons, Comparative Myology; Muscles of the croup and caudal thigh, Comparative Myology; Muscles of lateral, medial and cranial thigh Comparative Myology; Muscles of the leg and terminal tendons, Comparative Myology; Muscles of the thorax, abdomen and superficial muscles of the neck, Comparative Myology; Deep muscles of the neck, Comparative Myology; Facial Muscles, Respiratory System; Comparative Anatomy of Nasal Cavity, larynx, Trachea, Lungs and associated details, Comparative Anatomy of Heart and vessels cranial to the heart, Comparative Anatomy of Major Blood vessels of thorax, head and neck, Comparative Anatomy of Major Blood Vessels of abdomen, fore and hind limbs, Digestive System; Comparative Anatomy of oral cavity, esophagus, stomach, Digestive System; Comparative Anatomy of intestines, associated organs etc., Digestive System; Comparative Anatomy of intestines, associated organs etc. Comparative Anatomy of Urinary system, Comparative Anatomy of Urinary system, Comparative Anatomy of Male Genital System, Comparative Anatomy of Female Genital System, Species Specific Differences of Pelvic Cavity, Comparative Anatomy of Endocrine Glands, Comparative Anatomy of Cranial Cavity, spinal canal and spinal cord, Comparative Anatomy of Brain and ventricular system, Comparative Anatomy of Spinal and cranial nerves, Comparative Anatomy of Special Senses; eye, Comparative Anatomy of Special Senses; Ear, Comparative Anatomy of Integumentary system and its modification with special reference to hoof, Sagittal section of head, Comparative Surface Anatomy of skeletal system, Comparative Surface Anatomy of Head and Neck, Comparative Surface Anatomy of structures in the thorax, Comparative Surface Anatomy of structures in the Abdomen, Comparative Surface Anatomy of fore and hind limbs.

BOOKS RECOMMENDED

1. Sisson, S., Grossman, J. D., Getty, R. 1975 (5th Ed.). Sisson and Grossman's the Anatomy of the Domestic Animals. Volume 1. W B Saunders Co. USA.

FURTHER READING

1. Dyce, K.M., Sack, W.O., Wensing, C.J.W., 2002 (3rd Ed.). Textbook of Veterinary Anatomy. W B Saunders Co. USA
2. Koenig, H.E., Liebich, H-G., 2009 (4th Ed.). Veterinary Anatomy of Domestic Mammals: Textbook and Colour Atlas. Manson Publishing Ltd.
3. Ashdown, R.R., Done, S. H., 1996 (2nd Ed.). Color Atlas of Veterinary Anatomy: Volume I, The Ruminants. Mosby Ltd.
4. Ashdown, R.R., Done, S. H., 1996 (2nd Ed.). Color Atlas of Veterinary Anatomy: Volume II, The Horse. Mosby Ltd.

INTRODUCTION TO LIVESTOCK MANAGEMENT

2(0-2)

PRACTICAL

Approaching, handling and restraining of animals, Approaching, handling and restraining of animals Regions and body points of animals, Grooming and cleaning of animals, Identification of breeds of farm animals, Methods of identifications, Measuring Physiological norms of farm animals, Preparing animals for shows, Body measurements for weight estimation, Record keeping, Practical tips for housing of dairy and meat animals, Design and layout plans for dairy buildings, Exercise on measurements and facilities for housing and equipments of cattle and buffalo, Exercise on measurements and facilities for housing and equipments of sheep and goat, Suitable plans for stable construction along with designing fitting and equipments of stable, Visit to livestock farms and shows.

BOOKS RECOMMENDED

1. Banerjee, G. C. 1998. A Text Book of Animal Husbandry. Oxford and IBH Publishing Co. New Delhi India
2. Gopalkrishnan C. A. and G. M. M. Lal. 1993 Livestock and Poultry Enterprises for Rural Development Vikas Publishing House Pvt. Ltd. 576. Masjid Road, Jangpura, New Delhi- 110014
3. Khan B. B., M. Yaqoob, M. Riaz, M. Younas and A. Iqbal 2004 Livestock Management Manual Dept. Livestock Management, University of Agriculture Faisalabad
4. Khan, B.B., M. Younas, M. Riaz and M. Yaqoob 2005 Breeds of Livestock in Pakistan. Mashhoor Printing press, Aminpure Bazar, Faisalabad.
5. Khan. B. B., A. Iqbal and M. I. Muastafa 2003. Sheep and Goat Production, Livestock Management Manual Dept. Livestock Management, University of Agriculture Faisalabad.
6. Shah. S. I, 1994 Animal Husbandry, National Book Foundation Islamabad, Pakistan.
7. William M. Etgen and Paul M. Reaves 1982 Dairy, Cattle Feeding, and Management, John Wiley & Sons New York USA.

SYSTEMIC HISTOLOGY

5(1-4)

THEORY

Cardiovascular System Histology of Heart, Elastic and Muscular Arteries, Arterioles and Capillaries. **Cardiovascular System** Histology of Venioles, Small, Medium and Large-Sized Veins, Arterio-Venous-Anatomosis and Vasa Vasorum **Lymphatic System:** Introduction to Lymphoid Tissue. Histology of Lymph Node and Spleen, Histology of Thymus and Tonsils. **Lymphatic System:** Introduction to Lymphoid

Tissue. Histology of Lymph Node and Spleen, Histology of Thymus and Tonsils. **Digestive System:** Histology of Oral Cavity, Esophagus, Simple Stomach **Digestive System:** Histology of Compound Stomach In Ruminants And Intestines, Accessory Glands of Digestive System: Salivary Glands, Liver, Exocrine, Pancreas, Gall Bladder **Respiratory System:** Histology of Nasal Cavity, Vomernasal Organs and Pranasal Sinuses, Nasolarynx, Trachea And Extrapulmonary Bronchi **Respiratory System:** Histology of the Lungs, Bronchi, Bronchioles, Respiratory Bronchioles, Alveoli, Alveolar Duct and Alveolar Sacs **Urinary System:** Histology of Kidney: Nephron, Juxtaglomerular Apparatus, Collecting Tubules and Collecting Ducts **Urinary System:** Microscopic structure of Excretory Passages: Ureter, Urinary Bladder. Male and Female Urethra **Male Reproductive System:** Spermatogenesis, Histology of the Testes and their Associated Ducts: Epididymis, Ductus Deferens and Penis. Erection Mechanism **Female Reproductive System:** Oogenesis, Histology of Ovary, Fallopian Tubes and Uterus **Endocrine System:** General Structure of Endocrine Organs. Histology Of Hypophysis cerebri (Pituitary Gland), Epiphysis cerbri (Pineal Gland). **Endocrine System:** Histology of Thyroid and Parathyroid Gland, Adrenal Gland; Endocrine Tissues and Cells.

PRACTICAL

Cardiovascular System: Light Microscopic Study of the Tissue Sections of Heart, Elastic and Muscular Arteries, Arterioles and Capillaries, **Cardiovascular System:** Light Microscopic Study of the Tissue Sections of Venules, Small, Medium and Large-sized Veins, Arterio-venous-anastomosis and Vasa Vasorum., **Lymphatic System:** Light Microscopic Study of the Tissue Sections of Lymph node and Spleen., **Lymphatic System:** Light Microscopic Study of the Tissue Sections of Thymus and Tonsils., **Integumentary System:** Light Microscopic Study of the Tissue Sections of Skin: Epidermis, Dermis, and Hypodermis, Accessory Structures of the Skin: Hair, Sweat and Sebaceous glands, **Digestive system:** Light Microscopic Study of the Tissue Sections of Oral Cavity, Esophagus, Simple stomach in horse, dog and cat., **Digestive system:** Light Microscopic Study of the Tissue Sections of Compound Stomach in Ruminants and Intestines, Accessory glands of Digestive System: Salivary Glands, Liver, Exocrine, Pancreas and Gall Bladder. **Respiratory system:** Light Microscopic Study of the Tissue Sections of Nasal Cavity, Nasal Sinus, Nasopharynx and Oropharynx, Larynx and Trachea. **Respiratory system:** Light Microscopic Study of the Tissue Sections of Lungs, Bronchi, Bronchioles, Respiratory Bronchioles, Alveoli, Alveolar duct and alveolar sacs. **Urinary system:** Light Microscopic Study of the Tissue Sections of Kidney: Nephron, Juxta-glomerular Apparatus, Collecting tubules and collecting ducts. **Urinary system:** Light Microscopic Study of the Tissue Sections of Excretory passages: Ureter, Urinary Bladder. Male and female Urethra **Male Reproductive System:** Light Microscopic Study of the

Tissue Sections of the Testes and their associated ducts: Epididymis, Ductus Deferens and Penis. Spermatogenesis. Microanatomy of Spermatozoa **Male Reproductive System**: Light Microscopic Study of the Tissue Sections of male accessory glands (vesicular, prostate, bulbo-urethral glands). **Female Reproductive System**: Light Microscopic Study of the Tissue Sections of the Ovary, Uterine tube and Uterus **Female Reproductive System**: Light Microscopic Study of the Tissue Sections of Cervix and Vagina **Endocrine System**: Light Microscopic Study of the Tissue Sections of Pituitary gland, Thyroid gland, Adrenal gland and Pineal body.

BOOKS RECOMMENDED

1. Alberts et al., 1983. Molecular Biology of Cell. Garland Pub. Inc, London.
2. Bacha, W.J. (1990). Color Atlas of Veterinary Histology, Lea & Febiger, USA.
3. Banks, W. J., 1993. Applied Veterinary Histology, 3rd Ed., Mosby Year Book, London.
4. McGaedy, T. A., P.J. Quinn, E.S. Fitzpatrick, and M.T. Ryan, 2006. Veterinary Embryology, Blackwell Publishing, UK
5. Qureshi, A. S. and Chaudhry, M.N., 2007. Illustrated Vet. Histology, MAS Publishers, Faisalabad..
6. Eurell, J. A., and B. L. Frappier, 2007. Dellmann's Textbook of Veterinary Histology, Blackwell Publishing, UK.
7. Patten, 1964. Foundations of Embyology, McGraw-Hill Book Company, New York.

CARDIOVASCULAR, RESPIRATORY AND RENAL PHYSIOLOGY

4(2-2)

THEORY

Introduction to Physiology, Branches and its scope. **Cell**: Functional Systems of a mammalian cell (general characteristics, cellular ingestions and digestion). Physiological functions of cellular organelle, Cellular locomotion, cellular differentiation and apoptosis, ions channels and transportation. **Cardiovascular System**: Blood, its composition, Blood cells genesis and differentiation.. Structure and synthesis of hemoglobin, its types, and iron metabolism. Functions of Neutrophils, Basophils, Eosinophils, Monocyte- Macrophage system and their role against body infection, reticulo-endothelial system. Resistance of body to infection, Lymphocytes and immunity (Humoral and cell mediated immunity). Blood groups and transfusion; Blood transfusion complications. Mechanism of Blood coagulation, different pathways; Humeral and tissue factors affecting coagulation; Fibrinolytic system and implication.. Clinical correlation (Anemia, polycythemia, allergy and hypersensitivity, jaundice,

hemophilia). **Circulatory Physiology:** Introduction to circulation and its characteristics; Biophysics of hemodynamics.. Circulation (General; Systemic and Regional circulation; Coronary, Skeletal muscle, Spleenic, Foetal, Pulmonary Circulation). Microcirculation and fluid exchange. Blood Pressure, neural and hormonal control of blood pressure and blood volume, Local control of blood pressure and flow. Physiology of Lymphatic system lymph channel of body, formation of lymph; Role of lymphatic system in controlling interstitial fluid protein, volume and pressure; Cardiac Cell (properties, energy requirement) Physiological basis of Cardiac cycle; Relationship of heart sound to heart pumping, regulation of cardiac activity. Rhythmical excitation of heart; Electrophysiology of heart; Characteristics Normal Electrocardiogram. Clinical correlation (edema formation, circulatory shock, Electrocardiographic interpretation of cardiac muscle and coronary blood flow abnormality). **RESPIRATORY SYSTEM :** Functional anatomy of respiratory system Mechanism of Pulmonary ventilation; Pulmonary volume and capacities Physical principals of gas exchange, Respiratory membrane and Diffusion of different gases through it; Fetal gas exchange Factors affecting rate of gas diffusion, Role of surfactants, pleural cavity Transport of Oxygen in blood, lungs and tissues with regulation Transport of carbon dioxide in lungs, blood and tissues with regulation Neural and hormonal control of respiration Clinical correlation (pulmonary edema, emphysema and hypertension, CO poisoning, hypoxia) **RENAL PHYSIOLOGY:** Introduction to renal physiology; Anatomy and physiology of Nephron **Urine formation;** Glomerular filtration, Physiological control and auto-regulation of Glomerular filtration rate Tubular Reabsorption and processing of Glomerular filtrate; Mechanism of tubular re-absorption and regulation. Regulation of extra-cellular fluid osmolarity :balance of sodium and potassium by kidney, Renal absorption of bivalent ion. Renal blood flow, renal clearance, filtration fraction; Regulation of urine volume and concentration; Act of Micturation and regulation. **Introduction to acid – base Physiology :** Renal mechanisms for maintaining hydrogen ion concentration in body fluids; Regulation of acid–base balance, Clinical correlation (acidosis, alkalosis).

PRACTICAL

Methods of Handling and Restraint of Different Domestic animals for blood collection, body temperature, pulse. Collection of Blood. Sites of Blood collection in different animal species, precautions while blood collection. Different types of anticoagulants used routinely and their mechanism of actions. Practical demonstration of measuring Body temperature, pulse, respiration rate in different domestic animals. Practical demonstration of blood collection in different domestic animals. Determination of Total Red Blood Cell Count of the blood sample obtained from some animal source or human volunteer. Determination of Total White Blood Cell Count of the blood sample obtained from some animal source. Determination of

Packed Cell Volume. Determination of Haemoglobin concentration
Determination of coagulation and bleeding time. Practical performance of erythrocyte Sedimentation Rate. Practical performance of Differential Leukocyte Count. Demonstration and Practical performance for the Determination of Blood Groups. Demonstration and Practical performance for the Determination of various lung capacities and volumes. Urinalysis

BOOKS RECOMMENDED

1. Cunningham, J.G. and B. G. Klein (2007). Textbook of Veterinary Physiology. 4th Ed. WB Saunders Company, USA.
2. Zia-ur-Rahman, B. Aslam, J. A. Khan and T. Khaliq (2007). Manual of Physiology-1. Department of physiology and pharmacology, University of Agriculture, Faisalabad, Pakistan.
3. Guyton, A. C. and J. E. Hall. (2006). Textbook of Medical Physiology. 11th Ed. WB Saunders Company, USA.
4. Barrelet, K. E., S. M. Barman, S. Boitano, H. L. Brooks (2006). Ganong's Review of Medical Physiology. 23rd Ed. Appleton & Lange, USA.
5. Dukes, H. H., M., J. Swenson and W.O. Reece (2004). Duke's Physiology of Domestic Animals. 12th Edition, Comstock Publishing, USA.
6. Chruch D. C. (1993). The Ruminant Animal: Digestive Physiology and Nutrition. Waveland Press, Inc, USA.

PHYSIOLOGY OF DIGESTION AND LACTATION 4(2-2)

THEORY

Introduction to gastrointestinal physiology, Feeding behavior, prehension and mastication, enteric nervous system, Physiological mechanism of deglutition, Saliva, its secretion. composition, regulation, Eructation mechanism, emesis and its control, Physiologic anatomy of stomach, Contractile activity of the stomach, gastric motility, factors affecting gastric motility, Gastric secretion, composition, regulation, factors influencing the gastric secretion, Physiologic anatomy of intestine, role of villus in digestion and absorption, Digestion and absorption of carbohydrates, Digestion and absorption of proteins, Digestion and absorption of fats, Absorption of vitamins end electrolytes, Exocrine role of Pancreas in digestion, composition of pancreatic secretion, regulation of pancreatic secretion, Role of Liver in digestion, importance of enter-hepatic circulation in fat digestion, factors affecting the secretion of bile, Ruminant stomach, anatomy and physiology, concept of functional ruminal epithelium, Esophageal grooves and concepts of nutrient-by-pass, Microbial ecosystem of digestion in ruminants, Fermentation of carbohydrates, proteins and fats in rumen, Production and absorption of volatile fatty acids, nitrogen in ruminants, Post-absorptive utilization of

nutrients, Functional anatomy of mammary glands and mammary growth, Physiology of lactation and mammogenesis, Lactogenesis and galactopoesis, Milk synthesis and secretion, Mammary gland metabolism and biosynthesis of milk components, Biological functions of milk and their nutritive value, Lactation performance, physiological factors affecting lactation, Mammary biotechnology

PRACTICAL

Study of equipments used for mammalian experiments, Farm visits for observation on rumination, deglutition in ruminants, Salivary secretion in dogs, cats and ruminants, Tests for saliva of different animals, Tests for saliva of different animals, Thyri-vella fistula and intestinal motility in dogs, Intestinal motility in dogs with balloons, Measurement of absorption in rabbits, Motility of ruminant stomach, Rumen fistula/cannulation, Biochemical experiments on bile, Biochemical experiments on bile, Effects of pancreatectomy in dogs and replacement therapy, Determination of composition of milk, Determination of pH and specific gravity of milk, Determination of total solid in milk

BOOKS RECOMMENDED

1. Cunningham, J.G. and B. G. Klein (2007). Textbook of Veterinary Physiology. 4th Ed. WB Saunders Company, USA.
2. Guyton, A. C. and J. E. Hall. (2006). Textbook of Medical Physiology. 11th Ed. WB Saunders Company, USA.
3. Barrelet, K. E., S. M. Barman, S. Boitano, H. L. Brooks (2006). Ganong's Review of Medical Physiology. 23rd Ed. Appleton & Lange, USA.
4. Dukes, H. H., M., J. Swenson and W.O. Reece (2004). Duke's Physiology of Domestic Animals. 12th Edition, Comstock Publishing, USA.
5. Jafri, S. A., M. Rabbani and H. Rehman (2002). Manual of Digestive Physiology. Manual. Muktaba-i-Danwasharian, Lahore, Pakistan.
6. Chruch D. C. (1993). The Ruminant Animal: Digestive Physiology and Nutrition. Waveland Press, Inc, USA.

ENDOCRINOLOGY AND NEUROMUSCULAR PHYSIOLOGY

5(1-3)

THEORY

Neuro-muscular Physiology :Introduction to Neurophysiology, Physiologic anatomy of Neuron, Action potential: its properties and types, Synapse and Synaptic transmission, Types of neurotransmitters, Physiologic anatomy and Neurophysiology of skeletal muscles, mechanism of contraction, excitation-contraction coupling mechanism, Physiologic anatomy of smooth muscle, its types, electrophysiological differences,

mechanism of contraction, Divisions of nervous system: CNS and PNS, Concept of upper motor and lower motor neurons, Autonomic nervous system, Parasympathetic and sympathetic divisions, Types of receptors their properties, Anatomical divisions of brain and functions of each part, **Endocrine Physiology:** An overview of endocrine system ,integration of endocrine and nervous system, Classification, transport of hormones, Hormone -cell interaction and feed back mechanism, Pituitary gland; functional anatomy and secretions and their Physiological functions, Thyroid gland; Physiological anatomy; synthesis, release, functions of thyroxin and triiodothyronie, Endocrine pancreas; role of insulin and glucagons in regulation of glucose metabolism, Parathyroid gland: Physiological anatomy; synthesis, release, functions and abnormalities of paratharmone and calcitonin.

PRACTICAL

Demonstration of various instruments used in Laboratory (Power-Lab., Tissue organ bath, Kymograph, oscilloscope, student's stimulator etc), Pithing of a frog and demonstration of spinal reflexes, Nerve-muscle preparation of frog, Effect of various physiological stimuli on nerve-muscle preparation of frog, Effect of various chemical stimuli on nerve-muscle preparation of frog, Fatigue phenomena in muscle to determine the velocity of nerve impulse in frog's nerve muscle preparation, Effect of increasing strength on muscle activity of frog, Isolated heart activity of a frog/rabbit, Recording of myocardial activity of isolated heart in decerebrated frog, Demonstration of isolated intestinal activity of rabbit, Demonstration of location of endocrine glands in rats and rabbits, Thyroidectomy in dogs and its metabolic effects, Thyroidectomy in dogs and replacement therapy, Isolated rat uterus and effect of oxytocin, Isolated rat uterus and effect of oxytocin, Glucose tolerance test

BOOKS RECOMMENDED

1. Costanzo, L. (2008). Physiology. 4th Edition, Elsevier Pub., USA.
2. Cunningham, J.G. and B. G. Klein (2007). Textbook of Veterinary Physiology. 4th Ed. WB Saunders Company, USA.
3. Guyton, A. C. and J. E. Hall. (2006). Textbook of Medical Physiology. 11th Ed. WB Saunders Company, USA.
4. Barreet, K. E., S. M. Barman, S. Boitano, H. L. Brooks (2006). Ganong's Review of Medical Physiology. 23rd Ed. Appleton & Lange, USA.
5. Dukes, H. H., M., J. Swenson and W.O. Reece (2004). Duke's Physiology of Domestic Animals. 12th Edition, Comstock Publishing, USA.
6. Jafri, S. A., M. Rabbani and H. Rehman (2002). Neuromuscular and Endocrine Physiology Manual. Muktaba-i-Danwasharian, Lahore, Pakistan

INTRODUCTION TO POULTRY PRODUCTION

3(1-2)

THEORY

Importance, history, present status and future perspectives of poultry industry; classification of poultry breeds and varieties; brooding, rearing and production practices in poultry; rural vs commercial poultry production; introduction to various body systems of the chicken; composition of poultry meat and eggs.

PRACTICAL

Demonstration regarding body parts of poultry; demonstration of digestive; respiratory, urinary and reproductive systems of a poultry; structure and composition of an egg; demonstration of various routine practices at poultry farm.

BOOKS RECOMMENDED

1. Austic, R.E. and M.C. Nesheim. 1990. Poultry Production. Lea and Febiger Philadelphia. USA.
2. Hunton, P. 1995. Poultry Production: Production System Approach. Elsevier Science Publishers, Amsterdam, The Netherlands.
3. Jadhav, N.V. 1998. Practical Manual for Avian Production and Management. Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi, India.
4. Jull, M.A. 2003. Successful Poultry Management. Biotech Books. Delhi India.
5. Owen, W.P. 2000. Poultry Farming and Keeping. Biotech Books. India.

GENERAL MICROBIOLOGY

4(2-2)

THEORY

Introduction of Microbiology, definition and branches of Microbiology, Historical introduction including works of Pasteur, Koch and Lister etc, Recent developments in microbiology, Prokaryotes v/s Eukaryotes, bacterial growth and multiplication, Physico-chemical requirements (pH, temperature; oxidation reduction potential; gaseous and nutritional requirements), Types of culture media, Bacterial multiplication and growth curve, continuous culture, Bacterial genetics, Mutation and mutagenesis (transposons, conjugation, transformation), Role of transduction, lysogeny, plasmid in mutation and mutagenesis, Introduction to genetic engineering, Introduction to fungi, molds and yeasts, Growth requirements and mode of replication of molds and yeasts, Isolation and identification of molds and yeasts, Classification of molds and yeasts, Clinical diagnosis of different fungal diseases, Fundamental characteristics of viruses (Definition and history of virology; general properties of viruses; methods

of studying viruses; purification of viruses and determination of virus size), Virus classification, Virus replication (Adsorption-receptor/ligand; entry mechanisms; uncoating; biosynthesis of virus components; transcription and translation; assembly; release), Replication of RNA and DNA viruses and their comparison analysis, Replication of Retroviruses and defective viruses, Properties of animal viruses at cellular levels (infection of cell with more than one viruses etc), Recombination; exaltation; dormancy and reactivation; interference, Mechanisms of heamagglutination, heamadsorption and elution, Interferon (Properties, types, mode of action, biological significance, antibodies vs interferon), Viral vaccines and factor affecting success/ failure of viral vaccines, Bacteriophages and its typing, Physico-chemical characteristics of viruses, Method for isolation and identification of viruses.

PRACTICAL:

Safety in microbiological laboratory, Demonstration of laboratory equipments, their basic functioning and handling, Microscope and microscopy (Bright field; dark field; phase contrast; fluorescent microscopes etc), Sterilization and disinfection and different methods e.g. moist heat, dry heat, irradiation, filtration and chemical agents etc (Phenol coefficient) Collection, preservation and submission of morbid material for laboratory diagnosis, Preparation and demonstration of various bacteriological media (General and selective), Demonstration of staining techniques (Gram's, Loeffler's, Zeihl-Neelson's and spore staining techniques), Methods of bacterial cultivation and growth measurement, Identification of bacterial characteristics (colony, morphology, shape and arrangement), biochemical tests and sugar fermentation tests, Micrometry and motility, antibiotic susceptibility testing, Isolation identification common fungi and molds, Introduction to equipments used in virological work, Collection, transportation, storage and preparation of samples for virus studies, Purification (ultracentrifugation; precipitation and ultra-filtration and cultivation of viruses (animal inoculation; egg inoculation; cell culture preparation; demonstration of cytopathic effects (CPE), Virus identification methods (Electron microscopy; serology; precipitation test, virus neutralization test etc), Virus titration (determination of LD50, ID50, EID50, CCID50) and then preservation and storage of purified viruses

BOOKS RECOMMENDED:

1. Anonymous, 1999. A laboratory manual for the isolation and identification of avian pathogens. 6th Ed. American Association of Avian pathologists, Iowa State University Press, Ames, Iowa.
2. Burleson, F.G., T.M. Chanbes and D.I. Wiedranks, 1992. Virology-A laboratory Manual Academic Press, London
3. Cstro, A.E. and W.F. Henschle, 1992. Veterinary Diagnostic Virology. Mosby yearbook, Inc., Baltimore.

4. Fenner, F.J., E.P. Gibbs, F.A. Murphy, M.J. Studdert and D.O. White, 1993. Veterinary Virology 2nd Ed., Academic Press London.
5. Merchant, I.A. and R.A. Packer, 1984. Veterinary Bacteriology and Virology. 7th Ed., Iowa State University Press, Ames, Iowa.
6. OIE, 2000. Manual of standards for diagnostic tests and vaccines. Off. Intl. Des. Epiz., Paris.
7. Quinn, P.J., M.E. Carter, B.K. Markie and G.R. Carter, 1994. Clinical Veterinary Microbiology. Wolf, London.
8. Rabbani, M. and M.A. Muneer, 2001. Techniques in Virology. 1st Ed., UVAS Press, Lahore
9. Talaro, K. and A. Talaro, 1996. Foundation in Microbiology. 2nd Ed., Win C. Brown Publ., Iowa.
10. Virella, G., 1997. Microbiology and Infectious Disease. 3rd Ed., Williams and Wilkins, Baltimore.

INTRODUCTION TO ANIMAL BREEDING AND GENETICS

5(3-2)

THEORY

History of genetics. Chemical basis of inheritance. Genetic basis of inheritance, cell division. Mendelism, monohybrid and polyhybrid crosses. Additive and non-additive gene action. Probability, concept and laws of probability, modified segregation ratio. Polygenic inheritance, pleiotropy, linkage, crossing over and chromosomal mapping. Expression and interaction of gene. Mutation, lethal and sub-lethal genes. Quantitative genetics; Heritability and repeatability (avian and ruminants). Population genetics: genetic and phenotypic correlations. Emerging genetic technologies.

PRACTICAL

Microscopic studies on the animal cells undergoing mitosis and meiosis. Cytogenetics, karyotyping. Gamete and genotype formation Exercises on monohybrid, polyhybrid and gene interactions. Exercises on the estimation of heritability and repeatability in various animals and poultry. Case studies for lethal semi-lethal and other genetic abnormalities. Exercises on relevant topics.

BOOKS RECOMMENDED

1. Elrod, S. 2001. Schaum's Outline of Genetics. McGraw-Hill, Book Co. USA.
2. Klung, W.S. and M.R. Cummings, 2006. Concepts of Genetics. Prentice Hal, Inc. New Jersey, USA.
3. Nicholas, F.W. 1995. Introduction to Veterinary Genetics. Oxford, Oxford University Press.

THEORY

The Science of nutrition and its scope, History and the role of the past scientist in the development of the science of nutrition, Basic terms used in animal nutrition, Composition of animal body and plants and its interaction, Classification of nutrients, Classification of carbohydrates, Functions of carbohydrates. Classification of lipids. Functions of lipids. Water, its importance and functions, Factors governing water requirements of livestock and poultry, Classification of minerals and their general functions, role of macro-minerals in animal nutrition, Impact of mineral deficiency and toxicity of minerals, Impact of mineral deficiency and toxicity of minerals, Classification of vitamins and their general functions, Importance of fat soluble vitamins, Interrelationship of vitamins, minerals and their toxicity, Feed additives and their use in livestock and poultry feeding, Nutrition in relation to body maintenance and growth., Nutrition in relation to reproduction. Nutrition in relation to animal production, Digestion mechanism of lipids in monogastric, Digestion mechanism of carbohydrates in ruminants, Digestion mechanism of proteins in ruminants, Digestion mechanism of lipids in ruminants, Metabolism of carbohydrates, Metabolism of carbohydrates, Metabolism of proteins, Metabolism of lipids.

PRACTICAL

Identification of feedstuffs, Identification of forages, Physical characteristics of cereals and cereals byproducts, Physical characteristics of forages, Physical characteristics of agro-industrial byproducts and wastes for protein and energy sources, Feed samples collection techniques, Forage samples collection techniques, Feed samples preparation for analysis, Introduction to feed analysis equipments, Grinding and weighing of samples, Analysis of dry matter and ash, Analysis of crude protein, Analysis of crude fat, Analysis of crude fiber, Introduction to mineral analysis

BOOKS RECOMMENDED

1. Perry, T.W., A.E. Cullison and R.S. Lowrey. 1999. Feeds and Feeding. 5th Ed. Prentice Hall, New Jersey, USA.
2. Lander, P.E. 2001. The Feeding of Farm Animals in India. Biotech Books, New Delhi, India.
3. Ensminger M.E., J.E. Oldfield and W.W. Heinemann. 1990. Feeds and Nutrition Digest (2nd Ed). The Ensminger Publishing Co., Clovis, California, USA.

THEORY

Introduction, history, important terms of pathology, Adaptation: atrophy, metaplasia, hyperplasia, hypertrophy, hypoplasia, Cell Injury: Pathogenesis of cell injury, Hypoxic cell injury, Cell injury due to membrane damage, Reversible cell injury – cell swelling and hydropic change, Intracellular lipid accumulation, Lysozomal storage diseases, Types of necrosis (coagulative, caseous, liquefactive, fat, Zenker's necrosis, etc), Outcome of necrosis, autolysis, difference between autolysis and necrosis, Gangrene, difference between gangrene and necrosis, Exogenous and endogenous pigments, melanin, ceroid, haemosiderin, lipofuscin and mineralization, Circulatory Disturbances: Hyperaemia, Congestion, Oedema, Haemorrhage, Embolism, Shock (hypovolaemic, haemorrhagic, septic), Inflammation: Causes, Inflammatory process and manifestation, Biochemical mediators: General features of mediators, Vasoactive amines (histamine and serotonin), Kinins, Arachidonic acid metabolites, Biochemical mediators: Complement system, Nitric oxide, others, Types of inflammatory exudates, Chronic Inflammation, Morphological Characteristics of neoplasia, Laboratory Diagnosis of neoplasia, Hypersensitivity reactions: Type 1 & 2, Autoimmunity, Amyloidosis.

PRACTICAL

Introduction to Pathology Lab. General rules for identification of gross changes in various organs/tissues, Preservation and fixation of morbid tissues, Preparation of microscopic slides (Tissue processing, embedding and staining), **Microscopic picture of the following conditions:** degenerative changes, Degenerative changes, Various types of infiltrations, Various types of infiltrations, Different types of necrosis, Different types of necrosis, Vascular disturbances, Vascular disturbances, Growth changes, Inflammatory changes in various organs, Inflammatory changes in various organs, Important neoplasms of animals

BOOKS RECOMMENDED

1. Cheville, N. F., 2006. Introduction to Veterinary Pathology. 3rd Ed. Iowa State Press, Ames, Iowa, USA.
2. McGavin, D. M. and J. F. Zachary, 2006. Pathologic Basis of Veterinary Disease. 4th Ed. Mosby; St. Louis, MO, USA.
3. Dunlop, R. H. and C. H. Malbert, 2004. Veterinary Pathophysiology. Blackwell Publishers, Ames, Iowa, USA.
4. Majno, G. and I. Joris, 2004. Cells, Tissues, and Disease: Principles of General Pathology. 2 Ed. Oxford University Press, New York, USA.
5. Slauson, D. O. and B. J. Cooper, 2002. Mechanisms of Disease. A Textbook of Comparative General Pathology. 3rd Ed. Mosby, A Harcourt Health Sciences Company, London, UK.

THEORY

Introduction to Parasitology, Effects of Parasites on their host and their economic importance, Animal association, Host and organ specificity, Host Parasite relationship, Types of Parasitism, Types of Hosts. Mode of infection of Parasite, Nomenclature and classification of parasites, Locomotory and nervous systems of parasites, Digestive and reproductive systems of parasites, Parasitic zoonosis, Immunity Against Parasites

PRACTICAL

Course objectives and laboratory ethics, Visit to abattoir: antemortem and postmortem examination for parasites, Field visit: interaction with the farmers/staff of the livestock farm, Visit of livestock farm/s: gross examination of animals for parasites, Visit of livestock farm/s: collection and handling samples for parasitic examination, Visit of livestock farm/s: collection and handling samples for parasitic examination, Use of different types of microscopes for parasitic examination, Macro- and microscopic measurement of parasites, Diagnostic methods in parasitology, Visit to veterinary hospital/clinics: veterinarian's approach towards parasite control, Identification of major classes of parasites; outcomes of the course.

BOOKS RECOMMENDED

1. Akhtar, M., M. A. Hafeez and C. S. Hayat 2003. General Parasitology and Protozoology. The Elite Scientific Publications Faisalabad, Pakistan.
2. Ash, L.A. and T.C. Orihel, 1991. Parasites: a guide to laboratory procedures and identification. ASCP Press. American Society of Clinical Pathologists.
3. Hayat, C.S. and M. Akhtar, 1999. Parasitic Diagnosis. UGC. Govt. of Pakistan.
4. Iqbal, Z., M. S. Sajid, R. Z. Abbas and M. N. Khan, 2003. *Manual of General Parasitology and Protozoology*, ISBN 969-8490-07-8. Friends Science Publishers, Faisalabad, Pakistan.
5. Iqbal, Z., M.S. Sajid, A. Jabbar, Z.A. Rao and M.N. Khan, 2006. Techniques in Parasitology. ISBN 969-417-089-3. Higher Education Commission, Islamabad-Pakistan
6. Roberts, L.S. and J.J. Janovy, 2000. Foundations of Parasitology. 5th Edition, W.C.B. Company, U.K.
7. Soulsby, E. J. L., 2006. Helminths, Arthropods and Protozoa of Domesticated Animals. The English Language Book Society Bailliere Tindall, London.

8. Urquhart G.M., J. Armour, J.L. Duncan, A.M. Dunn, F.W. Jennings, 2000. Veterinary Parasitology. Longman Scientific and Technical, U.K.

FUNDAMENTALS OF IMMUNOLOGY

3(1-2)

THEORY

Introduction to immunity, types of immunity, Non specific (Innate) Defense: Skin and Mucous membranes, Complement system: components, pathways of activation, consequences of activation, regulation of complement system, Phagocytosis: Phagocytic cells, Mechanism of phagocytosis, Antigen: Antigenicity, nature of antigens, essential features of antigens, Epitopes, adjuvants, cross-reactivity, Specific defense: Humoral Immunity: Primary response, secondary response, Functions of Antibodies, Cell-mediated Immunity: components and evaluation of cell mediated immunity, Theories of antibody formation, monoclonal antibodies and their uses, hybridomas, Immunoglobulin (antibodies): Nature of antibodies, structure, Classes and subclasses of immunoglobulin, immunoglobulin of domestic animals, Sources of lymphoid cells, primary lymphoid organs (Thymus, Bursa of Fabricius) B cells, origin, clonal selection, activation of B cells, Cells and organs of immune system: origin of immune cells, T cells, activation of T cells, types of T cells Secondary Lymphoid organs: Lymph nodes, spleen, other tissues, Lymphocytes, Cellular basis of antibody production: antigen sensitive cells, plasma cells, memory cells, Cellular basis of cell-mediated immunity: Response of T cells, lymphokines, cell mediated toxicity, Cell interactions, regulation of immune system, Immune tolerance Major histocompatibility complex (MHC): MHC proteins, Importance of MHC, Hypersensitivity, mechanism and types of hypersensitivity, Immunoprophylaxis: immunization, types and procedures of immunization; Passive and active immunization, Standard Operational procedures, HACCP, Batch Manufacturing Record (BMR). Production, monitoring and immunotherapeutics, Passive immunizations, Production of Biologics, Types, characteristics of vaccines, subunit vaccines, DNA vaccines, live attenuated and killed vaccines. Failures in vaccination, adverse consequences of vaccination, Administration of Vaccines, vaccination schedules, monitoring of vaccinated animals.

PRACTICAL

Bio-safety in an immunology laboratory, Introduction, handling and functions of equipments used in Immunology laboratory, Use of Fluorescent microscope, Differential white blood count, Model system of phagocytosis, Bacterial agglutination test, Precipitation test, Complement fixation test, Enzyme linked immunoassay, Virus neutralization test, Preparation of antigen, Raising of hyper-immune sera, Purification of antibodies in serum samples, Method of vaccine production and

evaluation, Demonstration of delayed hypersensitivity testing., SOP, BMR, HACCP, Cold chain system, vaccination schedule, monitoring of vaccinated animals.

BOOKS RECOMMENDED

1. Tizzard, I. R., 1999. An Introduction to Veterinary Immunology. W.B. Saunders, Co. London, U.K.
2. Jawetz, E., 2000. Medical Microbiology, 21th Edition, Prentice-Hall Intl, Ltd., London.
3. Tortora, G. J., B. R. Funke and C.L. Case, 1997. Microbiology- An Introduction, Addison and Wesley Longman Inc., California.
4. Lansing, M.P., P.H. John and A.K. Donald, 1999. Microbiology. 4th ed., WCB McGraw Hill, London.
5. Hudson, L. and F.C. Hay, 1991. Practical Immunology, 3rd Ed., Blackwell Scientific Publication, London.
6. Thomas, J. K., A.O. Barbara and A.G. Richard, 2006. Kuby Immunology. W.H. Freeman publishers.
7. Helen, C., M. Haeney, S. Misbahand N. Snowden, 2006. Essentials of Clinical Immunology. 5th Ed., Blackwell Scientific Publication, London.

GENERAL PHARMACOLOGY AND PHARMACEUTICS

4(2-2)

THEORY

Introduction to Pharmacology, Historical perspectives, Scope, Definitions and Terminology, Drug development and drug regulations, Drug sources, Classification of drugs, Transport mechanisms across biomembranes, Drug formulations, Routes of their administration, Biodisposition of drugs, Bioavailability of drugs, Protein binding of Drugs, Distribution of Drugs, Storage of Drugs, Metabolism of Drugs, Excretion of Drugs, Pharmacokinetics, Principles and applications, Pharmacodynamics, Drug actions, Structure activity relationship, Receptor theories, Dose-response relationship, Therapeutic index, Drug resistance, Drug Idiosyncrasy , Adverse reactions of drugs, Drug interactions, Basic principles governing the preparation of different dosage forms, Basic principles governing the storage of different dosage forms, Basic principles governing the dispensing of different dosage forms.

PRACTICAL

Weights and measures, Prescription writing, Pharmaceutical calculations, Partition coefficient of drugs, Formulations; external and internal dosage forms, Techniques of drug administration in animals, Identification of various drugs, Preparation of ointments, Preparation of liniments , Preparation of tinctures, Experiments on drug antagonism and synergism,

Drug assays, Acute toxicity study, Strychnine poisoning in rabbits., Strychnine poisoning in dogs, Demonstration of Pharmacokinetic experiments.

BOOKS RECOMMENDED:

1. Hardman, J.G., L.E. Limbird, et al., 2005. Goodman and Gillman pharmacology basis of therapeutics, 11th Ed., McGraw-Hill, New York.
2. Akhtar, M.S., 2004. Introduction to Veterinary Pharmacology & Therapeutics. 4th Ed. Agri. Livestock Bureau Pakistan, Faisalabad.
3. Adams, H.R., 2001. Veterinary pharmacology & Therapeutics, 8th Ed. Iowa State University Press USA.
4. Katzung, B.G. 2003. Basic and Clinical Pharmacology. 8th Ed., 2001Mc Graw hill, New York.
5. Moats, W.A., and Marjorie, B.M. Medina (1996). Veterinary Drug residues food safety, Oxford Press.

GENERAL MEDICINE

4(2-2)

THEORY

History and scope and general terms used in veterinary medicine **General systemic states** Toxemia and Septicemia Fever, hyperthermia, hypothermia Anaphylaxis and shock **Diseases of alimentary system** Stomatitis, Pharyngitis and Choking Simple indigestion Ruminal acidosis Ruminal tympany Traumatic reticuloperitonitis Enteritis Equine colic **Diseases of hepatobiliary system** Hepatitis, jaundice Cholilithiasis **Diseases of cardiovascular system** Hepatitis, jaundice **Diseases of cardiovascular system** Cholilithiasis General terms, Pericarditis, myocarditis, endocarditis, etc. Congestive heart failure and congenital cardiac defects Cardiac murmurs **Diseases of haematopoitic & haemolymphatic system** Disorders of white cells (leucopenia, leukocytosis etc.), Anemia and edema Haemorrhage and Lymphadenopathy (lymphadenitis) **Diseases of respiratory system** General clinical signs of respiratory diseases, principles of respiratory disease therapy, Rhinitis Laryngitis, Tracheitis and Bronchitis Pulmonary congestion and edema Pneumonia and Aspiration pneumonia Pulmonary emphysema Hydrothorax & haemothorax Pneumothorax and Pleurisy Epistaxis **Diseases of urinary system** General terms, Nephritis and Pyelonephritis Cystitis **Diseases of nervous system** Common manifestations of diseases of nervous system, encephalitis, Encephalomalacia, meningitis etc. **Diseases of musculoskeletal system** Myositis, Myopathy, Arthritis, arthropathy Osteomyelitis, Osteomalacia, Osteodystrophy **Diseases of skin** General terms, dermatitis, seborrhea and photosensitization etc.

PRACTICAL

Introduction to clinics Various techniques to restrain animals for clinical examination Various techniques to cast an animals for various clinical procedures History and clinical examination (visual inspection and recording the cardinal parameters of health like body temperature, pulse and respiration rates) Important considerations while examining different body systems Anatomical location of different body organs Evaluation of hydration status Rectal examination Review of art of prescription writing Different methods of drug administration Passing of stomach tube and probang Passing of urinary catheter Collection and dispatch of samples for laboratory diagnosis Field tests for mastitis Review of various coprological and hematological tests for diagnosis

BOOKS RECOMMENDED

1. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.
2. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA.
3. Pinsent, P.J.N. & C.J. Fulle 1997. Outline of Clinical Diagnosis in Horse. Blackwell Science, Oxford, UK.
4. Howard J.L, 1999. Current Veterinary Therapy, Food Animal Practice. W.B. Saunders, Co., U.S.A.
5. Hungerford. T.G. 1991, Hungerford's Disease of Livestock 9th Ed. Mc Graw Hill Book Company, Sydney, Australia.
6. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.

GENERAL SURGERY AND ANAESTHESIOLOGY

5(1-4)

THEORY

Surgical principles. General surgical considerations, pre-operative preparations, patient assessment and stabilization , Inflammation and its management, Body fluids, Acid-base imbalances, Antisepsis, asepsis, disinfection and sterilization, Wounds, their types, treatment and complications, regeneration, factors affecting wound healing, antimicrobial therapy, Haematoma, contusions, abrasions, galls burns, and their treatment., Sinus, fistula, abscess, ulcers and their treatment, Hernia and its types , Management of hernia, Introduction of Veterinary Anaesthesia, Pre-anesthetic and anaesthetic agents and their use, Pre-anaesthetic considerations, Monitoring of patient during, anaesthesia, Anaesthetic complications (cardiac arrest, respiratory failure, shock, acid base imbalance) and their management, Types of anaesthesia (local, regional and general), Stages of general anaesthesia. Anaesthesia under field

conditions, Aneasthetic regimens for dogs, cats, horses and donkeys , Aneasthetic regimens for ruminants and camels , Aneasthetic regimens for birds, wild, exotic, and laboratory animals

PRACTICAL

Definition, Scope and History of Veterinary Surgery, Elective and emergency surgery Surgical instruments (Small and large animals), Biomaterials (Suture materials, dressings, etc.), Suturing patterns and knots , Standard surgical pack and its sterilization, , Antiseptics and Disinfectants, Scrubbing , Preparation of surgical team and patient for aseptic surgery and Operating room conduct, Pre-operative patient assessment, Post operative care and physical therapy, Pain management and anti-inflammatory medication, Fluid Types and indications , Practical demonstration of Fluid administration, Management of wounds, abrasions, galls and ulcers , Management of abscess, sinuses and fistula, Management of haematoma, contusions and hemostatic techniques, Management of burns, Management of hernia, Shock and its management, Injectable anesthetic agents , Inhalant anesthetic agents , Anesthetic equipments and circuits, Stages of general anesthesia and monitoring of patient, Anesthetic emergencies , Epidural anesthesia, Flank anesthesia, Practical demonstration of anesthetic regimens for dogs, Practical demonstration of anesthetic regimens for cats, Practical demonstration of anesthetic regimens horses and donkeys, Practical demonstration of anesthetic regimens for small ruminants , Practical demonstration of anesthetic regimens for large ruminants and camels, Practical demonstration of anesthetic regimens for birds, Practical demonstration of anesthetic regimens for wild, exotic and laboratory animals

BOOKS RECOMMENDED:

1. Venugopalan, A.. 2000. Essentials of Veterinary Surgery. 8th ed. Oxford New Delhi.
2. Kumar. A.. 1997. Veterinary Surgical Techniques. Vikas Publishing House, New Delhi, India.
3. Oehme, F.W. and J.E. Prier, 1988. Textbook of Large Animal Surgery. 2nd ed. Williams and Wilkins, Baltimore, London, UK.
4. Harrari. J. 1996. Small Animal Surgery. Williams and Wilkins, Baltimore. USA.
5. Thrall, D.E.,-1994. Textbook of Veterinary Diagnostic Radiology. \V.£. Saunders Co., Philadelphia. USA.
6. Morgan. I.P.M., 1993. Technique of veterinary Radiology, Iowa State Univ. Press, Ames Iowa., USA.
7. Nyland. TO. and I.S. Mattoon, 1995. Veterinary Diagnostics Ultrasound. W.B. Saunders Co., Philadelphia, USA.
8. Turner. A.S. and C. W. McIlwraith, 1994. Techniques in Large Animal Surgery. 2nd ed. Lea & Febiger Philadelphia, USA.

9. Jennings. Jr. P.B., 1984. The Practice of Large Animal Surgery. W.B. Saunders Co., Philadelphia. USA.

REPRODUCTIVE BIOTECHNOLOGY

2(2-0)

THEORY

Introduction to biotechnology and its recent trends, Artificial insemination (AI): historical perspective, advantages & disadvantages, AI services/status in Pakistan, techniques of AI in domestic animals, Semen Preservation, Factors affecting conception rate, Estrus detection, Embryo transfer (ET) technology: Applications and Limitations, Selection of animals, superovulation and embryo collection procedures, Preservation of embryos and embryo transfer techniques, Embryo transfer in other species, Ultrasonography, Controlled breeding in dairy animals, Estrus synchronization through shortening the estrus cycle, Estrus synchronization through prolongation of the estrus cycle, Controlled breeding in small ruminants, Controlled breeding in other domestic animals, In vitro embryo production (IVEP): applications, Oocytes collection and maturation (IVM), In vitro fertilization (IVF), In vitro embryo culture (IVC), Sexing of embryos, Sexing of semen, Cloning: applications, Animal Cloning, Transgenic animals, Role of biotechnology in herd management, Crossbreeding in farm animals, Genetic basis of male selection, Recent advances in Reproductive biotechnology, Assisted Reproductive technologies (ART)

BOOKS RECOMMENDED

1. Meredith, M.J. (Ed) (1995) Animal breeding and infertility. 1st edition Blackwell publishers, Berlin, Germany
2. Gordon, I. (1996) Controlled reproduction in cattle and buffaloes. Published by CAB International Willingford, UK
3. PL Senger (2003) Pathways to pregnancy and parturition. 2nd Ed. Current Conceptions Inc. Washington State university Press, Pullman USA

MAJOR COURSES

VETERINARY PROTOZOOLOGY

3 (1-2)

THEORY

Protozoology: definition, history and differences from other unicellular organisms, Anatomy and physiology of protozoa, Classification, Morphology, Life cycle, Pathogenesis, Diagnosis and Control of the species of the following genera of Protozoa, Trypanosoma / Leshmania, Trichomonias and Histomonas, Entamoeba, Giardia and Balantidium, Eimeria and Isospora, Toxoplasma and Sarcocystis, Toxoplasmosis and Sarcocystosis and Plasmodium, Plasmodium, Haemoproteus, Leucocytozoan and Hepatozoan, Babesia, Theileria, Anaplasma & Cryptosporidium, Ehrlichia & Eperythrozoon, Protozoan zoonosis.

PRACTICAL

Course objectives and laboratory ethics, Qualitative faecal examination, Quantitative faecal examination and interpretation of faecal egg count, Methods of blood examination, Quality control for blood examination and pseudoparasites, Urine examination and examination of genital discharges, Sputum examination, Cerebrospinal fluid examination, Mounting of protozoa; Culture medium of protozoa, Morphological examination of intestinal protozoa.

BOOKS RECOMMENDED

1. Akhtar, M., M. A. Hafeez and C. S. Hayat 2003. General Parasitology and Protozoology. The Elite Scientific Publications Faisalabad, Pakistan.
2. Ash, L.A. and T.C. Orihel, 1991. Parasites: a guide to laboratory procedures and identification. ASCP Press. American Society of Clinical Pathologists.
3. Hayat, C.S. and M. Akhtar, 1999. Parasitic Diagnosis. UGC. Govt. of Pakistan.
4. Iqbal, Z., M. S. Sajid, R. Z. Abbas and M. N. Khan, 2003. *Manual of General Parasitology and Protozoology*, ISBN 969-8490-07-8. Friends Science Publishers, Faisalabad, Pakistan.
5. Iqbal, Z., M.S. Sajid, A. Jabbar, Z.A. Rao and M.N. Khan, 2006. Techniques in Parasitology. ISBN 969-417-089-3. Higher Education Commission, Islamabad-Pakistan
6. Levine, N.D., 1990. Veterinary Protozoology. Iowa State University Press, Ames, Iowa, USA.
7. Roberts, L.S. and J.J. Janovy, 2000. Foundations of Parasitology. 5th Edition, W.C.B. Company, U.K.
8. Ruprah, N. S., 1985. A Textbook of Clinical Protozoology. Oxonian Press, Pvt. Ltd.

9. Soulsby, E. J. L., 2006. Helminths, Arthropods and Protozoa of Domesticated Animals. The English Language Book Society Bailliere Tindall, London.
10. Urquhart G.M., J. Armour, J.L. Duncan, A.M. Dunn, F.W. Jennings, 2000. Veterinary Parasitology. Longman Scientific and Technical, U.K.

ANIMAL FEED RESOURCES & FORAGE CONVERSATION

4(2-2)

THEORY

Classification of animal feed stuffs, Classification of animal feed stuffs, Nutritive value of different feedstuffs, Anti-nutritional factors, Feed resources of Pakistan for poultry, Availability trends of feedstuffs, Feeding practices in livestock farming, Scope for improving fodder production, Forage crops conservation, Advantages and disadvantages of hay making, Techniques of hay making, Hay feeding practices, Choice of forage crops for silage, Agro industrial by products and their availability and biological treatments, Supplementation strategies for stall fed and grazing animals, Feed additives, their classification, mode of action and uses in ruminants and poultry.

PRACTICAL

Identification of fodder and forage species, Morphological characteristics of forage species, Hay making, Hay quality evaluation, Silage preparation demonstration, Silage preparation, Laboratory analysis of silage samples for quality, Laboratory analysis of silage samples for dry matter, Laboratory analysis of silage samples for Ph, Laboratory analysis of silage samples for ammonia N, Urea treatment of cereal straw, Alkali/ammonia treatment of cereal straw, Preparation of multi nutrition feed blocks

BOOKS RECOMMENDED

1. Sarwar, M. and C.S. Ali. 2000. The rumen; Digestive Physiology and Feeding Management. The friend science publisher. 39-B; Peoples Colony No. 1, Faisalabad.
2. Perry, T.W., A.E. Cullison and R.S. Lowery. 1999. Feeds and Feeding. 5th Edition. Prentice Hall, New Jersey, USA.
3. Renard, C. 1997. Crop Residues in sustainable Mixed Crop/Livestock Farming systems. CAB International UK.
4. Dennis, J.W. 1990. Forage in Ruminant Nutrition. Academic Press Inc., Harcourt Brace Jovanovich Publishers, USA.
5. Ensminger, M.E., J.E. Old Field and W.W. Heinemann. 1990. Latest Edition, Feeds and Nutrition Digest. The Ensminger Publisher Co. Clovis, California, USA.
6. Preston, T.R. and R.A. Leng. 1987. Matching Ruminants Production

systems with Available Feed Resource in the Tropics and Subtropics. Penambul Books, Armidale, Australia.

POULTRY BREEDING AND HATCHERY MANAGEMENT

3(1-2)

THEORY

Objectives of poultry breeding for meat and egg production; qualitative and quantitative traits heritability of quantitative traits; significance of poultry breeding systems; factors affecting egg size and composition; natural and artificial incubation; designs of modern incubators, incubation principles; collection, handling, storage and transportation of hatching eggs; factors affecting hatchability, commercial hatchery management, embryonic development of chick, incubation at high altitude; hatchery sanitation and waste management.

PRACTICAL

Identification of different poultry breeds; judging, selection and culling; hatchery design and construction principles; selection, setting and candling of hatching eggs; cleaning, disinfection, fumigation of incubators; taking of hatch, sexing, grading, vaccination and transportation of baby chicks; preparation of hatchery feasibility report; importance of record keeping and computers in breeding and hatchery operations; visit to a commercial breeding farm, hatchery and poultry show.

BOOKS RECOMMENDED

1. Bell, D.D. and W.D. Weaver. 2002. Commercial Chicken Meat and Egg Production. 5th Edition. Kluwer Academic Publishers, Norwell Massachusetts 02061 USA.
2. Crawford, R.D. 1990. Poultry Breeding and Genetics. Elsevier Science Publishers, Amsterdam. The Netherlands.
3. Etches, R. J. 1996. Reproduction in Poultry. CAB International, UK.
4. Ensminger, M.E. 1992. Poultry Science. The Interstate Printers and Publishers Inc. Danville. Illinois. USA.
5. Muir, W.M. and S.E. Aggrey. 2003. Poultry Genetics. Breeding and Biotechnology. 1st Edition. CAB International, UK.
6. Parkhurst, C.R. and G.J. Mountney. 1997. Poultry Meat and Egg Production. Chapman and hall Inc., New York, USA.
7. Taylor, L.W. 2003. Fertility and Hatchability of Chicken and Turkey Egg. Greenword Publishers. Lucknow. India.

THEORY

Digestive system: Developmental anomalies and acquired lesions of mouth, ipervit poisoning, cleft palate, dental carries, sialoadentis, ptylism aptylism, renula; Diseases of Esophagus: choking, diverticulum; Tympany or Bloat; traumatic pericarditis; Diseases of abomasums, Enteritis, Types, Etiology, Intussusception Foot and Mouth Disease (FMD): Aphthous Fever, Rinderpest, Pestis de Petits Ruminants; Malignant Catarrhal Fever, Mucosal Disease/Bovine Viral Diarrhoea & Actinomycosis and Actinobacillosis, Blue Tongue (Sore-Muzzle); Black Tongue, Johne's Disease (Paratuberculosis), Clostridial Infections: Botulism, Clostridial Infections: Anthrax, Clostridial Infections: Black Disease, Big Head; Clostridial Infections: Bacillary Haemoglobinuria, Hepatitis, **Skin and Appendages:** Overview, Poxes, Sheep-Pox, Goat-Pox, lumpy skin disease, Cattle-Pox, Buffalo-Pox, Pseudo-Cow-Pox (Milker's Nodules); Contagious Ecthyma; Dermatitis: Solar, infectious, parasitic, **Dermatophytes (Ring Worms), Mange: Psoroptic, chorioptic mange, neoplasia, Urinary system:** functional histology, congenital and hereditary anomalies, Glomerulonephritis, Nephrotic Syndrome, Interstitial Nephritis, Toxic Tubular Nephritis, Nephrosis; Pulpy Kidney Disease, Cystitis, Urolithiasis; Tumors of urinary System, **Cardiovascular system:** Congenital Anomalies, Tetratology Of Fallot, Cardiovascular Anomalies, Cardiac Failure: Acute, Chronic, Congestives, Right And Left Sided, High Altitude Disease, Myocarditis, Pericarditis, hydropericardium, Endocarditis, Arteiosclerosis, Varicose Veins, Etio-pathology of anemia, **Nervous system:** Congenital anomalies, Encephalitis, encephalomalacia, Hydrocephalus, Rabies, Mad-itck (Aujeszky's Disease), Louping ill, Psuedo-rabies, Circling disease, BSE, neoplasms, **Respiratory system:** Overview, anomalies, Rhinitis, Herpesvirus Infection, Epistaxis, Bronchiectasis, Bronchitis, Pneumonia, Stages And Types Of Pneumonia: Embolic, Verminous, Gangrenous, Bronchopneumonia Asthma, Pleuritis, Atelectasis, Emphysema, Infectious Bovine Rhinotracheitis (IBR), Bovine Malignant Catarrh (Malignant Catarrhal Fever); Tuberculosis, Neoplasms, **Musculo-skeleton system:** Overview, Inherited Diseases Of Muscles; Equine Rhandomyolysis (Snyndrome), White Muscle Disease, Myositis, Fracture Repair, **Rickets, Osteomalacia, Osteodystrophy, Osteoporosis, Osteopetrosis, Exostoses, neoplasia, Reproductive System:** Anomalies: Tumors Of The Ovary Granulosa Cell Tumor Theca-Cell Tumor, Salpingitis, Pyosalpinx; Segmental Aplasia; Uterus Unicornous; Endometritis, Developmental Anomalies Of Testis; Testicular Hypoplasia, Testicular Degeneration, Orchitis, Tumours Of Male Organs; Semininoas; Sertoli Cell Or Sustentacular Cell Tumor, Interstitial Or Leydig Cell Tumor, Metabolic diseases: **Postparturient Haemoglobinuria; Milk Fever, hipervitaminosis, hipervitaminosis, Hyopmagnesaemia, Ketosis Or Acetonaemia, Grass Tetany, Pregnancy Toxaemia**

PRACTICAL

Gross lesions of oral cavity, oesophagus, Microscopic lesions of oral cavity, oesophagus, Gross examination of rumen, reticulum, omasum and abomasums, Microscopic lesions of rumen, reticulum, omasum and abomasums, Gross lesions of small and large intestine, Microscopic lesions of small and large intestine, Gross and microscopic lesions of liver, Gross examination of upper respiratory tract, Microscopic lesions of upper respiratory tract, Gross examination of lower respiratory tract, Microscopic lesions of lower respiratory tract, Lesions of urinary system, Lesions of male reproductive system, Lesions of female reproductive system, Lesions of nervous and cardiovascular system, Lesions of musculo-skeletal system.

BOOKS RECOMMENDED

1. Cheville, N. F., 2006. Introduction to Veterinary Pathology. 3rd Ed. Iowa State Press, Ames, Iowa, USA.
2. McGavin, D. M. and J. F. Zachary, 2006. Pathologic Basis of Veterinary Disease. 4th Ed. Mosby; St. Louis, MO, USA. Dunlop, R. H. and C. H. Malbert, 2004. Veterinary Pathophysiology. Blackwell Publishers, Ames, Iowa, USA.
3. Majno, G. and I. Joris, 2004. Cells, Tissues, and Disease: Principles of General Pathology. 2 Ed. Oxford University Press, New York, USA.
4. Slauson, D. O. and B. J. Cooper, 2002. Mechanisms of Disease. A Textbook of Comparative General Pathology. 3rd Ed. Mosby, A Harcourt Health Sciences Company, London, UK.

VETERINARY HELMINTHOLOGY

5 (3-2)

THEORY

Introduction to Helminthology, Classification, Anatomy and Physiology of Trematodes, Classification, Anatomy and Physiology of Trematodes, Classification, Anatomy and Physiology of Trematodes, Dicrocoelium & Eurytrema, Opisthorchis, Clonorchis & Nanophyetus, Fasciola, Fasciolopsis & Fascioloides, Echinostoma & Metagonimus, Paragonimus & Prosthogonimus, Paramphistomum, Cotylophoran, Gastrothylax, Gastrodiscus, Schistosoma, Classification, Anatomy and Physiology of Cestodes, Classification, Anatomy and Physiology of Cestodes, Anoplocephala, Paranoplocephala, Moniezia, Avitellina, Stilesia, Thysanosoma & Davainea, Raillietina, Amoebotaenia & Choanotaenia, Dipylidium & Hymenolepis, Taenia spp. Taenia spp. Echinococcus, Echinococcus & Mesocestoides, Diphyllbothrium & Spirometra, Classification, Anatomy and Physiology of Nematodes, Classification, Anatomy and Physiology of Nematodes, Ostertagia, Cooperia, Haemonchus, Trichostrongylus & Bunostomum, Chabertia & Oesophagostomum, Ascaris, Parascaris, Toxascaris & Toxocara,

Heterakis & Ascaridia, Strongylus & small strongyles, Dictyocaulus, Metastrongylus, Protostrongylus and Muellerius, Rhabditis & Stephanurus, Thelazia, Spirocerca, Gongylonema & Tetrameres, Angiostrongylus & Habronema, Ancylostoma, Necator & Uncinaria, Oxyuris, Enterobius, Subulura & Strongyloides, Gnathostoma, Dirofilaria, Wuchereria, Loa & Parafilaria, Setaria, Dipetalonema, Onchocerca & Dracunculus, Trichinella, Trichuris, Capillaria & Dioctophyma, Acanthocephala, Macrocanthorhynchus, Annelida & Hirudo, Discussion.

PRACTICAL

Methods for collection, transportation, fixation and preservation of Helminths, Methods for collection, fixation and preservation transportation of Helminths, Methods for collection and examination of faeces for the presence of eggs/larvae of various helminthes, Methods for examination and staining of blood film for helminthes, Methods for collection and examination of urine and sputum for the presence of eggs/larvae of various helminthes, Identification of Trematodes, Identification of cestodes, Identification of Nematodes, Field visit at livestock and poultry farms for collection and identification of endoparasites, Application of insecticides, Review

BOOKS RECOMMENDED:

1. Chowdhry, N., and I. Tada, 1994. Helminthology. Narosa Publication House, New Delhi.
2. Georgi, J. R., M. E. Georgi and V. J. Theodorides, 1999. Parasitology for Veterinarians. 7th Ed. W.B. Saunder Company London.
3. Halton, D.W., M. Behinke and I. Marshal, 2001. Practical Exercises in Parasitology. Cambridge University Press. BSP.
4. Hayat C.S. and M. Akhtar, 1999. Parasitic Diagnosis, UGC, Govt. of Pakistan.
5. Iqbal, Z., M.S. Sajid, A. Jabbar, Z.A. Rao and M.N. Khan, 2006. Techniques in Parasitology. ISBN 969-417-089-3. Higher Education Commission, Islamabad-Pakistan
6. Iqbal, Z., Z.D. Sandhu and A. Jabbar, 2004. Manual of Veterinary Helminthology. Friends Science Publishers, Faisalabad, Pakistan
7. Kassai, T., 1999. Veterinary Helminthology. Butterworth Heinemann, Oxford.
8. Ministry of Agriculture, Fisheries and Food, 1986. Manual of Veterinary Laboratory Parasitological Techniques. Reference Book 418, Her Majesty's Stationery Office, London
9. Soulsby, E. J. L., 2006. Helminths, Arthropods and Protozoa of Domesticated Animals. The English Language Book Society Bailliere Tindall, London.
10. Urquhart, G.M., J. L. Duncan, A. M. Dunn, F. W. Jennings, 2000. Veterinary Parasitology. Longman Scientific

THEORY

Classification of pathogens, Factors affecting pathogens, General characters, pathogenesis, epidemiology of Genus Staphylococcus, General characters, pathogenesis, epidemiology of Genus Streptococcus, General characters, pathogenesis, epidemiology of Genus Escherichia, General characters, pathogenesis, epidemiology of Genus Salmonella, General characters, pathogenesis, epidemiology of Genus Klebsiella, General characters, pathogenesis, epidemiology of Genus Proteus and Yersinia, General characters, pathogenesis, epidemiology of Genus Pasteurella, General characters, pathogenesis, epidemiology of Genus Brucella, General characters, pathogenesis, epidemiology of Genus Pseudomonas, General characters, pathogenesis, epidemiology of Genus Burkholderia, General characters, pathogenesis, epidemiology of Genus Moraxella, General characters, pathogenesis, epidemiology, of Genus Diplococcus, General characters, pathogenesis, epidemiology, of Genus Listeria, General characters, pathogenesis, epidemiology of Genus Bacillus, General characters, pathogenesis, epidemiology of Genus Clostridium welchii, General characters, pathogenesis, epidemiology of Genus Clostridium, General characters, pathogenesis, epidemiology of Genus Corynebacterium, General characters, pathogenesis, epidemiology of Genus Mycobacterium, General characters, pathogenesis, epidemiology of Genus Actinobacillus, General characters, pathogenesis, epidemiology of Genus Actinomyces, General characters, pathogenesis, epidemiology of Genus Nocardia, General characters, pathogenesis, epidemiology of Genus Dermatophilus, General characters, pathogenesis, epidemiology of Genus Erysipelothrix, General characters, pathogenesis, epidemiology of Genus Leptospira, General characters, pathogenesis, epidemiology of Genus Borrelia/ Treponema, General characters, pathogenesis, epidemiology of Genus Compylobacter, General characters, pathogenesis, epidemiology, of Genus Mycoplasma, Mycosis, dermatophytes, other disease of fungal origin, Mycotoxicosis in animals

PRACTICAL

Collection, transportation and processing of sample for bacterial diagnosis, Characterization of Staphylococcus spp, Characterization of E. coli, Characterization of Salmonella spp, Characterization of Bacillus species, Characterization of Pasteurella species, Characterization of Mycobacterium species, Characterization of Corynebacterium species, Characterization of Clostridium spp, Characterization of Mycoplasma spp, Fermentation for bacterial growth, Evaluation of bacterial vaccines, Monitoring of vaccinated animals, Skin sensitivity test for diagnosis T.B. and glanders, Characterization of fungal contaminants

SMALL RUMINANT PRODUCTION

3(1-2)

THEORY:

Scope and role of small ruminants, Sheep and goat as milch, meat and wool/hair producer, Systems of production, Selection and Measures for increased production. Routine management practices. Grazing management systems and supplementary feeding, Management during drought, Record keeping of sheep and goat, Forage production and feeding management, Fencing on ranges, Shearing and handling wool/hair, Establishing commercial flocks common ailments, Keeping flock healthy.

PRACTICAL:

Identification of sheep and goat breeds, Identification of sheep and goat breeds, Judging for milk, meat and wool/hair production, Farm practices i.e. castration, trimming of feet, suckling, tagging, Farm practices i.e. docking, drenching, dipping, spraying and medication, Farm Practices (Continued), Dentition for determining the age of sheep and goat, Shearing and handling of wool, Grading and Scoring of Wool, Identification of various forages, Sanitation and preventive measures, Sheep / Goat Farming, Visit to sheep and goat farms, Revision and discussion, Revision and discussion.

BOOKS RECOMMENDED:

1. Ensminger, M.E. and .O. Parker, 1986. Sheep and Goat Science. Interstate Printers and Publishers Inc. Danville, Illinois. USA.
2. Holechek, J.L., R.D. Piper and C.H. Herbel, 1989. Range management, Principles and Practices. Prentice Hall Inc Englewood, Cliffs NJ.
3. Khan, B.B., A. Iqbal and M.I. Mustafa. 2003. Sheep and Goat Production, Dept of Livestock Management, Univ. of Agriculture, Faisalabad.
4. Mackintosh, J.B. (Ed). 1993. Sheep Production in Pakistan. Pakistan Agricultural Research Council (PARC) Islamabad.
5. Qureshi, M., A.A., G.S. Khan and M.S. Yaqoob 1983. Range Management In Pakistan. Kazi Publication, Ganpat Road, Lahore.
6. Steel, M., 1996. Goats. McMillan Education Ltd. London.

RUMINANT NUTRITION

3(1-2)

THEORY

Nutrients, their classification and requirements, Concept of forage, concentrate and non-conventional feed resources in feeding of ruminants, Feeding standards, their usefulness and limitations for large ruminants.

Feeding standards, their usefulness and limitations for small ruminants. Nutrient requirements of cattle for maintenance, production and reproduction. Nutrient requirements of buffaloes for maintenance, production and reproduction. Nutrient requirements of sheep for maintenance, production and reproduction, Nutrient requirements of beef animals for maintenance and fattening. Concept of digestibility and nitrogen balance, Factors affecting digestibility, energy, protein, minerals and vitamins needs of farm animals, Rumen by-pass nutrients and techniques used for enhancing by-pass proteins and lipids, Feeding management of dairy animals at different physiological stages, Feeding practices of small ruminants, Nutritional management of grazing livestock, Feeding of calves from birth to puberty.

PRACTICAL

Demonstration of different nutrient digestibility techniques, Formulation of least cost balanced rations for dairy cows. Formulation of least cost balanced rations for dairy buffaloes. Formulation of least cost balanced rations for sheep. Formulation of least cost balanced rations for goat. Formulation of least cost balanced rations for beef animals. Formulation of least cost balanced rations for young calves. Formulation of mineral mixtures. Chemical treatment of crop residues. Preparation of multi-nutrients feed blocks

BOOKS RECOMMENDED:

1. Garnsworthy and J. Wiseman. 2002. Recent Advances in Ruminant Nutrition. Empress Publishing. The Netherlands.
2. Pathak, N.N. 2000. Nutrient Requirement of Buffalo. Deradoon International Books, India.
3. Morand-Fehi, P. 1991. Goat Nutrition. EAAP Publication No. 46, Pudoc Wageningen.
4. Chamberlain, A.T. and J.M. Wilkinson. 2002. Feeding the Dairy Cow. Empress Publishing. The Netherlands.
5. Sarwar, M. and S.A.Chaudhry. 2000. The Rumen: Digestive Physiology and Feeding Management. Univ. of Agriculture Press, Faisalabad.
6. Sarwar, M. and Zia-ul-Hasan. 2000. Nutrient Metabolism in Ruminants. University of Agriculture Press, Faisalabad.
7. NRC. 2001. Nutrient Requirements of Dairy Cattle. National Research Council, National Academy Press, Washington, D.C., USA.
8. NRC. 1981. Nutrient Requirements of Goat. National Research Council, National Academy Press, Washington, D.C., USA.
9. NRC. 1985. Nutrient Requirements of Sheep. National Research Council, National Academy Press, Washington, D.C., USA.
10. Agriculture Research Council, 1989. The Nutritional Requirements of Ruminant Livestock, ARC, London.

FEED EVALUATION, FORMULATION & PROCESSING

4(2-2)

THEORY

Techniques for estimating nutritive value of feed stuffs and their validity; in vivo and laboratory techniques; factors affecting the nutritive value of feeds; Measures of protein quality for monogastric; protein efficiency ratio, gross protein value; the essential amino acid index; protein evaluation systems for ruminants; natural toxicants of feeds and detoxification; feeding systems for livestock and poultry; feed raw material handling; storage; mixing; processing and storage of finished feed; quality control in feed processing; forms of feeds and least cost ration formulation for ruminant livestock; equine, pets and poultry; feed stuff laws and regulations.

PRACTICAL:

Use of computer for least cost feed formulation for various classes of livestock and poultry; availability pattern of feed stuffs in local market and their price structures; manufacturing of wholesome feed; demonstration of feeding trials for estimating feed efficiency; visit of feed mills.

BOOKS RECOMMENDED:

1. Banerjee, G.C. 1999. Feeds and Principles of Animal Nutrition. Oxford, IBH Publishing Co., Pvt., Ltd. New Delhi, India.
2. Cheeke, P.R. 1992. Applied animal nutrition. Feeds and feeding. Delmar Publisher, Canada.
3. Ensminger, M.E., J.E. old field and W.W. Heinemann, 1990/Latest Edition, Feeds and Nutrition Digest. The Ensminger Publishing Co. Clovis, California, USA
4. Lesson, S. and J.D. Summers. 2001. Commercial Poultry Nutrition, University, Book P. O. Box 1326, Gulph, Ontario, Canada.
5. McEllihiney, R.R. 1994. Feed Manufacturing Technology IV. American Feed Industry Association, Co., Clovis, California, USA
6. Singhal, K.K. 1992. Dictionary of Animal Nutrition and Feed Technology, Malhotra Publishing House, New Delhi, India.
7. Simmons, N.O. 1963. Feed Milling and Associated Subjects. Leonard Hill, London.

SYSTEMIC PHARMACOLOGY AND THERAPEUTICS

4(2-2)

THEORY

Drugs acting on Central Nervous System, General considerations, Preanesthetic medication, Inhalant General anesthetics, Intravenous anesthetics, Hypnotics, Sedatives and analgesics., Anticonvulsants,

Tranquilizers and CNS stimulants, Euthanasia, Local anesthesia., Intraspinal and epidural anesthesia, Neuromuscular-blocking agents, Autonomic drugs, Pharmacology of Autocoids, Antipyretics and analgesics, Antiinflammatory drugs, Drugs acting on gastrointestinal tract, Rumen pharmacology, Drugs acting on respiratory system, Drugs acting on urinary system, Diuretics and antidiuretics, Drugs acting on cardiovascular system, Drugs acting on fluids and electrolyte balance, Endocrine pharmacology, Nutritional pharmacology, Drugs acting locally on skin, Drugs acting locally on mucus membranes, Drugs acting locally on eyes. Drugs acting locally on ears. Use of drugs in poultry, Use of drugs in fish, Use of drugs in zoo animals.

PRACTICAL

Effect of autonomic drugs on isolated heart rabbit or guinea pigs. Effect of autonomic drugs on isolated intestine rabbit or guinea pigs. Effect of drug on intestinal motility in situ, Effect of autonomic drugs on eyes of rabbit, Rat hind quarter preparation, Diuretic and antidiuretic drug action demonstration in sheep or goat, Demonstration of drug effects on respiration in dog, Demonstration of drug effects on blood pressure in dog, Demonstration of techniques of volatile and intravenous anesthetics. Preanesthetic medication, Demonstration of epidural anesthesia in dog. Demonstration of epidural anesthesia in buffaloes. Demonstration of epidural anesthesia in cows. Demonstration of epidural anesthesia in sheep/goat. Conduction plexus anesthesia in frog. Infiltration, surface and intraspinal anesthesia in rabbit.

BOOKS RECOMMENDED:

1. Hardman, J.G., L.E. Limbird, et al., 2005. Goodman and Gillman pharmacology basis of therapeutics, 11th Ed., McGraw-Hill, New York.
2. Akhtar, M.S., 2004. Introduction to Veterinary Pharmacology & Therapeutics. 4th Ed. Agri. Livestock Bureau Pakistan, Faisalabad.
3. Adams, H.R., 2001. Veterinary pharmacology & Therapeutics, 8th Ed. Iowa State University Press USA.
4. Katzung, B.G. 2003. Basic and Clinical Pharmacology. 8th Ed., 2001 Mc Graw hill, New York.
5. Moats, W.A., and Marjorie, B.M. Medina (1996). Veterinary Drug residues food safety, Oxford Press.
6. Brander, G.C., D.M. Pugh, R.J. Bywater and W.L. Jenkins, 1996. Veterinary Applied Pharmacology & Therapeutics 6th Ed., Bailliere Tindall, London.

SYSTEMATIC VIROLOGY

4(2-2)

THEORY

Description including morphology, cultivation, physico-chemical characteristics, isolation and identification, immunity/prophylaxis, association with disease, diagnosis and control and of RNA and DNA viruses of livestock, poultry and fish including

PRACTICAL

Sources of sample; sample collection, transportation, and processing of sample for virus isolation, Cultivation of IBV in chicken embryos, Cultivation of ILT in chicken embryos, Establishment of monolayer of BHK-21 cell line, FMD Virus cultivation in BHK-21, PPR Virus cultivation in vero cell line, HPS virus cultivation in broilers, EM and demonstration of Negri bodies, Sero-characterization of NDV-HA&HI tests, virus neutralization, Sero-characterization of FMD virus ELISA, Sero-characterization of PPR virus CFT, Sero-characterization of IBDV – AGPT, Evaluation of attenuated live NDV virus vaccine, Evaluation of killed FMD vaccine

BOOKS RECOMMENDED:

1. Anonymous, 1999. A laboratory manual for the isolation and identification of avian pathogens. 6th Ed. American Association of Avian pathologists, Iowa State University Press, Ames, Iowa.
2. Cstro, A.E. and W.F. Henschele, 1992. Veterinary Diagnostic Virology. Mosby yearbook, Inc., Baltimore.
3. Fenner, F.J., E.P. Gibbs, F.A. Murphy, M.J. Studdert and D.O. White, 1993. Veterinary Virology 2nd Ed., Academic Press London.
4. OIE, 2000. Manual of standards for diagnostic tests and vaccines. Off. Intl. Des. Epiz., Paris.
5. Quinn, P.J., M.E. Carter, B.K. Markie and G.R. Carter, 1994. Clinical Veterinary Microbiology. Wolf, London.
6. Talaro, K. and A. Talaro, 1996. Foundation in Microbiology. 2nd Ed., Win C. Brown Publ., Iowa.
7. Virella, G., 1997. Microbiology and Infectious Disease. 3rd Ed., Williams and Wilkins, Baltimore.

VETERINARY ENTOMOLOGY

4(2-2)

THEORY

General introduction of entomology, Arthropods and their economic significance, Classification of arthropoda, Respiratory and digestive systems of arthropods, Nervous and reproductive systems of arthropods, Different types of mouthparts of insects and arachnids and their significance in disease transmission, Haematopinidae; Linognathidae,

Pediculidae and other species of lice, Cimicidae, Reduviidae, Cimicidae, Redyvudaes, Pulicidae and others, Pulicidae and others, Culicidae, Ceratopogonidae and Simulidae, Simulidae, Psychodidae, Tabanidae, Gastrophilidae, Gastrophilidae, Glossinidae, Muscidae, Calliphoridae, Oesteridae, Hypodermatidae, Hypodermatidae, Cuterebridae, and Hippoboscidae, Ixodidae, Argasidae, Demodicidae, Sarcoptidae, Psoroptidae, Dermanyssilac and cheylotodae, Pathogens transmitted by insects and arachnids: A Review

PRACTICAL

Methods for collection, fixation and preservation of arthropods, Methods for collection, fixation and preservation of arthropods, Methods for collection, fixation and preservation of arthropods, Methods for preparation of permanent mounts and pinning of insects and arachnids, Examination of skin scrapings for mange, Identification of lice, Identification of bugs and fleas, Identification of flies, Identification of ticks, Identification of ticks, Identification of mites, Field visit, Practical demonstration of application of insecticides

BOOKS RECOMMENDED:

1. Georgi, J. R., M. E. Georgi and V. J. Theodorises, 1999. Parasitology for Veterinarians. 7th Ed. W.B. Saunder Company London.
2. Hayat C.S. and M. Akhtar, 1999. Parasitic Diagnosis, UGC. Govt. of Pakistan.
3. Iqbal, Z., M. N. Khan and A. Jabbar 2003. An Illustrated Textbook of Veterinary Entomology. Friends Science Publishers, Faisalabad, Pakistan.
4. Khan, M. N., Z. D. Sandhu, A. Jabbar and Z. Iqbal 2003. Manual of Veterinary Entomology. Friends Science Publishers, Faisalabad, Pakistan.
5. Kettle, D.S., 1995. Medical and Veterinary Entomology. 2nd Ed., C.A.B. International, Wallingford Oxon UK.
6. Soulsby, E. J. L., 2006. Helminths, Arthropods and Protozoa of Domesticated Animals. The English Language Book Society Bailliere Tindall, London.
7. Wall, R. and D. Shearer, 1997.89 Veterinary Entomology. 1st Ed., Chapman & Hall

NECROPSY PRACTICES

2(0-2)

PRACTICAL

Instruments used for necropsy; layout of postmortem block, Prerequisites and rules of Postmortem examination; precautionary measures adopted during PM conduction of zoonotic diseases, Death, Modes of death, Signs of death, Disinfection of instruments and premises, Types of wounds,

Death due to snake bite, Death due to drowning, lightning, Death due to cold shock, heat prostration, Methods of euthenesis, Postmortem examination, external examination and history taking, Postmortem procedure in domestic animals and avian species, Opening of skull and examination of brain and spinal cord, Examination of abdominal and thoracic organs, Postmortem Report writing, Postmortem examination and interpretation in small and large ruminants, Postmortem examination and interpretation in dogs and cats, Postmortem examination and interpretation in equine, Postmortem examination and interpretation in poultry birds.

BOOKS RECOMMENDED

1. Cooper, J. E. and M. E. Cooper, 2007. Introduction to Veterinary and Comparative Forensic Medicine. Blackwell Publishing Book Services, Oxford, UK.
2. Scott, E. M., 2006. Basic Avian Technology: Avian Necropsy and Cytology. Teton New Media.
3. Bullied, A., 1988. Clinical Laboratory and Necropsy Procedures in Small Animals. Elsevier Science Health Science div., Netherland.
4. Andrews J. J. (ed.), 1986. Necropsy Techniques. The Veterinary Clinics of North America, 2 (1): 1-202.
5. Alden, C. L., 1981. Color Atlas for Small Animal Necropsy. Veterinary Medicine Pub Co
6. Winter, H., 1966. Post Mortem Examination of Ruminants. University of Queensland Press, St. Lucia, Queensland, Australia.

POULTRY NUTRITION

3 (1-2)

THEORY

Importance of balanced feed for poultry, Nutrient requirements for broilers, Nutrient requirements for layers, Nutrient requirements for breeders, Factors affecting the nutrient requirements of poultry, Importance of quality of water, Digestion mechanism for various nutrients, Amino acid balance and use of synthetic amino acids, Feed additives in poultry ration, Toxins and anti nutritional factors in poultry feed, Nutritional diseases caused by vitamin deficiencies, Vitamin and mineral toxicity, Feeding systems in open & control sheds, Feeding management during heat stress, Feed processing techniques.

PRACTICAL

Description of different categories and forms of commercially available poultry feeds. Chemical analysis of cereals, Chemical analysis of cereal by-products, Chemical analysis of vegetable protein sources, Chemical analysis of animal protein sources, Chemical analysis of animal protein

sources, Feed formulation for broilers., Feed formulation for layers, Feed formulation for broiler breeders, Estimation of feed consumption, weight gain and FCR, Feed management practices at poultry farms, Visit to poultry feed mill.

BOOKS RECOMMENDED:

1. Austic, R.E. and M.C. Nesheim, 1990. Poultry production. Lea and Febiger, Philadelphia, USA.
2. Ensminger, M.E., 1992. Poultry Science, The Interstate Printers and Publishers Inc., Danville, Illinois, USA.
3. Hunton, P., 1995. Poultry Production: Production System Approach, Elsevier Science Publishers, Amsterdam, The Netherlands.
4. NRC (1994) Nutrient Requirements of Poultry. (9th Edition) National Academy Press Washington D.C.

BEEF PRODUCTION

3(1-2)

THEORY

Scope and importance of meat production in Pakistan, Present situation of meat industry and Problems of meat industry in Pakistan, Important meat & dual purposes breeds of Buffalo and cattle, Beef Production Systems, Feeding of beef Animals, Breeding of beef Animals, Management of Beef Animals, Growth rate and fattening potential of male cow and buffalo calves, Feed additives, hormones and Probiotics, Vitamins etc for enhanced growth Antibiotics, Factors affecting carcass and meat quality, Post slaughter change in the Carcass, Carcass grades of beef, Spoilage of meat, Meat Hygiene, Storage and Preservation of Meat, Marketing of beef animals and beef, Modern Slaughter Houses, Slaughtering Methods.

PRACTICAL

Identification of Different Beef Breeds, Beef Production Systems, Regions and body points of beef animals, Feeding for beef animal production, Methods of identifications of beef animals, Management at birth raising orphan and multiple birth calves, Creep feeding, Dehorning, Castration and Weaning, Preparing Beef animals for shows, Body measurements for weight estimation , Practical tips for housing of beef animals , Feasibility calculation, Postmortem inspection, Carcass evaluation, carcass grades and cuts, Carcass grades of beef, Visit to abattoir

BOOKS RECOMMENDED:

1. Alvi, A.S. 1991. Meat Production and Technology in Pakistan, Pakistan Agricultural Research Council, Islamabad.
2. Anwar, A.H. 1996. Meat Hygiene and Inspection. Dept. of Veterinary Parasitology, Uni. of Agric. Faisalabad.

3. Ensminger, M.E. 1976. Beef Cattle Science. The Interstate Printers and Publisher, One, Danville, Illinois, USA.
4. Gracey, J. F. and Collins D.S. 1992. Meat Hygiene. Bailliere Tindall, UK.
5. Hill, D. 1990. Cattle and Buffalo Meat Production in the Tropics. Longman, UK.
6. Preston, T.R. and Millis, M.B. 1982. Intensive Beef Production. A. Wheator and Co. Ltd, Exeter, UK

DAIRY PRODUCTION

4(2-2)

THEORY

Scope and importance of buffalo and cattle production in Pakistan, Characteristics of local breeds, Characteristics of exotic and crossbred animals, Buffalo and cow as a meat and draught animals, Principles of profitable dairy enterprise, Raising Dairy replacement (Calves), Raising Dairy replacement (heifers), Management of dairy animals for better reproductive efficiency, Management of pregnant animals, Management of lactating animals, Selection of dairy animals (Judging / Scoring), Growth and fattening potential of cow and buffalo, Feeding for optimum milk production, Factors affecting milk quality and yield, Housing for dairy animals, Hygienic milk production, Importance of record keeping, Methods of record keeping, Dairy herd improvement associations (DHIA), Dairy production systems, Grazing management of cattle and buffalo, Transportation and marketing of livestock and livestock products, Dairy herd health management, Bacterial and Viral diseases & their prevention, Metabolic diseases and prevention, Common disease problems and prevention.

PRACTICAL

Demonstration of characteristics of an ideal dairy animal. Demonstration, Judging and scoring of animals, Care, handling and feeding of calves, Milking practices, Routine test for milk quality determination. Dehorning/disbudding, Castration, extra teat removal, teat dipping, hoof trimming, practices, Planning for year round fodder availability & Fodder preservation practices, Preparing feasibility reports, Record Keeping, Use of Computer for record keeping, Visit to Livestock farms and shows.

BOOKS RECOMMENDED:

1. Banerjee, G. C. 1998. A Text Book of Animal Husbandry. Oxford and IBH publishing Co. New Delhi India
2. Bath, D.L., F.N. Dickenson and H.A. Tucker. 1985. Dairy Cattle, Principal, practices, problems, profits. Lea & Febiger, Philadelphia.

3. Bilal M.Q., and Abrar, A. 2004. Dairy hygiene and disease prevention. Dept. of Livestock Management, Uni. of Agric. Faisalabad.
4. Ensminger, M.E., 1983. Dairy Cattle Science. The interstate Printers, Danville, Illinis, USA.
5. Gopalakrishnan C. A. and G. M. M. Lal. 1993. Livestock and Poultry Enterprises for Rural Development. Vikas Publishing House Pvt. Ltd. 576. Masjid Road, Jangpura, New Delhi- 110014
6. Khan B. B., M. Yaqoob, M. Riaz, M. Younas and A. Iqbal 2004. Livestock Management Manual. Dept. of Livestock Management, Uni. of Agric. Faisalabad.
7. Khan, B.B. (Editor). 2008. Health and Husbandry of Dairy Animals. Pak Printers Publishers, Faisalabad.
8. Shah. S. I 1994. Animal Husbandry. National Book Foundation Islamabad.

DAIRY TECHNOLOGY

3(1-2)

THEORY

Principles of profitable dairy farming Mammary system Synthesis of milk Milk let down and its inhibition Factors affecting milk production and composition Biotechnology and enhanced milk production Hand and machine milking Physical and chemical properties of milk Hygienic milk production Collection. Transportation Processing and marketing of milk Cooling, homogenization and standardization Manufacturing of dairy products (Yoghurt, Butter, Ghee, Whey, Cheese, etc.) Management of milk plant. Planning. Layout and designing of dairy plant

PRACTICAL

Demonstration of milk let down Hygienic measures for clean milk production Mastitis screening tests Manual and machine milking practice Physical and chemical analysis of milk Cleaning and sanitizing of barns and Milk collection, cooling, tenderization, homogenization, pasteurization and UHT process practices. Economics of milk production and processing. Visit to milk processing plants.

BOOKS RECOMMENDED

1. Bath, D.L, F.N. Dickenson and H.A. Tucker, 1985. Dairy Cattle; Principles, Practices, Problems, Profits. Lea & fabiger, Philadelphia, U.S.A.
2. Davis, J.G. 1994, Milk testing. Agro-Botanical. Publications, India.
3. Larson, B.L 1985. Lactation. The Iowa State University Press. Iowa.
4. Schmidt, G.H., L.D. Van Vlk and M.F. Hutjens, 1988. Principles of Dairy science 2nd Ed. Prentice Hall Inc. Englewood cliffs, New Jersey, U.S.A.

THEORY

An overview of bottlenecks in the development of dairy industry in Pakistan and government initiative to address the impediments; Fundamental concept of quarantine at farm level ; General biosecurity and farm sanitation methods Nutrition in relation to dairy animal health; Endo- and ecto-parasite control; Milking practices and mastitis control methods; milking machine and its evaluation; Continued Drug residues avoidance; Deworming in farm animals; Vaccinations against prevalent diseases; Basics of Housing in relation to dairy animal health; Combating heat and cold stress in farm animals; Disinfection of farm premises before stocking and after de-stocking; Manual and computer assisted herd health programme and analysis; DHIA or other farm related record programmes; Continued

PRACTICAL

Hands on training of use of computer programs (e.g. Dairy Champ) for dairy health and production. Farm record analysis for prevention of diseases. Drug residue screening procedures Detection procedures for failure of passive transfer of immunity Colostrum preservation and feeding Identifications of common poisonous plants Somatic cell counts and standard plate counts for evaluation of milk quality Body condition scoring Screening of animals for mastitis, tuberculosis, Jhone's disease, brucellosis. Drinking water analysis Silage preparation, feeding and related problems Least cost feed formulation Designing a herd health programmes for a dairy in a periurban setting Feasibility report of a dairy farm Detection techniques for insecticides, pesticides & mycotoxins from cotton seed cake and other feeds stuff Practice of preventive package through community animal health workers

BOOKS RECOMMENDED

1. Kaneene, J.B., & E.C. Mather, W.K. Kellog. 1992. Cost Benefits of Food Animal Health. Michigan State Univ., USA.
2. Radostits, O.M., C.C. Gay, and K.W. Hinchcliff, P. D. Constable 2007. Veterinary Medicine A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats, and Horses. 10th Ed. W.B. Saunders Co., Philadelphia, USA.
3. Recent Proceedings of the meetings of American Association of Bovine Practitioners.
4. Howard, J.L. 1993 Current Veterinary therapy III. Food Animal Practice W.B. Saunders Co., Philadelphia
5. Andrews A. H. 2000. The Health of Dairy Cattle, Blackwell Science,Oxford

6. Radostits, O.M., K. E. Leslic and J. Fetrow. 1994. Herd Health: Food Animal Production Medicine. 4th Ed. W.B. Saunders Co., Philadelphia, USA.
7. Divers, T. J. and S. F. Peek, 2008. Rebhun's Diseases of Dairy Cattle. Saunders- Elsevier. St. Louis, USA.
8. Brand, A., J. P. T.M. Noordhuizen and Y. H. Schukken, 2005. Herd Health and Production management in Dairy Practice. Wageningen Academic Publishers, Netherland.
9. Internet sources, papers in the proceeding of relevant seminars, conferences, symposia, workshops etc.

ANIMAL REPRODUCTION & ARTIFICIAL INSEMINATION

4(2-2)

THEORY

Functional anatomy and physiology of Male Reproductive system; Functional anatomy and physiology of female reproductive system (Ovaries, oviduct, uterus, cervix and vagina); Endocrinology of Reproduction; Hormones of Hypothalamus, Pituitary gland, ovary, testis, uterus and placenta; Puberty; Breeding seasons in Farm animals; Physiology of estrous cycle (Follicular Phase & Luteal Phase); Folliculogenesis and oogenesis; Ovulation; Spermatogenesis; Control of estrous cycle; Fertilization; Sperm transport in female reproductive tract; Embryogenesis; Maternal Recognition of pregnancy; Sex differentiation; Placentation; Gestation; Parturition; Puerperium & Lactation; Physiology of small ruminants, equine and canine/feline Reproduction; Introduction to Artificial Insemination; Present Status of AI in Pakistan; Estrus detection methods; Sire Selection (Progeny testing program)

PRACTICAL

Functional anatomy and histology of female reproductive system (Demonstration); Study of female reproductive organs (Table palpation); Biometry of female reproductive organs (Table palpation); Demonstration of ovarian changes during estrous cycle in cows/buffaloes; Demonstration of changes in the female reproductive tract during pregnancy; Palpation of Non-pregnant Reproductive tract in live animals; Palpation of pregnant reproductive organs; Practice of passing AI rod; Functional anatomy and histology of male reproductive system (Demonstration); Sterilization of semen collection equipments and bull preparation for semen collection; Preparation of artificial vagina and demonstration of semen collection by different methods; Collection and evaluation of semen; Demonstration of various methods of semen storage; Application and uses of AI Gun, AI Sheath and AI rod; Thawing of frozen Semen; Semen Handling

BOOKS RECOMMENDED:

1. PL Senger (2003) Pathways to pregnancy and parturition. 2nd Ed. Current Conceptions Inc. Washington State university Press, Pullman USA
2. Hafez ESE and B. Hafez (2000) Reproduction in Farm Animals. 7th Ed. Lippincott, USA.
3. Salisbury, G. W.; Van Demark, N.L. and J. R. Lodge (1985) Physiology of Reproduction and AI of cattle. 2nd Edition, CBS Publishers, India
4. Penner, P.; R. Ed. Empringham and P.A. Watson (1993) Bovine Artificial Insemination Technical Manual. 2nd edition. Published by Canadian Association of Animal Breeders, Woodstock, Ontario, Canada

VETERINARY TOXICOLOGY AND CHEMOTHERAPY

3(1-2)

THEORY

Concepts and general considerations. Chemotherapy of Microbial diseases Chemotherapy of Fungal diseases Chemotherapy of Fungal diseases Chemotherapy of viral diseases Beta lactam antibiotics Beta lactam antibiotics Aminoglycosides Macrolides Lincosamides Tetracyclines Chloramphenicol Nitrofurans Quinolones Sulfonamides and combinations with TMP Antiviral agents Antifungal agents

PRACTICAL

Tests for residues of antibiotics. Tests for residues of Sulphonamides Antibiotic sensitivity tests Microbiological assay Tests for screening of pesticide residues in fodder Tests for screening of antibiotics toxic levels in fodder. Tests for screening of nitrates toxic levels in fodder. Tests for screening of hydrocyanic acid toxic levels in fodder. Drug incompatibilities Acute toxicity study Strychnine poisoning in rabbits. Strychnine poisoning in dogs. Drugs effects on neuromuscular junction. Demonstration of the destruction of acetylcholine by cholinesterase. Effects of histamine on tissues. Study tour to pharmaceutical industry

BOOKS RECOMMENDED:

1. Hardman, J.G., L.E. Limbird, et al., 2005. Goodman and Gillman pharmacology basis of therapeutics, 11th ed., McGraw-Hill, New York.
2. Akhtar, M.S., 2004. Introduction to Veterinary Pharmacology & Therapeutics. 3rd Ed. Agri. Livestock Bureau Pakistan, Faisalabad.
3. Adams, H.R., 2001. Veterinary pharmacology & Therapeutics, 8th Ed. Iowa State University Press USA.

4. Katzung, B.G. 2003. Basic and Clinical Pharmacology. 8th Ed., 2001 Mc Graw hill, New York.
5. Moats, W. A., and Marjorie, B.M. Medina (1996). Veterinary Drug residues food safety, Oxford press.
6. Brander, G.C., D. M. Pugh, R. J. Bywater and W. L. Jenkins, 1996. Veterinary Applied Pharmacology & Therapeutics 6th Ed., Bailliere Tindall, London.
7. Osweiler, G. D. (1996). Toxicology. Williams and Wilkins, Philadelphia USA.
8. Research and review papers in current journals.
9. Osweiler, G. D; Carson, T. L; Buck W. B. and Gelder, G. A. V. (1998). Clinical and Diagnostic Veterinary Toxicology 3rd Ed. Kendall/Hunt Publishing Company Dubuque, Iowa USA.
10. H.S. Sandhu., S. Rampal, 2006. Essentials of Veterinary Pharmacology & Therapeutics, Kalyani Publishers, Ludhiana, India.

DIAGNOSTIC IMAGING

3(1-2)

THEORY

Scope of diagnostic imaging in veterinary practice, Radiographic terminology and basic principles to study a radiograph , Nature and production of X-rays, Radiographic image formation, Radiographic hazards and protection, Radiography of the skeletal system, Plain and contrast radiography of urinary system, Plain and contrast radiography of gastro-intestinal system, Plain and Contrast radiography of Respiratory system, Principles of diagnostic ultrasound, Indications and techniques, Ultrasound artifacts, Sonography of the general abdomen: liver and spleen, Sonography features of gastrointestinal tract, Sonography features of urinary tract & reproductive tract, Sonography of musculoskeletal system, Sonography features of eye and orbit, Imaging of heart and Doppler ultrasound, Magnetic resonance imaging (MRI), CT Scan

PRACTICAL

X-ray machine and its working, Dark room requirements and maintenance, Exposure and processing of films, Contrast Radiography techniques, Examination and Evaluation of Radiograph, Techniques for radiography of appendicular and axial skeleton, Imaging of the general abdomen, Imaging of liver and spleen, Imaging of gastrointestinal tract and pancreas, Imaging of urinary tract, Imaging of reproductive tract, Imaging of musculoskeletal system, Imaging of eye and orbit, Imaging of cardiovascular system, Use of Ultrasonography Equipments, Imaging of clinical cases presented to the clinics of the department.

BOOKS RECOMMENDED

1. Penninck, D., and M. D'Anju, 2008. Atlas of Small Animal Ultrasonography. Blackwell Publishing Co., Oxford. UK.
2. Mannion, P. (Ed.), 2006. Diagnostic Ultrasound in Small Animal Practice. Blackwell Science Ltd., Oxford, UK.
3. Kealy, J. K., and H. McAllister, 2004. Diagnostic Radiology and Ultrasonography of Dog and Cat. W. B. Saunders Co., Philadelphia, USA
4. Farrow, C., 2003. Veterinary Diagnostic Imaging. Mosby International, W. B. Saunders Co. Ltd., USA.
5. Thrall, D. E. (Ed.), 2002. Textbook of Veterinary Diagnostic Radiology. W. B. Saunders Co., Philadelphia, USA.
6. Robert, E. C., B. A. Selcer, J. A. Hudson, S. T. Finn-Bonder, M. B. Mahaffey, P. L. Johnson and K. W. Marich, 1995. Practical Veterinary Ultrasound. Williams and Wilkins, Philadelphia, USA.
7. Singh, A. P., and J. Singh. 1995. Veterinary Radiology. CBS, Publishers & Distributors, New Delhi, India.

POULTRY HOUSING AND FARM MANAGEMENT

4(2-2)

THEORY

Basic principles for site selection and house construction; poultry housing types and systems; open sided Vs environment controlled houses; poultry equipments; brooding, rearing and laying management; early chick mortality and its control; raising of broilers, layers and breeder flocks; cage and deep litter management; light management; management during hot and cold climates; farming of pigeons, quails, turkey, pea fowls, ostrich and ducks; litter management and waste disposal; significance of record keeping.

PRACTICAL

Demonstration of housing and layout plans of poultry houses; demonstration of open sided and environmentally control houses; demonstration regarding equipments, vaccination, medication, beak trimming and fumigation; selection and culling procedures; induced molting techniques; managing flocks during hot and cold climate; feasibility report for broilers, layers and breeder farm; use of computer in record keeping and analysis; visit to a modern commercial broiler, layer and breeder farms.

BOOKS RECOMMENDED:

1. Sainsbury, D. 1999. Poultry Health and Management; chickens, turkey, ducks, geese and quails. Blackwell Scientific Publications, London. UK.
2. Ensminger, M.E. 1992. Poultry Science. The Interstate Printers and Publishers Inc. Danville. Illinois. USA.
3. Bell, D.D. and W.D. Weaver. 2002. Commercial Chicken Meat and Egg Production. 5th Edition. Kluwer Academic Publishers, Norwell Massachusetts 02061 USA.
4. Jadhav, N.V. 1998. Practical Manual for Avian Production and Management. Jaypee Brothers, Medical Publishers (Pvt.) Ltd., New Delhi, India.
5. Jull, M.A. 2003. Successful Poultry Management. Biotech Books. Delhi India.

LARGE ANIMAL SURGERY

3(1-2)

THEORY

Scope of large animal surgery, Surgical affections of head and neck and ear, Affections of eye, Affections of eye, Affections of musculo-skeletal system, Affections of musculo-skeletal system, Affections of musculo-skeletal system, Affections of digestive system, Surgical management of colic, Affections of teeth, Affections of thorax, Affections of urinary system, Affections of male genital system, Affections of female genital system, Affections of the integumentary system, skin, claws, horns, and tail, Affections of the teats and udder.

PRACTICAL

Ectropion, entropion and enucleation of eyeball procedure, Ectropion, entropion and enucleation of eyeball, practical demonstration, Various tenectomies and tendon repair and neurectomy, procedure, Various tenectomies and tendon repair and neurectomy, practical demonstration, Temporary and Permanent Tracheotomy, and laryngeal diverticulectomy procedure, Temporary and Permanent Tracheotomy and laryngeal diverticulectomy practical demonstration, Oesophagotomy procedure, Oesophagotomy, practical demonstration, Rumenotomy procedure, Rumenotomy practical demonstration, Castration of farm animals and equine, procedure, Castration of farm animals and equine, practical demonstration, Penile amputation, procedure, Penile amputation, practical demonstration, Methods of disbudding and dehorning and tail docking in cattle and buffaloes, procedure, Methods of disbudding and dehorning and tail docking in cattle and buffaloes, practical demonstration

BOOKS RECOMMENDED:

1. Venugopalan. A., 2000. Essentials of Veterinary Surgery 8th ed. Oxford and IBH. Publishers and Distributors. New Delhi. India.
2. Auer. J.A., 1999. Equine surgery. 2nd ed. W.B. Saunders Co., Philadelphia. USA.
3. Jennings. Jr. P.B., 1984. The Practice of Large Animal Surgery. W.B. Saunders Co., Philadelphia. USA.
4. Colahan. PT., A.M. Merrite, IN. Moore and I.G. Mayhew, 1999. Equine Medicine and Surgery .5th ed. (Vol. 1 &2). Mosby, Philadelphia. USA.
5. Turner. A.S. and C. W. Mcllwraith, 1994. Techniques in Large Animal Surgery. 2nd ed. Lea & Febiger Philadelphia, USA.
6. Tagi. R.P.S. and L Singh, 1993. Ruminant Surgery. C.B.S. Publishers and Distributors. New Delhi; India.
7. Oehme. F.W., and E. Prier, 1988. Textbook of Large Animal Surgery. 2nd ed. Williams and Wilkins, Baltimore, London. UK.
8. Jennings. Jr. P.B., 1984. The Practice of Large Animal Surgery. W.B. Saunders Co., Philadelphia. USA.

SYSTEMIC VETERINARY MEDICINE- I

3(3-0)

THEORY:

Diseases Of Digestive And Hepatobiliary System Vesicular stomatitis Colibacillosis Salmonellosis (Paratyphoid) Rinderpest (Cattle Plauge) and Peste des petits ruminants Foot and Mouth Disease Bovine Viral Diarrhea / Mucosal disease Acute undifferentiated diarrhea in newborn farm animals Enterotoxemia Johne's disease Malignant catarrhal fever Hemochosis Blue tongue and Oral necrobacillosis Coccidiosis Cryptosporidiosis and Giardiasis Fasciolosis Strongylosis and Toxoplasmosis Braxy (Bradshot) and Infectious necrotic hepatitis (Black disease) Miscellaneous roundworm infestations, Intestinal amphistomiasis, tapeworm infestations etc. Newcastle disease and Inclusion body hepatitis Thrush, Infectious stunting syndrome and Spirochateosis in Poultry Giardiasis and Cryptosporidiosis Leptospirosis Infectious Canine Hepatitis Parvovirus infection and Feline panluekpenia Feline calicivirus and Fatty Liver Disease in cats Canine and Feline Coronavirus infections Pet diseases caused by protozoa, nematodes and cestodes etc. **Diseases Of Mammary Glands, Metabolic Diseases And Nutritional Disorders** Mastitis and Miscellaneous abnormalities of teats and udder, Parturient paresis (milk fever) Downer's cow syndrome and hypomagnesemic tetany Ketosis and pregnancy toxemia Post-parturient hemoglobinuria Iodine deficiency, Selenium and / or vitamin E deficiency Calcium (hypocalcemia) and / or phosphorous (hypophosphatemia) deficiency Lactation tetany of mares Miscellaneous mineral deficiencies, Diseases associated with deficiencies of fat soluble and water soluble vitamins in horses

Deficiencies imbalances of vitamins, minerals, proteins and other nutrients, poisonings and intoxications in poultry Deficiencies imbalances of vitamins, minerals, proteins and other nutrients, etc. in Pets, Eclampsia **Diseases Associated With Physical Agents** Lightning stroke and electrocution Diseases associated with inorganic poisons (Lead Arsenic, phosphorous, mercury, etc. farm animals and pets Nux Vomica poisoning in dog Diseases associated with farm chemicals (Anthelmintics, organophosphorous compounds etc.) Poisoning by mycotoxicosis **Miscellaneous systemic conditions** Snake bite, Bee Sting and insect bites **Diseases Of Urogenital System** Brucellosis and Contagious bovine pyelonephritis Leptospirosis and Dourine Egg drop syndrome Feline Urological Syndrome

BOOKS RECOMMENDED

1. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.
2. Y. M. Saif 2003. Diseases of Poultry. 11th Ed. Iowa State Press A Blackwell Publishing Company. USA
3. Matin W. B. and I. D. Ait Isen, 2000. Diseases of Sheep, 3rd Ed. Blackwell Science, Oxford, U. K.
4. Chaudhry Zafar Iqbal and Saif Uddin Jahangir Akbar, 2000. The Camel and its Diseases. Al Bayan Printing and Publishing Est. UAE.
5. Howard J.L, 1999. Current Veterinary Therapy, Food Animal Practice. W.B. Saunders, Co., U.S.A.
6. Rebhum, W. C. 1998. Diseases of Dairy Cattle, Williams and Willkins, Baltimore, USA.
7. Smith B.P. 1996. Large Animal Internal Medicine. 2nd Ed. The Mosby Co. Philadelphia U.S.A.
8. Hungerford. T.G. 1991, Hungerford's Disease of Livestock 9th Ed. Mc Graw Hill Book Company, Sydney, Australia.
9. Y. M. Saif 2003. Diseases of Poultry. 11th Ed. Iowa State Press A Blackwell Publishing Company. USA
10. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA.
11. Rhea V. Morgan. 1997. Handbook of Small Animal Practice. 3rd Ed. W. B. Saunders Company, PA, USA.
12. Larry P. Tilley and Francis W. K. Smith, Jr. 1997. The 5 Minute Veterinary Consult Canine and Feline. William and Wilkins, M.D. USA.

MEAT HYGIENE AND PUBLIC HEALTH

3(1-2)

THEORY

Introduction to meat industry; Significance of meat hygiene in public health Objectives of meat inspection Characteristics of good quality meat Food animal transportation and its effects on carcass quality; determinants of

meat quality Ante mortem examination of food animals Slaughtering techniques and dressing Postmortem inspection of food animals Systemic inspection of carcass Non-specific and specific lesions in different organs of the body and meat judgment Non-specific and specific lesions in different organs of the body and meat judgment Differentiation of meat of different animals Chemical and antibiotics residues in meat Meat hygiene practice; Food poisoning and meat microbiology Poultry meat Inspection in specific diseases Poultry meat dressing and preservation Laws governing slaughters of animals and meat quality Laws governing slaughters of animals and meat quality

PRACTICAL

General layout of slaughter house Ante mortem inspection Postmortem inspection Carcass judgment Chemical tests for putrefaction Slaughter house sanitation Differentiation of meat of different animals Chemical residues detection in meat Microbial tests of meat and antibiotics residues detection in meat Guidelines for minimum postmortem inspection requirements of heads for cattle, sheep and goats Guidelines for minimum postmortem inspection requirements of viscera for cattle, sheep and goats Recognition of various pathological conditions of meat and edible organs Disposal of condemned meat Visit to abattoir

BOOKS RECOMMENDED:

1. Andrew, G., 2009. Bovine Meat Inspection: Anatomy, Physiology and Disease Conditions. Paul & Co Pub Consortium.
2. Wilson, A., 2008. Wilson's Practical Meat Inspection. 7th Ed. Blackwell Pub Professional, Ames, Iowa, USA.
3. Grist, A., 2005. Bovine Meat Inspection: Anatomy, Physiology and Disease Conditions. Blackwell Pub Professional, Ames, Iowa, USA.
4. Gracey, J. F., 1999. Meat Hygiene. 10th Edition. The English Language Book Society, Bailliere Tindal, London, UK.
5. Akab, B. and M. Johnston, 1996. Poultry Meat Hygiene and Inspection. W. B. Saunders and Co., Philadelphia.
6. Herenda, D. C. and D. A. Faranco, 1991. Food animal Pathology and Meat Hygiene. Mosby Year Book, London.

MILK HYGIENE AND PUBLIC HEALTH

3(1-2)

THEORY:

Introduction to meat industry; Significance of meat hygiene in public health Objectives of meat inspection Characteristics of good quality meat Food animal transportation and its effects on carcass quality; determinants of meat quality Ante mortem examination of food animals Slaughtering techniques and dressing Postmortem inspection of food animals Systemic

inspection of carcass Non-specific and specific lesions in different organs of the body and meat judgment Differentiation of meat of different animals Chemical and antibiotics residues in meat Meat hygiene practice; Food poisoning and meat microbiology Poultry meat Inspection in specific diseases Poultry meat dressing and preservation Laws governing slaughters of animals and meat quality

PRACTICAL:

General layout of slaughter house Ante mortem inspection Postmortem inspection Carcass judgment Chemical tests for putrefaction Slaughter house sanitation Differentiation of meat of different animals Chemical residues detection in meat Microbial tests of meat and antibiotics residues detection in meat Guidelines for minimum postmortem inspection requirements of heads for cattle, sheep and goats Guidelines for minimum postmortem inspection requirements of viscera for cattle, sheep and goats Visit to abattoir

BOOKS RECOMMENDED:

1. Andrew, G., 2009. Bovine Meat Inspection: Anatomy, Physiology and Disease Conditions. Paul & Co Pub Consortium.
2. Wilson, A., 2008. Wilson's Practical Meat Inspection. 7th Ed. Blackwell Pub Professional, Ames, Iowa, USA.
3. Grist, A., 2005. Bovine Meat Inspection: Anatomy, Physiology and Disease Conditions. Blackwell Pub Professional, Ames, Iowa, USA.
4. Gracey, J. F., 1999. Meat Hygiene. 10th Edition. The English Language Book Society, Bailliere Tindal, London, UK.
5. Akab, B. and M. Johnston, 1996. Poultry Meat Hygiene and Inspection. W. B. Saunders and Co., Philadelphia.
6. Herenda, D. C. and D. A. Faranco, 1991. Food animal Pathology and Meat Hygiene. Mosby Year Book, London

ANIMAL BREEDING PLANS AND POLICIES

4(2-2)

THEORY

Role of animal breeding. Selection methods and kinds. Various system of breeding; Inbreeding, line breeding, out-breeding, out-crossing, crossbreeding, grading up. Development of inbred lines, selection for best combining abilities, reciprocal recurrent selection. Traits of economic importance in cattle, buffalo, sheep/goat and poultry. Animal genetic resources. National breeding policy. Constraints and future breeding plans. Emerging breeding technologies. Role of breed registry societies/associations in developed countries and its application in Pakistan.

PRACTICAL

Computation of various productive traits in farm animals and poultry. Exercises on the feasibility of pure breeding and crossbreeding in farm animals and poultry. Measurement of coefficient of relationship and inbreeding. Measurement of heterosis. Estimation of genetic changes in performance traits due to various mating system. Evaluation of livestock and poultry on the basis of their own performance, pedigree and progeny. Selection exercises and assessment of genetic gain. Calculation of breeding values from single and repeated records. Use of computer for data handling and analyses. Visit of livestock and poultry breeding farms.

BOOKS RECOMMENDED

1. Bourdon, R.M. 2000. Understanding Animal Breeding: Prentice-Hall, Inc. Upper Saddle River, New Jersey.
2. Legates, J.E. and E.J. Warwick. 1990. Breeding and Improvement of Farm Animals. McGraw-Hill Publishing Co., New York. .
3. MINFAL. 1991. National Agricultural Policy. Ministry of Food, Agriculture and Cooperatives. Government of Pakistan, Islamabad.
4. Oldenbroek, J.K. 1999. Gene banks and the Conservation of Farm Animal Genetic Resources. DLO Institute for Animal Science and Health, The Netherlands.
5. Willis, M.B. 1998. Dalton's Introduction to Practical Animal Breeding. Blackwell, Science Ltd. UK.

EQUINE AND CAMEL PRODUCTION

3(1-2)

THEORY:

Camel as milk, meat and draught animal; equines (horses mules & donkeys) as draught animals; types and breeds of camel and equines; special characteristics, body conformation and draught ability of camel and equines; selection for various types; breeding, feeding and reproduction management of camel, horse & donkey; principles of equitation; common ailments and prophylactics; welfare of camel and equines.

PRACTICAL:

Demonstration of body conformation and defects; determining age; marking camel and horses; grooming and cleaning; use of various management tools and equipment; care of foot; use and care of harness and saddles; equitation practices; measuring physiological norms; visit to stud farms.

REPRODUCTION CLINIC I

4(0-4)

PRACTICAL

Breeding soundness examination of female Biometry of female reproductive organs Palpation of female reproductive system on palpation table Rectal palpation of genital organs in the live animal Estrus cycle Different methods of estrus detection. Pregnancy diagnosis Systematic procedure for conducting clinical examination of male reproductive system Breeding soundness examination of male Testicular circumference, manual palpation of epididymis, testis in normal and abnormal conditions Rectal palpation of accessory sex glands Methods of semen collection & semen handling Evaluation, processing & freezing of semen Live/dead staining of spermatozoa & determination of sperm abnormalities Dilution rate and extension of semen Different extenders and their preparation

BOOKS RECOMMENDED:

1. Zemjenis, R. 1970 Diagnostic and Therapeutic Techniques in Animal Reproduction The Williams & Wilkins Company, Baltimore.
2. Morrow, D.A., 1986 Current Therapy in Theriogenology, II. W.B. Saunders Company, Philadelphia.
3. Ahmad, M. And M.A. Saji, 1997. Manual for Beeding Soundness of Dairy Bulls for use in A.I. Livestock and Dairy development Department, 16-Cooper Road, Lahore.
4. Kahn, W., D. Wolkman and R.M. Kenney, 1994 Veterinary Reproductive Ultrasonography, Mosby-Wolfe, London.

MEDICINE CLINIC -I

4(0-4)

PRACTICAL:

Exercises in clinical examination Diagnosis and treatment of diseases of alimentary system Diagnosis and treatment of diseases of hemopoitic system Diagnosis and treatment of diseases of cardiovascular system Diagnosis and treatment of diseases of hepatobiliary system Diagnosis and treatment of diseases of hepatobiliary system Diagnosis and treatment of diseases of respiratory system Diagnosis and treatment of diseases of nervous system Diagnosis and treatment of diseases of urinary system Diagnosis and treatment of diseases of skin and musculoskeletal system Demonstration of different diagnostic and treatment methods like gastric lavage, enema, allergic tests etc. Practical handling of emergencies like colic, tympany, snake bite, poisoning, shock, heat stroke etc. Recording of minimum 10 cases under the supervision of teacher and making a presentation after consulting veterinary information resources like journals, books and internet etc.

BOOKS RECOMMENDED

1. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.
2. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.
3. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA.
4. Pinsent, P.J.N. and C.L. Fuller (1997) Outline of clinical diagnosis in horse. Blackwell science, Oxford, UK.
5. Andrew, AH (1990) Outline of clinical diagnosis in cattle. Butterworth & Co., London, UK.

SURGERY CLINIC-I

4(0-4)

PRACTICAL:

Physical and chemical restraint techniques in horses
Physical and chemical restraint techniques in ruminants
Physical and chemical restraint techniques in pets
History taking and clinical examination
Routes of drug administration and catheterization in male and female animals
Bandages and bandaging techniques
Preparations used for topical dressing of wounds
Treatment of wounds abrasions, galls and ulcers
Treatment and Management of abscesses
Trocarization in small and large animals
Hospitalization and care of sick animals.

Note: The topics will be covered subject to the availability of cases at the clinics.

Students will be required to record a minimum of 10 cases (history taking, clinical findings, laboratory investigation, diagnosis, differential diagnosis treatment and discussion) in each clinic course under the supervision of a teacher. The discussion of the case record will be written by consulting library books, journals and internet. Ambulatory clinic will be arranged by the University/Institute. Audio-Video films for each operation will be developed and shown during the course of studies.

BOOKS RECOMMENDED:

1. Venugopalan, A. 2000. Essentials of Veterinary Surgery. 8th ed. Oxford and 1BH Publishers and Distributors, New Delhi, India.
2. Kumar. A. 1997. Veterinary Surgical Techniques. Vikas Publishing House, New Delhi, India.
3. Harari. 1993. Surgical Complications and Wound Healing in the small Animal Practices, VV.B. Saunders Co., Philadelphia, USA.
4. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.

VETERINARY OBSTETRICS AND GENITAL DISEASES

6(2-4)

THEORY

Significance of obstetrics; Effect of Climate on fertility; Effect of Nutrition on fertility; Early embryonic mortality; Bovine Abortion (non-infectious and infectious causes); Mummification & Maceration; Dropsy of Fetal membranes & Teratological defects in cattle; Uterine Torsion; Genital Prolapse; Causes and types of dystocia; Selection of obstetrical procedures; Diseases of Puerperal period; Metabolic diseases; Retention of Fetal membranes; Brucellosis; Leptospirosis and other bacterial diseases of reproductive importance; Compylobacteriosis and Trichomoniasis; IBR, IPV and other misc infections; Hormonal causes of infertility; Repeat Breeding; Anestrus; Uterine infections; Uterine cultures and treatment; Genetic and nutritional basis of infertility in male; Different types/forms of infertility in male; Principles of Hormonal & Antibiotic therapy; Small ruminants reproductive disorders and Caesarian Section; Equine Reproductive Disorders; Canine Reproductive Disorders

PRACTICAL

Introduction to obstetrics & Obstetrical Anatomy; Normal presentation, position and posture; Abnormal presentation , position and posture of fetus; Identification of Obstetrical Instruments; Method of use of Obstetrical Instruments; Normal parturition mechanism in different species; Fetomaternal disproportion; Maternal causes of dystokia; Fetal causes of dystokia; Introduction of obstetrical Procedures in Maternal and Fetal Dystokia; Handling of Animal; Preparation of Animal for Handling Dystokia; Procedures to correct Postural Defect (Mutation); Forced extraction (Obstetrical Procedures); Performance of Mutation and forced extraction; Introduction and different methods of fetotomy; Performance of fetotomy; Epidural anesthesia; Different type of anesthesia used for C-section. (Local, Paravertebral anesthesia); Induction of parturition in cattle; Caesarian Section; induction of abortion in cattle; Diagnosis of Various types of Dystokia; Approach to an obstetrical case; Treatment of Various types of Dystokia; Method of Handling of Clinical cases; Method of Handling of Clinical cases; Venereal diseases in the animals causing abortion; Handling of various types of prolapse and torsion; Prevention and Treatment of Infertility in Male; Prevention and Treatment of Infertility in Female; Injuries and Disease of the Puerperal period

BOOKS RECOMMENDED:

1. Roberts, S.J., 1986. Veterinary Obstetrics and Genital Diseases. 2nd Ed., Edwards Brothers, Inc., Ann. Arbor, Michigan, U.S.A.
2. Morrow, D.A., 1986 Current Therapy in Theriogenology, II. W.B. Saunders Company, Philadelphia.
3. Youngquist, Current therapy in large animal Thereogenology 2007

THEORY:

Diseases of Cardiovascular and Hemopoietic Congestive heart failure and Pericarditis Bacillary hemoglobinuria and Black leg Equine infectious anemia and equine viral arteritis Hydropericardium syndrome Avian infectious anemia and Streptococcosis in poultry **Diseases of Hemolymphatic and Immune System** Babesiosis (Texas Fever) and Theileriosis (East Coast Fever) Trypanosomiasis Lymphadenitis in sheep and Epizootic lymphadenitis in cattle Anaplasmosis and Bovine farcy Equine and Canine Ehrlichiosis, Purpura hemorrhagica Ulcerative and Epizootic lymphangitis Lymphoid leukosis and Infectious bursal disease Hemorrhagic disease and Mallee in Camels **Diseases Of Respiratory System** Pasteurellosis Mammalian and Avian Tuberculosis Mycoplasmosis Infectious bovine rhinotracheitis Ovine progressive pneumonia Equine viral adenopneumonitis and African horse sickness Equine Influenza Avian Influenza, Brooder's pneumonia Aspergillosis and Lungworm infestation Infectious coryza and Fowl Cholera Infectious bronchitis and Infectious laryngotracheitis Canine and Feline Upper Respiratory Tract Syndrome **Disease of Nervous System** Rabies Scrapie and Bovine Spongiform Encephalopathy Listeriosis Equine viral encephalomyelitis and Borreliosis (Lyme Diseases) Avian Encephalomyelitis and Marek's Diseases Botulism and Borna disease Canine Distemper, Vail in Camel **Diseases of Musculoskeletal System** Staphylococcus infection and Black leg Actinomycosis & Actinobacillosis Ephemeral fever and Caprine arthritis/encephalitis Malignant edema and Tetanus Staphylococcosis, Viral arthritis, Femur head necrosis in poultry

BOOKS RECOMMENDED

1. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.
2. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA.
3. Y. M. Saif 2003. Diseases of Poultry. 11th Ed. Iowa State Press A Blackwell Publishing Company. USA
4. Matin W. B. and I. D. Ait Isen, 2000. Diseases of Sheep, 3rd Ed. Blackwell Science, Oxford, U. K.
5. Chaudhry Zafar Iqbal and Saif Uddin Jahangir Akbar, 2000. The Camel and its Diseases. Al Bayan Printing and Publishing Est. UAE.
6. Howard J.L, 1999. Current Veterinary Therapy, Food Animal Practice. W.B. Saunders, Co., U.S.A.
7. Rebhum, W. C. 1998. Diseases of Dairy Cattle, Williams and Willkins, Baltimore, USA.
8. Smith B.P. 1996. Large Animal Internal Medicine. 2nd Ed. The Mosby Co. Philadelphia U.S.A.

9. Hungerford. T.G. 1991, Hungerford's Disease of Livestock 9th Ed. Mc Graw Hill Book Company, Sydney, Australia.
10. Rhea V. Morgan. 1997. Handbook of Small Animal Practice. 3rd Ed. W. B. Saunders Company, PA, USA.
11. Larry P. Tilley and Francis W. K. Smith, Jr. 1997. The 5 Minute Veterinary Consult Canine and Feline. William and Wilkins, M.D. USA.

FORENSIC MEDICINE AND JURISPRUDENCE

1(1-0)

THEORY

Definitions: Law, constitution, statutes, rules & regulations, ordinances, acts. Court , lawyer, Legal procedures in court, veterinary evidences, witness, Veterinarian as an expert, Legal duties of veterinarian Livestock laws and acts; Livestock slaughtering acts and control of slaughtering Livestock laws and acts; livestock Improvement, export and import, conservation, Livestock laws and acts; livestock Diseases, livestock protection, prevention of cruelty to animals Livestock laws and acts; livestock grazing and pasture, nutrition, livestock development, cooperatives; Animal insurance Livestock laws and acts; local and special laws, department service rules Quarantine and quarantine act; Common offences against animals Postmortem examination of animals from forensic perspective Determination of age of the animals; Detection of frauds in livestock Mechanical injuries and woundsVetro-legal aspects of wounds and injuries, difference between antemeortem and postmortem wounds, fractures etc; Death due to wounds, immediate, remote or indirect cause; Firearm wounds; Injuries due to heat, Burns Postmortem findings in lightening, electrocution and drowning, snake bite, tympany and anthrax Common poisoning in animals and post mortem findings; plant toxins Postmortem findings in tuberculosis, foot and mouth disease, hemorrhagic septicemia Ethics in biomedical research

BOOKS RECOMMENDED

1. Cooper, J. E. and M. E. Cooper, 2007. Introduction to Veterinary and Comparative Forensic Medicine. Blackwell Publishing Book Services, Oxford, UK.
2. [Merck](#), M. D., 2007. Veterinary Forensics: Animal Cruelty Investigations. Wiley-Blackwell.
3. Chakrabarti, A., S. K. Ray and N. Sahoo, 2004. Textbook of veterinary ethics and jurisprudence. Kalyani Publishers, New Delhi India.
4. Andrews J. J. (ed.), 1986. Necropsy Techniques. The Veterinary Clinics of North America, 2 (1): 1-202.

5. Dabas, Y. P. S. and O. P. Saxena, 1994. Veterinary Jurisprudence and postmortem. INTERNATIONAL Book distributing co., Lucknow, India.
6. Farani, m., 1983. Livestock laws manual. Food and Agriculture organization of the United Nations Rome (Italy).
7. Qamar, I. A. and M. Z. Durrani, 1963. Veterinary laws in West Pakistan. West Pakistan Agricultural University, Lyallpur.

SHOEING AND SOUNDNESS

3(1-2)

THEORY

Definition, history and basic terms in shoeing, Anatomy and physiology of foot, The horseshoe and shoe nails, Hot and cold shoeing, Injuries caused by farrier, Injuries caused by Shoes, Injuries caused by nails, Faults in dressing of foot, Affections of the foot, fore and hind limbs and corrective shoeing, Affections of the foot, fore and hind limbs and corrective shoeing, Affections of the foot, fore and hind limbs and corrective shoeing, Affections of the foot, fore and hind limbs and corrective shoeing, Affections of the foot, fore and hind limbs and corrective shoeing, Blemishes and vices in animals, Dentition of farm animals, Soundness

PRACTICAL

Anatomy of foot, Anatomy of foot, Shoeing tools, Types of shoes and nails, Types of shoes and nails, Hot Shoe preparation , Application of shoes (removal of shoe, preparation of foot), Application of shoes (removal of shoe, preparation of foot), Application of shoes (removal of shoe, preparation of foot), Application of shoes (removal of shoe, preparation of foot), Application of shoes (removal of shoe, preparation of foot), Application of shoes (removal of shoe, preparation of foot), Practices in determination of age from teeth, Practices in determination of age from teeth, Soundness certificate writing, Soundness certificate writing.

BOOKS RECOMMENDED

1. Greenough P.R., F.L. MacCallum and A.D. Weaver. 1997. Lameness in Cattle. 3rd Ed. Wright and Sons. Bristol, UK.
2. Pollitt. C.C. 1995. Colour Atlas of the Horse's Foot. Mosby-Wolfe, Philadelphia. USA.
3. Emery. L. J. Miller and N.V. Hoosen, 1977. Horseshoeing. Theory and Hoof Care. Lea and Febiger. Philadelphia, USA.
4. Stashak, T. S. 1992. Adam's Lameness in I horses. 4th ed. Lea and Febiger. Philadelphia.

THEORY

General surgical considerations, Fluid and electrolyte therapy in small animals, Affections of mouth & teeth, Affections of salivary glands, Affections of neck , Digestive system, Digestive system, Hip and Shoulder Dislocations, Fracture, Fracture, Affections of respiratory system. , Affections of skin and its adnexa, Affections of ears, Affections of urinary system, Male genital system, Female genital system

PRACTICAL

The student will perform following fundamental exercises on survival basis: Laparotomy techniques in small animals, Tooth extraction procedure , Practical demonstration of Tooth extraction, Procedure for salivary gland resection , Practical demonstration of salivary gland resection, Splenectomy procedure , Practical demonstration of Splenectomy, Gastrotomy procedure, Practical demonstration of Gastrotomy, Intestinal end-to-end anastomosis procedure, Practical demonstration of Intestinal end-to-end anastomosis, Castration procedure in dog and cat, Practical demonstration of Castration procedure in dog and cat, Ovariectomy procedure in bitches and queens, Practical demonstration of Ovariectomy in bitches and queens, Cystotomy procedure, Practical demonstration of Cystotomy, Nephrotomy and Nephrectomy procedures, Practical demonstration of Nephrotomy and Nephrectomy, Thoracotomy procedure, Practical demonstration of Thoracotomy, Procedure for correction of auricular haematoma and ear cropping procedure, Practical demonstration of correction of auricular haematoma and ear cropping , Tail docking and Dewclaw amputation procedure, Practical demonstration of Tail docking and Dewclaw amputation, Procedure for repair of prolapse of eye ball, Practical demonstration of repair of prolapse of eye ball, Approaches to different long bones and use of external and internal fixation devices for fracture repair, Practical demonstration of external fixation devices for fracture repair, Practical demonstration of internal fixation devices for fracture repair, Anal sac resection procedure, Practical demonstration of Anal sac resection

BOOKS RECOMMENDED

1. Bojrab, M.J., 1998. Current Techniques in Small Animal Surgery. 4th ed. Lea and Febiger, Philadelphia, USA.
2. Slatter, D.H.. 1991. Textbook of Small animal Surgery 2nd ed. W.B. Saunders Co., Philadelphia,USA.
3. Fossum, T. W. 1997. Small Animal Surgery. Mosby Year Book Inc. St. loins, Missouri, USA.
4. Harvey,' C.E., C. D. Newton and A. Schavvartz 1990. Small

- Animal Surgery. J.B. Lippincott. Philadelphia, USA.
5. Knecht. CD. A.R. Allen, D. J. Williams and J.H. Johnson, 1987. Fundamental Techniques in Veterinary Surgery. 3rd Ed. W.B. Saunders Co. Philadelphia. USA.
 6. Piemattei. D.L. 1993. An Atlas of Surgical Approaches to Bones of the Dog and Cat. 3^r F.d. W.B. Saunders Co. Philadelphia, USA.
 7. Archibald J (ed.) 1974. Canine Surgery, Santa Barbra, American Veterinary Publication Inc. USA.

REPRODUCTION CLINIC II

4(0-4)

PRACTICAL

Comparison of bovine & equine reproductive system Introduction of artificial insemination Different methods of artificial insemination Introduction & handling of liquid nitrogen cylinder Preparation of artificial insemination gun Method of rod & AI gun passing in the female reproductive tract Clinical application of hormones in different reproductive problems Ultrasonography in domestic animals Use of elactoejaculator for semen collection Training of students in diagnosis and treatment of various reproductive problems at clinics Clinical case recording and presentation for grading the students Recording of observations and clinical diagnosis of the problem Diagnosis & treatment of repeat breeder animals Endometrial biopsy oviductal patency test.

Note: The topics will be covered subject to the availability of cases at clinics

BOOKS RECOMMENDED:

1. Zemjenis, R. 1970 Diagnostic and Therapeutic Techniques in Animal Reproduction The Williams & Wilkins Company, Baltimore.
2. Morrow, D.A., 1986 Current Therapy in Theriogenology, II. W.B. Saunders Company, Philadelphia.
3. Ahmad, M. And M.A. Saji, 1997. Manual for Beeding Soundness of Dairy Bulls for use in A.I. Livestock and Dairy development Department, 16-Cooper Road, Lahore.
4. Kahn, W., D. Wolkmann and R.M. Kenney, 1994 Veterinary Reproductive Ultrasonography, Mosby-Wolfe, London.

MEDICINE CLINIC II

4(0-4)

PRACTICAL:

Practical exercise in clinical examination, diagnosis and treatment of diseases of mammary glands, eye and ear Study tour to livestock and poultry farms and research institutes Disease outbreak investigation

Discussion on important diseases Recording of minimum 15 cases under the supervision of teacher and making a presentation after consulting veterinary information resources like journals, books and internet Recording of minimum 15 cases under the supervision of teacher and making a presentation after consulting veterinary information resources like journals,

Note: The topics will be covered subject to the availability of cases at the clinics.

BOOKS RECOMMENDED

1. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.
2. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.
3. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA Andrew, AH (1990) Outline of clinical diagnosis in cattle. Butterworth & Co., London, UK.
4. Petersen-Jones S. M. and S. M. Crispin. 2001. Manual of Small Animal Ophthalmology. Blackwell Science, Oxford, U. K.
5. Pinsent, P.J.N. and C.L. Fuller (1997) Outline of clinical diagnosis in horse. Blackwell science, Oxford, UK.
6. Rebhum, W. C. 1998. Diseases of dairy Cattle. Williams and Wilkins, Baltimore. USA

SURGERY CLINIC-II

4(0-4)

PRACTICAL

Management and treatment of burn wounds, Management and treatment of burn wounds, Management and treatment of burn wounds, Antibiotics, Analgesics, Antiinflammatory drugs used in surgery, Antibiotics, Analgesics, Antiinflammatory drugs used in surgery, Antibiotics, Analgesics, Antiinflammatory drugs used in surgery, Lameness in large animals , Lameness in large animals , Lameness in large animals , Nerve block, regional and local anaesthesia in clinical cases, Nerve block, regional and local anaesthesia in clinical cases, Nerve block, regional and local anaesthesia in clinical cases, Use of firing and counter irritants in veterinary practices, Use of firing and counter irritants in veterinary practices, Use of firing and counter irritants in veterinary practices, Induction and maintenance of general anaesthesia in field conditions , Induction and maintenance of general anaesthesia in field conditions, Induction and maintenance of general anaesthesia in field conditions, Surgical management of horn, hoof and tail affections, Surgical management of horn, hoof and tail affections, Surgical management of horn, hoof and tail affections, Teat surgery (instruments, techniques and

complications), Teat surgery (instruments, techniques and complications), Teat surgery (instruments, techniques and complications), Castration of large animals, Castration of large animals , Castration of large animals, Visits to animal farms and hospitals, Visits to animal farms and hospitals, Visits to animal farms and hospitals, Visits to animal farms and hospitals, Visits to animal farms and hospitals

BOOK RECOMMENDED:

1. Crow, S.E. and A. A. Walshaw, 1997. Manual of Clinical Procedures in the Dog and Cat. 2nd Ed. J.B. Lippincott, Philadelphia.
2. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K. Bistner. S.I. and R.B. Ford, 1985.
3. Kirk and Bisner's. Handbook of Veterinary Procedures and Emergency Treatment. 6th ed. W.B. Saunders Co., Philadelphia.
4. Oehme, F.W. and IE. Prier, 1998. Text book of Large Animals Surgery. 2od ed. Williams and Wilkins, Baltimore, London.

LIVESTOCK FARMS OPERATIONS

4(0-4)

PRACTICAL

Routine farm practices, Housing management, Cleaning and sanitation, Manure disposal, Milk production milk let down, Hygienic measures for clean milk production, Mastitis screening tests and milk suckling, Castration and Extra teat removal, Drenching and Dipping, Dehorning/ Disbudding and Trimming, Dentition of Farm Animals, Record keeping, Preparation of animals for shows, Weaning practices, Care, handling and feeding of calves, Dry cow/buffalo management, Planning for year round fodder availability, Enrichment and preservation practices, Silage making, Hay making, Protecting animals from inclement weather, Land and labor management, Disease preventive measures, Prophylactic measures, Dry cow therapy, Approaching and handling, Restraining of animals, Daily roughage and concentrate feeding management practices for lactating and dry stock, Daily roughage and concentrate feeding management practices for dry stock, Total mix ration.

BOOKS RECOMMENDED

1. Banerjee, G.C., 1998. A text book of Animal Husbandry Oxford and IBH Publishing Co., New Delhi, India
2. Bath, D.L., F.N. Dickenson, H.A. Tucker, 1985. Dairy Cattle: principles, practices, problems, profits. Lea & Febiger, Philadelphia.
3. Tufail, S.I., 1994. Animal Husbandry. National Book Foundation, Islamabad, Pakistan

PRACTICAL:

Overview of the subject; Blood composition sampling strategies. Choosing an appropriate test; Collection, preservation and dispatch of morbid material Blood Collection, preservation/storage, evaluation RBC: Physiological and Pathological response Abnormal erythrocytes: Conditions and diseases Hemoglobin abnormalities, Hematocrit: significance and abnormalities Bone marrow examination Anemia: Clinical Evaluation Lab. Diagnosis of anemia: Tests and demonstration Lab. Diagnosis of anemia: Performance of tests Differential diagnosis of anemia, Erythrocyte indices, Polycythemia What is your diagnosis: Cases of erythrocyte abnormalities Leukocytes in health and disease: Leukopenia, Leukocytosis Leukocytes: individual cell response to disease (Neutrophilia, neutropenia) Leukocytes: individual cell response to disease (Lymphocytosis, lymphopenia) Leukocytes: individual cell response to disease (Eosinophilia, eosinopenia, monopenia, monocytosis) TLC & DLC: Demonstration and performance of tests What is your diagnosis: Cases of leukocyte abnormalities Examination of Serum total proteins, albumin and globulin: determination and performance Urinalysis: Overview, Collection, preservation, Urinalysis: Physical Examination, color Urinalysis: Physical Examination, color Urinalysis: volume, turbidity, Specific gravity, Chemical Examination of urine, pH, proteinuria, Glycosuria Determination of Ketonuria, blood in urine, Determination of urobilinogen, Calcium in urine Microscopic Examination of urine: Methods, preparation of urine sediment Microscopic Examination of urine: Organized and unorganized sediment examination Skin Scrapping: Sample collection, processing and examination LFTs: Different tests of liver Significance of various LFTs in disease diagnosis Different kidney function tests Significance of kidney function tests in disease diagnosis Exfoliative cytology

BOOKS RECOMMENDED:

1. Stockham, S. L. and M. A. Scott, 2008. Fundamentals of Veterinary Clinical Pathology. Blackwell Pub Professional, Ames, Iowa, USA.
2. Khan, A., 2008. Veterinary Clinical Pathology. University of Agriculture Press, Faisalabad.
3. Jackson, M. L., 2007. Veterinary Clinical Pathology: An Introduction. 1st Ed., Blackwell Pub Professional, Ames, Iowa, USA.
4. Latimer, K.S., E. A. Mahaffey and K. W. Presse, 2003. Veterinary Laboratory Medicine: Clinical Pathology. 4th Ed. Iowa State Press, Ames, Iowa, USA.
5. Coles, E. H., 1986. Veterinary Clinical Pathology. 4th Ed., W. B. Saunders Co., Philadelphia, USA.

THEORY

Introduction of epidemiology & its branches, Historical Perspective & JOHN Snow's Findings, Role of epidemiology in Preventive medicine, Role of epidemiology in herd health, Epidemiology through the years, Relationship of epidemiology & biostatistics, Introduction of public health & veterinary public health, Relationship of public health & community health, Emerging zoonoses & epidemic investigation, Role of international organizations for the control of zoonoses, Descriptive epidemiology, Who, when & where triad, agent, host & environment triad, Vital statistics, Prevalence & incidence, its types & applications, Morbidity rate & mortality rate, Tool of descriptive epidemiology, Surveillance introduction & examples, Active surveillance, passive surveillance, Methodology of surveillance, Sero – surveillance & Geometric mean titer, Sample size determination, Analytical epidemiology, Case control study retrospective study, Applications & examples of C.C study, Cohort study / prospective study, Applications & Examples of cohort studies, Experimental epidemiology, Clinical & community trials, Disease prevention control & eradication, International disease reporting, Water, milk, meat & food borne zoonotic diseases, Role of WTO in import & export of animals & animal by products.

PRACTICAL

Difference between qualitative & quantitative data, Presentation of data in tables, graphs & curves, Histogram, bar diagram, PIE charts & flow charts diagram, Different types of graphs on log & semi log paper, Difference between rate, ratios proportion, Morbidity & mortality rate, incidence & prevalence, Calculation of rates from the data & sample size, Interpretation from the results of surveillance reports, determination, Field visit for surveillance part I Data collection, Calculation & Interpretation of casecontrol study, cohort study from the given data I, Calculation & Interpretation of casecontrol study, cohort study from the given data II, Sample size determination of analytical studies, Methodology of randomization of clinical, Epidemic investigation from the given information..

BOOKS RECOMMENDED:

1. Thrusfield, M., 2006 Veterinary Epidemiology 3rd Ed. Blackwell Science, London.
2. Jones, H. J., M. W. Jubbert and H.Hagstard, 2000. Zoonosis – Recognition, Control and Prevention, Blackwell Science, Ltd., Oxford, U.K.
3. Ali Muhammad Mir, 2002, Synopsis of Epidemiology, Union Publication Anarkali Lahore.

4. Chaudhary RA Khan MA and Din M. 2000 Epidemiology of Major Livestock Diseases in Pakistan, College of Veterinary Science Lahore.
5. Martin, W., A. Meek and P. Welleber, 1987. Veterinary Epidemiology, Principle and Methods Iowa State University Press, Ames Iowa, USA.
6. Toma, B. and J. P. Vaillancourt, 1999. Directory of Veterinary Epidemiology. The Iowa State University Press, Ames, Iowa, USA.

POULTRY PATHOLOGY

5(1-4)

THEORY

Introduction to poultry industry of Pakistan, significance of diseases in poultry industry, Newcastle disease; Avian pneumovirus infection, Avian influenza, Infectious bronchitis; Laryngotracheitis, Hydropericardium; Inclusion body hepatitis; Egg drop syndrome, Infectious bursal disease, Avian encephalomyelitis; Chicken infectious anemia, Avian pox; Reovirus infections, Neoplastic diseases; Mareks disease; Leukosis sarcoma group, Salmonellosis; Colibacillosis, Infectious coryza; Fowl cholera; Spirocheatosis, Mycoplasmosis, Clostridial diseases, Coccidiosis; Other parasitic diseases, Mycotoxicosis; Fungal infections, Nutritional diseases ; Miscellaneous pathological disorders.

PRACTICALS

Disinfection of poultry farms; Laboratory tests for farm biosecurity evaluation, Disinfection of hatcheries; Laboratory tests for monitoring of hatchery biosecurity, hatching egg and chick health, Microbiological and toxicological monitoring of processed chicken; Processing plants; Poultry feeds, Postmortem techniques for poultry birds-I, Postmortem techniques for poultry birds-II, Collection of blood, serum and tissue samples; Live and dead birds submission to a laboratory, Postmortem examination and diagnosis of the problem (Case recording)-1, Lab tests and differential diagnosis of respiratory diseases of poultry birds, Postmortem examination and diagnosis of the problem (Case recording)-2, Lab tests and differential diagnosis of salmonellosis and colibacillosis, Postmortem examination and diagnosis of the problem (Case recording)-3, Differential diagnosis of coccidiosis caused by different *Eimeria* spp., Postmortem examination and diagnosis of the problem (Case recording)-4, Diagnosis of early chick mortality, Postmortem examination and diagnosis of the problem (Case recording)-5, Lab tests for diagnosis of Newcastle disease, Avian influenza, Postmortem examination and diagnosis of the problem (Case recording)-6, Lab tests for diagnosis of mycoplasma, Postmortem examination and diagnosis of the problem (Case recording)-7, Lab tests for diagnosis of different neoplastic diseases, Postmortem examination and diagnosis of the problem (Case recording)-8, Differential diagnosis of enteric diseases of chicken, Postmortem examination and diagnosis of the

problem (Case recording)-9, Veterinary sanitary aspects of vaccine handling and vaccination techniques, Postmortem examination and diagnosis of the problem (Case recording)-10, Demonstration and practical administration of vaccines, Postmortem examination and diagnosis of the problem (Case recording)-11, Diagnosis of mycotoxicosis and other toxicities; Mycotoxin detection, Postmortem examination and diagnosis of the problem (Case recording)-12, Diagnosis of diseases due to variation in ambient temperatures, water deprivations, Farm/hatchery visits; Group discussions.

BOOKS RECOMMENDED:

1. Saif, Y. M., A. M. Fadly, J. R. Glisson, L. R. McDougald, L. K. Nolan and D. E. Swayne, 2008. Diseases of Poultry. 12th Ed. Wiley-Blackwell, Ames, Iowa, USA.
2. Pattison, [M.](#), [D. Alexander](#), [J. M. Bradbury](#), [P. McMullin](#) (eds), 2008. Poultry Diseases. Saunders Ltd, Philadelphia, USA.
3. Carlton, B. R., 2006. Avian Disease Manual. American Association of Avian Pathologists.
4. Jordan, F. T. W., M. Pattison, D. Alexander, T. Faragher and D. J. Alexander, 2002. Poultry Diseases. 5th Ed. W.B.Saunders Company, London.UK.
5. Swayne, D. E., J. R. Glisson, M. W. Jackwood, J. E. Pearson and W. M. Reed, 1998. A Laboratory Manual for the Isolation and Identification of Avian Pathogens. 4th Ed. American Association of Avian Pathologist inc. Kennett Square, Pennsylvania, USA.

MEAT AND SLAUGHTER BY-PRODUCTS TECHNOLOGIES

4(2-2)

THEORY

Scope and importance of meat production, Meat terminology, Important meat breeds. Halal Slaughtering methods, Other slaughtering methods, Hygienic production, and Handling of meat, Meat spoilage, Essentials of meat quality, Factors influencing meat quality Antemortem, Factors influencing meat quality Postmortem, Flaying techniques, Carcass Grading, Meat evaluation for quality, Preparation of different meat cuts, Modern meat processing, Physical and chemical treatments, Equipment related to meat & meat products, Organoleptic meat evaluation, Meat Preservation methods, Poultry meat processing technology, Poultry meat processing technology, Fish meat processing technology, Meat by products Edible (Liver, kidney, heart), Meat by products Edible (Brain. Tongue, tail, testicles, Meat by products Edible (Head and trotters), Meat by products Edible (Fats, stomach, gut, intestines, bones.), Meat by products Non-Edible: (Hides and skins), Meat by products Non-Edible (Tallow and greases, blood, horn & hooves.), Meat by products

Pharmaceutical: (Glands, pancreases, ovaries, parathyroid, pituitary, testes), Meat by products Pharmaceutical (Thyroid, blood, bones, intestines, liver, lungs, spinal cord and stomach, gallbladder), Meat by products Sausages and sausages making. Slaughterhouse wastes management.

PRACTICAL

Layout and designs of modern slaughterhouses and abattoirs, Slaughterhouse management, Slaughterhouse sanitation, Antemortem examination, Postmortem examination, Slaughtering techniques, Flaying techniques, Rigor mortis phenomenon and physical & chemical properties of meat, Meat grading, Meat cutting techniques and packaging, Meat processing technologies, Methods of meat preservation, Meat Quality analysis, Meat by products, Visit to tannery and processing plants, Visit to slaughterhouse.

BOOKS RECOMMENDED:

1. Romans, J.R. and P.T. Ziegler, 1994. The Meat We Eat. The Interstate Printers and Publishers Inc., Danville, Illinois. U.S.A.

REFERENCE BOOKS

2. Lawrie, R.A., 1991. Meat Science. Pergamon Press, Oxford, UK.
3. Hui, Y.H., Nip. Wai. Kit. 2001. Meat Science & applications. Marcel Dekker, Inc. New York, USA.
4. Graccy, J.F. 1999. Meat Hygiene, 10th The English Language Book Society, Bailliere Tindal, London, UK.
5. Anwar, A.H. Khan M.N. 2000. Meat Hygiene and Inspection. Friends Science Publishers. Faisalabad, Pakistan.
6. Edward, S. Koneicko. 1985. A Hand Book of Meat Analysis. Avery Publishing Group Inc. New Jersey.
7. Hand book of fisheries and aquaculture technology, Asia pacific business press inc.110007 Delhi, India.
8. Joe M. Regenstein.1997.Introduction to Fish Technology. Chapman & Haal, Inc. New York USA.

REPRODUCTION CLINIC III

4(0-4)

PRACTICAL

Systematic procedure for conducting clinical examination of female genitalia, Reasons and treatment of delayed puberty in heifers, Reasons & treatment of prolonged calving interval in cattle & buffaloes, Diagnosis & treatment of cystic ovarian degeneration, Diagnosis & treatment of uterine infections (endometritis, pyometra etc.), Diagnosis & treatment of Vaginal & uterine prolapsed, Diagnosis and treatment of Retention of placenta,

Diagnosis and treatment of dystocia, Fern pattern production in estrus mucus in bovines and uterine sample collection for infections & culture sensitivity test, Induction of parturition/abortion in cattle/buffalo, Postpartum care of dam, Care of neonatal calf, Estrus cycle of bitches, Vaginal cytology in bitches, Canine semen collection and evaluation, Obtaining and examination of preputial samples, postmortem examination of bull's reproductive tract.

Note: The topics will be covered subject to the availability of cases at clinics

BOOKS RECOMMENDED:

1. Zemjenis, R. 1970 Diagnostic and Therapeutic Techniques in Animal Reproduction The Williams & Wilkins Company, Baltimore.
2. Morrow, D.A., 1986 Current Therapy in Theriogenology, II. W.B. Saunders Company, Philadelphia.
3. Ahmad, M. And M.A. Saji, 1997. Mannual for Beeding Soundness of Dairy Bulls for use in A.I. Livestock and Dairy development Department, 16-Cooper Road, Lahore.
4. Kahn, W., D. Wolkmann and R.M. Kenney, 1994 Veterinary Reproductive Ultrasonography, Mosby-Wolfe, London.

MEDICINE CLINIC III

4(0-4)

PRACTICAL

Independent handling, diagnosis and treatment of clinical cases, Assignment of indoor cases and maintaining their complete records, Vaccination schedules in animals, Practical demonstration of control measures for ecto and endo parasites on individual animals and on herd basis, Training in ambulatory clinical practice, Veterinary disaster preparedness (flood, drought, earthquake, poisonous gases, radiation, nuclear disaster etc.), Study tour to livestock farms, Professional films, Case record and presentation, Vetrolegal cases.

Note: The topics will be covered subject to the availability of cases at the clinics.

BOOKS RECOMMENDED

1. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.
2. Rhea V. Morgan. 1997. Handbook of Small Animal Practice. 3rd Ed. W. B. Saunders Company, PA, USA.
3. Radostitis, O.M., C.C. Gay, K.W. Hincheliff and P. D. Constable. 2007. Veterinary Medicine, 10th Ed. Saunders Elsevier, PA, USA.

4. Bistner, S. I. and R. B. Ford. 1995. Kirk and Bistner's Handbook of Veterinary Procedures and Emergency Treatment. 6th Ed. W. B. Saunders Co., Philadelphia, USA.
5. Cynthia M. Kahn and Scott Line 2005. The Merck Veterinary Manual. 9th Ed. Merial Ltd. G. A., USA.

SURGERY CLINIC-III

4(0-4)

PRACTICAL

Handling surgical emergency cases, Handling surgical emergency cases, Handling surgical emergency cases, Fluid replacement therapy and blood transfusion in. animals, Fluid replacement therapy and blood transfusion in. animals, Fluid replacement therapy and blood transfusion in. animals, Practice of passing stomach tube and stomach lavage, Practice of passing stomach tube and stomach lavage, Practice of passing stomach tube and stomach lavage, Back racking, rectal palpation, Back racking, rectal palpation, Back racking, rectal palpation, Surgical management of chocking, colic and grain over load, Surgical management of chocking, colic and grain over load, Surgical management of chocking, colic and grain over load, Management of urine retention cases, Management of urine retention cases, Management of urine retention cases, Application of plaster casts, Application of plaster casts, Application of plaster casts, Use of radiography and ultrasound as a diagnostic tool, Use of radiography and ultrasound as a diagnostic tool, Use of radiography and ultrasound as a diagnostic tool, Group discussion on cases received in the clinics arid case presentations, Group discussion on cases received in the clinics arid case presentations, Group discussion on cases received in the clinics arid case presentations, Independent handling of surgical cases, Independent handling of surgical cases, Independent handling of surgical cases, Independent handling of surgical cases

BOOK RECOMMENDED:

1. Speirs, V.C., 1997. Clinical Examination of Horse.. W.B. Saunders Co., Philadelphia, USA.
2. White II, N.A and IN. Moore, 1997, Current Technique in Equine Surgery and Lameness, 2nd. ed. W.B. Saunders. London Stashak, T.S , 1992.
3. Adams Lameness in Horses. 4th ed. Lea and Febiger, Philadelphia, USA.
4. Colbhan, P.T. AM. Merrite, J.N. Moore and I.G. May hew, 1999. Equine Medicine and Surgery, 5th ed. (Vol.I& 2) Mosby, Philadelphia, USA
5. Pillitt. C.C 1995, Colour Atlas of the Horse's Foot. Mosby-Wolfe, Philadelphia, USA

6. Kelly, W. R. 1984. Veterinary Clinical Diagnosis. 3rd Ed. Bailliere Tindall & Corsell, London, U. K.

POULTRY FARMS OPERATIONS

4(0-4)

PRACTICAL

Preparations on poultry farm before arrival of chicks. Receiving chicks. Care during brooding, rearing and laying period. Space, temperature, feed, water, ventilation and light requirements. Broiler flock management. All in and all out system. Management of multiage flocks. Feed withdrawal before slaughtering. Managing breeder flocks; feed and water restriction strategies. Male management. Parent flock management. Demonstration of incubator. Receiving eggs and their storage. Grading, setting and pre-warming hatching eggs. Principles of hatchery environment and operations. Sanitation and hygienic measures in hatchery. Use of Thermometers. Fumigation of hatching eggs. Candling. Taking off hatch. Grading and sexing of chicks. Dubbing and detoeing. Vaccination at hatchery. Chick boxes. Handling and delivery of chicks to the poultry farms. Cleaning, and disinfection of incubators. Tray washers. Waste disposal. Recorded keeping; eggs flow, hatch reports, and delivery. Handling and disposal of farm and hatchery wastes. Cull birds separation. Bio-security implementation at hatchery, broiler farm, layer farm, breeder farms and parent farms.

BOOKS RECOMMENDED

1. Austic, R.E. and M.C. Nesheim. 1990. Poultry Production. Lea and Febiger, Philadelphia, U.S.A.
2. Ensminger, M.E. 1992. Poultry Science. The Interstate Printers and Publishers. Inc., Danville, Illinois, U.S.A.
3. Bell, D.D. and W.D. Weaver. 2002. Commercial Chicken Meat and Egg Production. 5th Edition. Kluwer Academic Publishers, Norwell Massachusetts 02061 USA.
4. Sreenivasaih, P.V. 2006. Scientific Poultry Production. 3rd Revised Edition, International Book Distributing Company, Lucknow, India.
5. Moreng, R.E. and J.S. Avens. 1985. Poultry Science and Production. Reston Publishing Co. Inc., Reston, Virginia, U.S.A.

FEED MILL OPERATION

4(0-4)

PRACTICAL

Present status of feed industry in Pakistan, Problems of feed industry in Pakistan, Preparation of feasibility report to establish a feed mill for poultry feed, Preparation of feasibility report to establish a feed mill for poultry

feed, Preparation of feasibility report to establish a feed mill for ruminants, Preparation of feasibility report to establish a feed mill for ruminants. Construction and designing of feed mill for poultry feed. Construction and designing of feed mill for ruminants. Operational mechanism of feed mill, Procurement of raw materials for fed mill. Sampling techniques at feed mill. Feed marketing techniques. Introduction to different forms of feed mills Demonstration of different types of grinders. Demonstration of different types of grinders, Demonstration of different types of mixers. Demonstration of different types of mixers. Types of conveyers and elevators. Types of conveyers and elevators. Type of Silo for feed ingredient storages. Pallet machine use in feed mills. Pallet machine use in feed mills. Different types of extruders for different animal feed manufacturing. Demonstration of Extrusion process. Demonstration of Extrusion process. Demonstration of software to handle feed mill operations. Manufacturing of wholesome feed Packing process of feed. Storage of prepared feed. Visit of feed mills (Poultry), Visit of feed mills (ruminants).

BOOKS RECOMMENDED

1. McEllihiney, R.R.1994. Feed Manufacturing Technology IV. American Feed Industry Association, Inc. Arlington, USA.
2. Ensminger, M.E., J.E. Oldfield and W.W. Heinemann. 1990. Feeds and Nutrition Digest (2nd Ed). The Ensminger Publishing Co., Clovis, California. USA.
3. Bebb D.L. 1990. Mechanized Livestock Feeding. BSP Professional books, Oxford. U.K.
4. Orskov, E.R. 1988. Feed Science, World Science Series-B, Disciplinary Approach, Elsevier.
5. P.J. Moughan, M.W.A. Vestegen and M.I. Visser-Reyneveid. 2002. Feed Evaluation – Principles and Practice. Empress Publishing. The Netherlands.

COMPULSORY COURSES

ENGLISH I (Functional English)

OBJECTIVES: Enhance language skills and develop critical thinking.

COURSE CONTENTS

Basics of Grammar
Parts of speech and use of articles
Sentence structure, active and passive voice
Practice in unified sentence
Analysis of phrase, clause and sentence structure
Transitive and intransitive verbs
Punctuation and spelling

Comprehension

Answers to questions on a given text

Discussion

General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

Listening

To be improved by showing documentaries/films carefully selected by subject teachers

Translation skills

Urdu to English

Paragraph writing

Topics to be chosen at the discretion of the teacher

Presentation skills

Introduction

Note: *Extensive reading is required for vocabulary building*

BOOKS RECOMMENDED:

1. **Functional English**
 - a) Grammar

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
 2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506
- b) Writing
1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
- c) Reading/Comprehension
1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.
- d) Speaking

ENGLISH II

(Communication Skills)

OBJECTIVES: Enable the students to meet their real life communication needs.

COURSE CONTENTS

Paragraph writing

Practice in writing a good, unified and coherent paragraph

Essay writing

Introduction

CV and job application

Translation skills

Urdu to English

Study skills

Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension

Academic skills

Letter/memo writing, minutes of meetings, use of library and internet

Presentation skills

Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

BOOKS RECOMMENDED:

Communication Skills

a) **Grammar**

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

b) **Writing**

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

c) **Reading**

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
2. Reading and Study Skills by John Langan
3. Study Skills by Riachard Yorkey.

English III

(Technical Writing and Presentation Skills)

OBJECTIVES: Enhance language skills and develop critical thinking

COURSE CONTENTS

Presentation skills

Essay writing

Descriptive, narrative, discursive, argumentative

Academic writing

How to write a proposal for research paper/term paper

How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

Technical Report writing

Progress report writing

Note: Extensive reading is required for vocabulary building

RECOMMENDED BOOKS:

Technical Writing and Presentation Skills

a) Essay Writing and Academic Writing

1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.
3. Patterns of College Writing (4th edition) by Laurie G. Kirsznner and Stephen R. Mandell. St. Martin's Press.

b) Presentation Skills

c) Reading

The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

PAKISTAN STUDIES

(Compulsory)

INTRODUCTION/OBJECTIVES

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

COURSE OUTLINE

1. Historical Perspective

- a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
- b. Factors leading to Muslim separatism
- c. People and Land
 - i. Indus Civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features.

2. Government and Politics in Pakistan

Political and constitutional phases:

- a. 1947-58
- b. 1958-71
- c. 1971-77
- d. 1977-88
- e. 1988-99
- f. 1999 onward

3. Contemporary Pakistan

- a. Economic institutions and issues
- b. Society and social structure
- c. Ethnicity
- d. Foreign policy of Pakistan and challenges
- e. Futuristic outlook of Pakistan

BOOKS RECOMMENDED

1. Burki, Shahid Javed. *State & Society in Pakistan*, The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy*. Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. *Pakistan's Foreign policy: An Historical analysis*. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development*. Lahore, 1994.

5. Wilcox, Wayne. *The Emergence of Bangladesh.*, Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno - National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development.* Kent England: WmDawson & sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh.* Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan.* Boston: Houghton Mifflin, 1967.
12. Aziz, K.K. *Party, Politics in Pakistan*, Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, *Pakistan Under Martial Law*, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective.* Islamabad: National Commission on Historical and Cultural Research, 1993.

ISLAMIC STUDIES (Compulsory)

OBJECTIVES:

This course is aimed at:

- 1 To provide Basic information about Islamic Studies
- 2 To enhance understanding of the students regarding Islamic Civilization
- 3 To improve Students skill to perform prayers and other worships
- 4 To enhance the skill of the students for understanding of issues related to faith and religious life.

DETAIL OF COURSES

Introduction to Quranic Studies

- 1) Basic Concepts of Quran
- 2) History of Quran
- 3) Uloom-ul -Quran

Study of Selected Text of Holly Quran

- 1) Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
- 2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- 3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- 4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- 5) Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

Study of Selected Text of Holly Quran

- 1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- 2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- 3) Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

- 1) Life of Muhammad Bin Abdullah (Before Prophet Hood)
- 2) Life of Holy Prophet (S.A.W) in Makkah
- 3) Important Lessons Derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

- 1) Life of Holy Prophet (S.A.W) in Madina
- 2) Important Events of Life Holy Prophet in Madina
- 3) Important Lessons Derived from the life of Holy Prophet in Madina

Introduction To Sunnah

- 1) Basic Concepts of Hadith
- 2) History of Hadith
- 3) Kinds of Hadith
- 4) Uloom –ul-Hadith
- 5) Sunnah & Hadith
- 6) Legal Position of Sunnah

Selected Study from Text of Hadith

Introduction To Islamic Law & Jurisprudence

- 1) Basic Concepts of Islamic Law & Jurisprudence
- 2) History & Importance of Islamic Law & Jurisprudence
- 3) Sources of Islamic Law & Jurisprudence
- 4) Nature of Differences in Islamic Law
- 5) Islam and Sectarianism

Islamic Culture & Civilization

- 1) Basic Concepts of Islamic Culture & Civilization
- 2) Historical Development of Islamic Culture & Civilization
- 3) Characteristics of Islamic Culture & Civilization
- 4) Islamic Culture & Civilization and Contemporary Issues

Islam & Science

- 1) Basic Concepts of Islam & Science
- 2) Contributions of Muslims in the Development of Science
- 3) Quranic & Science

Islamic Economic System

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics
- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

Political System of Islam

- 1) Basic Concepts of Islamic Political System
- 2) Islamic Concept of Sovereignty
- 3) Basic Institutions of Govt. in Islam

Islamic History

- 1) Period of Khlaft-E-Rashida
- 2) Period of Ummayyads
- 3) Period of Abbasids

Social System of Islam

- 1) Basic Concepts Of Social System Of Islam
- 2) Elements Of Family

3) Ethical Values Of Islam

BOOKS REFERENCE:

- 1) Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad
- 2) Hameed ullah Muhammad, "Muslim Conduct of State"
- 3) Hameed ullah Muhammad, "Introduction to Islam"
- 4) Mulana Muhammad Yousaf Islahi,"
- 5) Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
- 6) Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
- 7) Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
- 8) H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
- 9) Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

ETHICS (For Non-Muslims)	1(1-0)
---------------------------------	---------------

THEORY

Definition, scope and nature of Ethics. Development of Ethical Theory. Development of Ethical Theory. Ethical Teachings of World Religions. Promotion of Moral Values Through Family And Institutions. Islamic Attitude Towards Minorities. General Review of Moral Standard as Duty and Happiness with reference to Kant and Mill. General Review of Business Ethics. Profits and Ethics, Is Business Bluffing Ethics? Ethics of Stakeholders. General Review of Biomedical Ethic. Ethical Implications of Euthanasia (Ethics of Care). Ethical Implications of Abortion. General Review of Ethics and Ecology. The Right to Liveable Environment and Animals.

BOOKS RECOMMENDED:

1. William, L.A., 1982. Introduction to Ethics, Mathuen & Co. Ltd., London, UK.
2. Rauf, A, 1988. Islamic Culture in Pakistan. Ferozesons (Pvt). Ltd., Lahore, Pakistan.
3. Garewal, S. M., 1985. Pakistan Way of Life and Culture. United Ltd., Lahore, Pakistan
4. Joseph, G., 1984 What the Great Religions Believe, The New American Library, New York, USA.

Note: One course will be selected from the following six courses of Mathematics.

COMPULSORY MATHEMATICS

(FOR STUDENTS NOT MAJORING IN MATHEMATICS)

1. MATHEMATICS I (ALGEBRA) 3 + 0

Prerequisite(s): Mathematics at secondary level

Specific Objectives of the Course:

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Preliminaries: Real-number system, complex numbers, introduction to sets, set operations, functions, types of functions.

Matrices: Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule.

Quadratic Equations: Solution of quadratic equations, qualitative analysis of roots of a quadratic equations, equations reducible to quadratic equations, cube roots of unity, relation between roots and coefficients of quadratic equations.

Sequences and Series: Arithmetic progression, geometric progression, harmonic progression.

Binomial Theorem: Introduction to mathematical induction, binomial theorem with rational and irrational indices.

Trigonometry: Fundamentals of trigonometry, trigonometric identities.

BOOKS RECOMMENDED:

1. Dolciani MP, Wooton W, Beckenback EF, Sharron S, *Algebra 2 and Trigonometry*, 1978, Houghton & Mifflin,
2. Boston (suggested text)
3. Kaufmann JE, *College Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
4. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th edition), 1986, PWS-Kent Company, Boston

2. MATHEMATICS II (CALCULUS) 3 + 0

Prerequisite(s): Mathematics I (Algebra)

Specific Objectives of the Course:

To prepare the students, not majoring in mathematics, with the essential tools of calculus to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Preliminaries: Real-number line, functions and their graphs, solution of equations involving absolute values, inequalities.

Limits and Continuity: Limit of a function, left-hand and right-hand limits, continuity, continuous functions.

Derivatives and their Applications: Differentiable functions, differentiation of polynomial, rational and transcendental functions, derivatives.

Integration and Definite Integrals: Techniques of evaluating indefinite integrals, integration by substitution, integration by parts, change of variables in indefinite integrals.

Books Recommended:

1. Anton H, Bevens I, Davis S, *Calculus: A New Horizon* (8th edition), 2005, John Wiley, New York
2. Stewart J, *Calculus* (3rd edition), 1995, Brooks/Cole (suggested text)
3. Swokowski EW, *Calculus and Analytic Geometry*, 1983, PWS-Kent Company, Boston
4. Thomas GB, Finney AR, *Calculus* (11th edition), 2005, Addison-Wesley, Reading, Ma, USA

3. MATHEMATICS III (GEOMETRY)

Prerequisite(s): Mathematics II (Calculus)

Credit Hours: 3 + 0

Specific Objectives of the Course:

To prepare the students, not majoring in mathematics, with the essential tools of geometry to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Geometry in Two Dimensions: Cartesian-coördinate mesh, slope of a line, equation of a line, parallel and perpendicular lines, various forms of equation of a line, intersection of two lines, angle between two lines, distance between two points, distance between a point and a line.

Circle: Equation of a circle, circles determined by various conditions, intersection of lines and circles, locus of a point in various conditions.

Conic Sections: Parabola, ellipse, hyperbola, the general-second-degree equation

BOOKS RECOMMENDED:

1. Abraham S, *Analytic Geometry*, Scott, Freshman and Company, 1969
2. Kaufmann JE, *College Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th edition), 1986, PWS-Kent Company, Boston

THEORY

Introduction of statistics. Types of data (scales of measurements). Frequency distribution for continuous and discrete data. Visual representation of data, stem and leaf display, box and whisker plots. Measures of Location and Variability, Moments, Skewness, Coefficient of Skewness and Kurtosis. Definitions and laws of probability. Simple Correlation and Regression Analysis. Elementary ideas of sampling, distribution of means and proportions. Test of significance of means, proportion, difference between means and difference between proportions with their confidence Intervals. Experimental Design (Completely Randomized Design, Randomized Complete Block Design)

PRACTICAL

The statistical packages Minitab and SPSS will be used for Measure of Location, Measure of Dispersion, Graphical Presentation, Regression and Correlation Analysis, Test of significance of Means, Proportion, Difference Between Two Means, Proportions, CR Design and RCB Design.

Reference Books

Zar, J.H.(2003) Biostatistical Analysis, Fourth Edition, Pearson Education (Singapore) Prentice Hall International (UK) Limited. London, UK.
Muhammad F., 2000 Statistical Methods and Data Analysis, Kitab Markaz, Bhawana Bazar Faisalabad, Pakistan.
Choudhry, M. R.(2001). Modern Statistics (Vol-I & II). Polymer Publications, Urdu Bazaar, Lahore.
Steel, R. G. D, J. H. Torrie and Dickey, D.A (1997) Principles and Procedures of Statistics
A Biometrical Approach Third Edition. WCB Mc. Graw Hill, New York, USA.