

PONDICHERRY UNIVERSITY

M.V.Sc. Degree Programme

Syllabus & Regulation

1. Short title, application and commencement

- 1.1 These regulations may be called as RAGACOVAS, Post-graduate Studies regulations – 2004 revised in 2010.
- 1.2 They shall govern the Post -graduate studies in RAGACOVAS leading to the award of Degree of Master of Veterinary Science by Pondicherry University.
- 1.3 They shall come into force with effect from the academic year 2010-2011 and will be applicable to the students admitted from this academic year.

2. Definitions

In these regulations, unless the context other-wise requires

- 2.1 **University:** Pondicherry University.
- 2.2 **College:** Rajiv Gandhi College of Veterinary and Animal Sciences.
- 2.3 **Department:** A department in the College as notified by the competent authority / Dean
- 2.4 **Vice –Chancellor:** The Vice –Chancellor of Pondicherry University.
- 2.5 **Registrar:** The Registrar of Pondicherry University.
- 2.6 **Dean:** The Dean of the Rajiv Gandhi College of Veterinary and Animal Sciences.
- 2.7 **Head of the Department (HOD):** Head of the Academic Department of RAGACOVAS, as notified by the competent authority / Dean.
- 2.8 **Teacher:** A teacher of RAGACOVAS.
- 2.9 **Academic year:** A period consisting of two consecutive semesters including inter-semester break as announced by the College.
- 2.10 **Semester:** An academic term consisting of not less than 105 instructional days excluding the days of external examinations.

- 2.11. Credit hour, Semester Credit or Credit:** One hour of lecture or three hours of laboratory or hospital or field practicals each week in a semester.
- 2.12. Course:** A unit of instruction or segment of subject matter (as specified in the course catalogue) to be covered in a semester, having a specific number and credits.
- 2.13. Course Catalogue:** A list of approved courses for the M.V.Sc. degree programme wherein each course is identified with a specific number and credits giving outlines of syllabus.
- 2.14. Grade Point (GP) of a course:** The value obtained by dividing the percentage of marks earned in a course by 10 and the grade point expressed on a 10-point scale up to one decimal place.
- 2.15. Credit Point of a course:** The product of grade point and credit hours in a course.
- 2.16. Grade Point Average (GPA):** The quotient of the total credit points obtained by a student in various courses at the end of each semester divided by total credit hours taken by the student in that semester.
- 2.17. Overall Grade Point Average (OGPA):** The quotient of cumulative credit points obtained by a student in all courses taken by him/her from the beginning of the first semester of the P.G. degree course divided by completed credit hours up to the end of a specified semester and it determines the over all performance of a student in all the courses taken during the period covering more than one semester. The OGPA has to be corrected to second decimal place.

3. Academic Departments in the College:

1. Animal Genetics and Breeding
2. Animal Nutrition
3. Animal Reproduction, Gynaecology & Obstetrics
4. Avian Production and Management
5. Clinical Veterinary Medicine, Ethics and Jurisprudence
6. Livestock Production and Management
7. Livestock Products Technology
8. Veterinary Anatomy & Histology
9. Veterinary and Animal Husbandry Extension
10. Veterinary Biochemistry
11. Veterinary Epidemiology & Preventive Medicine
12. Veterinary Microbiology
13. Veterinary Parasitology

14. Veterinary Pathology
15. Veterinary Pharmacology & Toxicology
16. Veterinary Physiology
17. Veterinary Public Health
18. Veterinary Surgery and Radiology

4. Major Fields of study for M.V.Sc. degree:

1. Animal Genetics and Breeding
2. Animal Nutrition
3. Veterinary Gynaecology & Obstetrics
4. Poultry Science
5. Veterinary Medicine
6. Livestock Production and Management
7. Livestock Products Technology
8. Veterinary Anatomy
9. Veterinary and Animal Husbandry Extension
10. Veterinary Biochemistry
11. Veterinary Microbiology
12. Veterinary Parasitology
13. Veterinary Pathology
14. Veterinary Pharmacology & Toxicology
15. Veterinary Physiology
16. Veterinary Public Health & Epidemiology
17. Veterinary Surgery and Radiology

5. Admission Procedure

- 5.1 Eligibility for admission:** The candidate seeking admission to Postgraduate programme leading to M.V.Sc. Degree shall possess (i) B.V.Sc. / B.V.Sc. & A.H. degree from an Institution recognized by Veterinary Council of India (VCI) with a minimum OGPA of 6.0 on 10 point scale (5.0 for SC/ST candidates). In the other grading systems, OGPA / marks will be appropriately proportioned to the 10 point grading scale. (ii) The candidate should not have completed the age of 35 years as on 31st December in the year of admission. (Relaxable by 5 years in case of SC/ST candidates).

- 5.1.1. Application for Admission:** Application for admission shall be made in the prescribed form to be obtained from the office of the Dean of the College after the notification is issued to this effect. The admissions shall be regulated and made in accordance with the regulations in force.
- 5.1.2. Number of Seats:** The number of seats in each major field of study is three, out of which, two seats are allocated for resident candidates of Pondicherry and one seat is allocated to candidates of other States and Union Territories. If sufficient applicants from other states are not available, the seats will not be filled up by any other category and will remain vacant.
- 5.2. Criteria for Residents of Pondicherry:** Criteria prescribed by the Government of Pondicherry from time to time for residents of Pondicherry will be followed.
- 5.3. Reservation:** Reservation of seats in different fields of study will be according to the reservation policy announced by the Government of Pondicherry from time to time for admission to Educational Institutions. The details of reservation for different categories will be indicated in the Information Bulletin for the year of admission.
- 5.4. Selection:** Selection of candidates will be based exclusively on marks obtained in the entrance examination.
- 5.5. Entrance Examination:** An entrance examination will be conducted by RAGACOVAS, Pondicherry on a date and time to be notified. The syllabus for entrance examination will be the syllabus prescribed by the VCI for B.V.Sc. & A.H. Degree. The details of entrance examination will be furnished in the information bulletin for admission.
- 5.6. Registration of courses:** The candidates provisionally selected for admission have to pay the prescribed fee and deposit all the original certificates and transcripts at the time of admission and register for courses on the date specified for the purpose. Failure to pay the required fee and register the courses will result in the cancellation of his/her offer of admission.

6. Courses and Credits:

The M.V.Sc. programme shall have one-year (two semesters) course work followed by one-year thesis work.

- 6.1. Credit requirements for Master's Degree:** The minimum total credit requirements for Master's Degree shall be as follows.
- | | | |
|-----|---------------------------|------|
| i. | Course credits | : 30 |
| ii. | Research (Thesis) credits | : 30 |
| | Total credits: | : 60 |

- 6.2. Distribution of credits:** The requirement of total course credits shall consist of 20 credits in major field and 10 in **two** minor fields. In each field of specialization, a minimum of 12 credit hours in core courses is required to be taken by a student. No change, addition or deletion in the prescribed core courses shall be permissible.
- 6.3. Credit load:** A candidate shall be allowed to register for a maximum of 15 credits in a semester. However, for enabling marginal adjustments, the student may register one extra credit (a total of 16) in a semester with the permission of the Dean.
- 6.4. Seminar:** A student of Master's Degree shall be required to give one seminar of one credit in major field.
- 6.5. Residential requirements:** Minimum residential requirement for M.V.Sc degree programme is four semesters and the maximum limit for completion of M.V.Sc. programme is four years (inclusive of duration of discontinuation, if any). If a student fails to complete his/her Master's programme within the maximum time limit prescribed, his/her admission shall stand cancelled.

7. Attendance:

The student is required to have an attendance of at least 80% of total classes in each course. The Dean may condone a shortage of up to 10% of attendance on valid grounds. If any student falls short of the required attendance he/she will not be permitted to appear in the University examinations.

8. Evaluation and Examinations:

Evaluation of a student in each course is based on Internal and External Examinations with equal weightage. The students registering for a particular course shall take all the examinations conducted during the semester. There will be no reexamination in case of those students who abstain from the University external examinations. However, the Dean may permit on valid grounds reexamination in lieu of only one missed internal examination.

- 8.1. Internal Examinations:** The internal examination in theory consists of two term examinations of 40 marks each and seminars or assignments carrying 20 marks. The first and second term examinations will be conducted after the completion of 50 and 80 instructional days respectively. It shall be the responsibility of the concerned Head of the Department to ensure proper conduct of all internal evaluations in all the courses offered by that Department.
 - 8.1.1.** The internal practical examination will be conducted after 80 instructional days for 80 marks including 10 marks for viva-voce. The evaluation of records and practical assignments carries 20 marks. Submission of records / assignments and attendance in viva-voce examination are compulsory. The HOD in consultation

with the course teacher will prepare the schedule of the examinations during the semester.

8.1.2. The answer scripts of all the internal examinations will be shown to the students after evaluation. The concerned HOD will retain the answer scripts for a minimum period of two years after the student completes the degree programme.

8.2. External Examinations: The external examination in each course will be conducted in theory and practicals after the end of the semester. However, only one external examiner will be invited to conduct the practical and evaluate the theory papers for all the courses offered by one department including major and minor fields of study. The external theory examination in a semester may spread over 6 to 8 days and the practical examination for a maximum of 3 days in a department depending upon the number of courses offered in that semester. The external examination for each course in theory will consist of one paper for 100 marks comprising subjective questions for 3-hour duration. The external examination in practical will be for 100 marks including viva- voce for 20 marks.

9. External Examiners:

All the Professors, Associate Professors and those Assistant Professors who possess Ph.D. Degree with five years of Teaching/Research/Extension experience in the concerned field of specialization and working in veterinary colleges and academic institutions are eligible for appointment as external examiners including thesis evaluation and paper setters.

9.1. Paper setting: The HOD will forward to the Dean a panel of at least five paper setters/external examiners and two internal examiners in the concerned subject for forwarding to the University. The University will arrange for the conduct of the external theory and practical examinations.

9.2. Evaluation: The University shall constitute a Board of examiners consisting of one external examiner and two internal examiners including the HOD of the concerned department who will be the Chairman of the Board to conduct external practical examinations including viva voce and to evaluate external examination answer scripts of all the courses offered by Department in that semester.

10. Minimum Marks for Pass:

A student is required to secure not less than 50% of marks in internal and external examinations separately in both theory and practical examinations in each course to be declared as passed in that course. If a candidate fails to obtain the above-mentioned minimum marks, he/she will be declared as failed and has to reregister the course as and when offered by the concerned department.

The Pondicherry University will declare the results of the examinations and the results will be communicated to the college.

11. Student Advisory Committee:

The Student Advisory Committee will consist of at least three members, two members representing major field of study and one from minor field. One of the two members of the committee representing the major field will be the Chairman of the Student Advisory Committee. The Dean shall approve the constitution of the advisory committee of each student before the end of the second semester on the recommendation of the concerned HOD. The Dean may, however add, if he so chooses one or more members to the committee.

The following teachers are eligible to be appointed as Chairman of the Student Advisory committee:

- i. Professors and Associate Professors
- ii. Assistant Professors who possess Ph.D. Degree with five years of Teaching/Research/Extension experience in the concerned filed of specialization
- iii. Assistant Professors who do not possess Ph.D Degree but have eight years of Teaching/Research/Extension experience in the concerned filed of specialization.

However, Assistant Professors who do not possess Ph.D Degree but have at least five years of experience in Teaching/Research/Extension in the concerned filed of specialization are also eligible to be appointed as members of the Student Advisory Committee.

12. Changes in the Advisory Committee:

If the Chairman/any member of the Advisory Committee is not available for any reason or proceeds on long leave / resigns from the present assignment, the HOD may recommend an eligible substitute for approval by the Dean.

13. Research Problem:

After the successful completion of the course work, the student has to submit, during the third semester an Outline of the Research Work (ORW) in prescribed format in consultation with the Advisory Committee to the Dean for approval. He/she will also present a seminar on the proposed work. Subsequent change(s) if any in the ORW need to be approved by the Dean. The student will carry out the research work as per the approved ORW under the supervision and guidance of the Advisory Committee.

14. Preparation and submission of thesis:

On successful completion of the research credits and research work to the satisfaction of the Advisory committee, the candidate will present a seminar on the research work before the faculty members. After incorporating the necessary suggestions in consultation with the Advisory Committee, the candidate will submit six draft copies of the thesis to the Dean along with a certificate in the prescribed proforma duly signed by the Chairman of the Advisory Committee. Six copies of thesis abstract of not more than 300 words shall also be submitted along with the thesis. The Dean shall forward three copies of the thesis to the University for evaluation.

15. Evaluation of the thesis:

The Head of the Department in consultation with the Chairman of the Advisory committee shall submit a panel of five external examiners in the field of specialization to the Dean for forwarding to the University. The thesis will be sent to one examiner from the panel who shall be required to send the detailed evaluation report with specific recommendation in a prescribed proforma to the University within three weeks.

15.1. Recommendation of the Examiner: In case the external examiner recommends for the acceptance of the thesis with remarks as “HIGHLY COMMENDED OR COMMENDED,” the report will be forwarded to the concerned Head of the Department for conduct of the Viva voce examination. The student shall submit six final bound copies of the thesis to the HOD who in turn will arrange for conduct of final viva-voce examination by inviting the external examiner who evaluated the thesis. The viva voce will be conducted by the external examiner, HOD and the members of the Advisory Committee. A certificate regarding the performance of the candidate in final viva-voce examination on the thesis in the prescribed form, duly signed by all the members of the Advisory committee and the external examiner shall be forwarded to the Dean by the concerned HOD. The result of the examination should clearly indicate the performance of the student either as “SATISFACTORY” or “UNSATISFACTORY” and the same will be communicated to the University for the declaration of the result.

15.1.1 If the performance of the candidate in the viva voce examination is “UNSATISFACTORY”, he/she may be asked to take the viva voce examination after a lapse of at least 30 days after the declaration of the result of the final viva voce examination. If his/her performance in the second viva voce is UNSATISFACTORY, he/she will be asked to revise the research programme by re-registering the research credits.

15.2. If the external examiner does not recommend for the award of the degree with the comments to revise and resubmit the thesis, the concerned HOD in consultation with the members of the Student Advisory Committee may

arrange for incorporating the suggestions given by the external examiner and resubmit the thesis to the University to arrange for evaluation.

15.3. If the external examiner rejects the thesis, the University may send the thesis to the second examiner from the panel of examiners for evaluation. If the second examiner recommends for the award of the degree, the report will be forwarded to the concerned HOD to arrange for conduct of viva voce examination as per the procedure in 15.1.

15.3.1. In case the second external examiner also rejects the thesis, the candidate will have to re-register the research credits and carry out the research work afresh.

15.4. A candidate shall not be permitted to submit his/her thesis for more than two occasions..

16. Grading & Transcript:

The University will award the grades to the students on a 10-point scale. A grade report / Transcript for each semester will be issued by the University during the subsequent semester. The University will issue a final transcript indicating the courses, credits and OGPA after the successful completion of all the courses and thesis viva voce examination.

17. Eligibility for Degree:

A candidate is eligible for the award of M.V.Sc. degree after successful completion of the prescribed course and research credits including final viva voce examination. Candidate securing an OGPA of 7.5 and above and completing the courses, and final thesis examination satisfactorily in the first attempt will be awarded degree in **FIRST CLASS WITH DISTINCTION**. Candidate securing an OGPA ranging from 6.00 to 7.49 and completing the courses, and final thesis examination satisfactorily in the first attempt will be awarded degree in **FIRST CLASS**. All the other passed candidates will be placed in **SECOND CLASS**.

18. Award of M.V.Sc. Degree:

A degree certificate under the seal of Pondicherry University signed by the Registrar and Vice-Chancellor of the University shall be presented to the candidate on successful completion of the requirements for the award of degree.

19. Temporary discontinuation and resumption of studies:

If a student wants to discontinue his/her studies temporarily or take a long leave, he/she may do so after successful completion of course credits with the prior approval of the Dean. Discontinuation before successful completion of course credits shall result in

cancellation of admission. The discontinuation is allowed only once in the MVSc degree programme. However, the maximum time limit prescribed for the completion of Master's Programme shall remain unchanged. The MVSc student should not be on the active rolls of employment in Government or University or any private or public undertakings during the study period.

20. Fee:

The student shall have to pay the entire fee prescribed by the college from time to time. In addition, he/she will also pay the prescribed Registration fee, Matriculation fee, Recognition fee, Examination fee, Sports fee and other fees decided from time to time by the Pondicherry University.

21. Amendment or Cancellation of result:

If the result of a candidate is discovered to be vitiated by error, malpractice, fraud, improper conduct or any other reason, the Vice Chancellor shall have the power to amend the result in such a manner as to accord with the true position and to make such a declaration as the Vice Chancellor may deem necessary in that behalf including debarring the candidate from the University/ College.

22. Student discipline:

The University/ College aims at maintaining the highest standards of discipline amongst students. The student should abide by any general or special rules prescribed by the University/ College in regard to discipline and conduct from time to time.

- 22.1.** Students shall not associate themselves with any political party or organization with in or outside the college premises.
- 22.2.** Smoking and Use of alcohol and intoxicating drugs inside the college/ hostel are strictly prohibited.
- 22.3.** Students shall desist from agitations, demonstrations and strikes.
- 22.4.** Students shall desist from any act of disobedience or misconduct.

The above acts of indiscipline shall be dealt very seriously and suitable punishment including expulsion from the college/hostel will be awarded.

23. Removal of Difficulties:

- 23.1.** If any difficulty arises in giving effects to provisions of these regulations, the Dean in consultation with the University may issue necessary orders which appear to the authorities to be necessary or expedient for removing the difficulty.

- 23.2.** No order under Rule 23.1 shall be questioned on the ground that no difficulty as is referred to in the said rule existed or was required to be removed.
- 23.3.** Notwithstanding anything contained in the Regulations, the college / University shall make changes, whenever necessary.

POST-GRADUATE STUDIES REGULATIONS
(Approved by PG Board of Studies)
2010-11 onwards



RAJIV GANDHI COLLEGE OF VETERINARY AND ANIMAL SCIENCES
(Affiliated to the Pondicherry University)
Kurumbapet, Puducherry – 9

1. M.V.Sc. IN ANIMAL GENETICS AND BREEDING

Sl. No.	Course No.	Course Title	Credits		Total Credits
			T	P	
1.	AGB601	Epigenetics, Developmental, Genetics and evolution	1	0	1
2.	AGB602*	Cytogenetics	2	1	3
3.	AGB603	Mutation Genetics	1	0	1
4.	AGB604*	Molecular Genetics	2	0	2
5.	AGB605*	Immunogenetics	2	1	3
6.	AGB606	Behavioural Genetics	1	0	1
7.	AGB607	Veterinary Clinical Genetics	2	0	2
8.	AGB608*	Population Genetics	2	1	3
9.	AGB609*	Principles of Animal Breeding	1	1	2
10.	AGB610*	Principles of Selection in Animal Breeding	1	1	2
11.	AGB611*	Breeding Systems	1	1	2
12.	AGB612	Cattle and Buffalo Breeding	2	0	2
13.	AGB613	Sheep and Goat Breeding	1	0	1
14.	AGB614	Swine Breeding	1	0	1
15.	AGB615	Poultry Breeding	1	0	1
16.	AGB616	Laboratory Animal Breeding	1	0	1
17.	AGB617	Equine Breeding	1	0	1
18.	AGB618	Conservation of Animal Genetic Resources	1	0	1
19.	AGB619	Modern Technologies in Animal Breeding	1	0	1
20.	AGB620	Linear models in Animal Breeding	2	1	3
21.	AGB621	Data Processing and Computer Application	1	1	2
22.	AGB622	Statistical Methods	2	1	3
23.	AGB680 [#]	Special Assignment	0	1	1
24.	AGB690 [#]	Seminar	1	0	1
25.	AGB700 [#]	Research	0	30	30

* Core Courses: (17 Credits)

[#] Compulsory

Minor Fields of Study

1. Animal Nutrition (ANN)
2. Veterinary Gynaecology & Obstetrics (VGO)
3. Poultry Science (PSC)
4. Livestock Production and Management (LPM)
5. Veterinary and Animal Husbandry Extension (AHE)
6. Veterinary Biochemistry (VBC)

AGB 601: Epigenetics, Developmental Genetics and Evolution **I** (Cr.Hr.: 1 + 0)

Theory: Epigenetics - definition - Epigenetic landscapes - phenocopies - induction - Zygote splitting - Genetic assimilation and evolutionary changes - Background radiation and evolutionary process - speciation - Gene regulation and expression switching off and on of genes during life stages - effect of deficiency and overdose of genes - Evolution of farm animals - various theories of evolution - Evolutionary forces.

AGB 602*: Cytogenetics **II** (Cr. Hrs.: 2 + 1)

Theory: Cell components - Discovery of Chromosomes - Chromosome theory of inheritance - ultra structure of chromosomes - Types of chromosomes - Prokaryotic and eukaryotic chromosomes - Polytene, lampbrush chromosomes - Lyon's hypothesis - Sex chromatin - chromosome number in different species - Recent techniques in cytogenetic studies - Karyotyping & Banding of chromosomes - Nucleolar organizing region - Sister chromatid exchanges - Chromosomal aberrations and their implications on economic traits - Cytogenetics and evolution.

Practical: Collection of samples for cytogenetic studies - chromosome culture techniques - preparation of karyotypes - banding of chromosomes - preparation of idiograms - sex chromatin studies.

AGB 603: Mutation Genetics **I** (Cr. Hr.:1 + 0)

Theory: Discovery and concept of mutation - introduction to mutagenesis - Micro and Macrolesions - somatic and nuclear mutations - different types of mutations - Detection of mutation - mutation rates - Different types of mutagens - physical and chemical - radiation sickness and LD-50 values of different organisms and comparative sensitivity of organs - radio isotopes and their uses in relation to mutation - antimutagenic agents - balanced lethal system - mutation and evolution.

AGB 604*: Molecular Genetics **I** (Cr. Hrs.:2 + 0)

Theory: Nature, structure replication and organisation of genetic material in eukaryotes - Resolution of gene to DNA level - genetic code - protein synthesis - operons - structural and regulatory genes - cloning - gene mapping - RFLP - transposable genetic elements - DNA finger printing.

AGB 605*: Immunogenetics **II** (Cr. Hrs.:2 + 1)

Theory: Development of immunogenetics - Antigenic modulation phenomenon - Basic concepts of immunity - genetic control of antigens - genetic basis of antibody diversity - structure of immunoglobulins - leucocytic antigens - antigens in different body fluids - Histocompatibility antigens - immunochemistry and genetic control of blood groups - blood group systems in farm animals - Blood typing - Blood group incompatibility - Biochemical Polymorphism of proteins & enzymes in farm animals - Gene regulation of polymorphism - Genetic basis of metabolic disorders - Marker genes and their utility.

Practical: Electrophoretic techniques - Detection of polymorphism of Haemoglobin, Transferrin and Amylase - Analysis of data on polymorphisms - Gene and Genotype frequencies and phenotype frequencies of polymorphic proteins and enzymes.

AGB 606: Behavioural Genetics

I (Cr. Hr.: 1 + 0)

Theory: Inheritance of behaviour - biochemical approach - maternal effects - qualitative behavioural traits - natural selection - genetic consequences of different types of selection - environmental dimension - application of behavioural genetics for selection and breeding of animals - genetic basis of evolutionary changes in behavioural pattern.

AGB 607: Veterinary Clinical genetics

II (Cr. Hrs.: 2 + 0)

Theory: Chromosome abnormalities - genetic disease - lethal genes - metabolic disorders of genetic origin - breeding for disease resistance - clinical cytogenetics – sub fertility - Sterility - Free martin - genetic diseases associated with immune systems - Hypo and agamaglobulinemia - Ig subclass selection deficiency - complement deficiency - genetics of hyper sensitivity - blood groups and diseases - Histocompatibility complex and leucocyte antigens associated with diseases in animals and birds - Gene therapy.

AGB 608*: Population Genetics

I (Cr. Hrs.: 2 + 1)

Theory: Qualitative and quantitative traits - Mendelian population - - gene and genotype frequencies - Hardy - Weinberg law and its applications - Forces changing gene frequencies - small population - effects of inbreeding on gene and genotype frequencies - Finite population - genetic load - genetic assimilation - population mean and variances - introduction to deterministic and stochastic models. Values and means - variation - components of variation - genotype environment interaction - Heritability, its estimation and uses - Repeatability, its estimation and uses - selection - response to selection - genetic gain - genetic correlation - correlated response - general and specific combining abilities - Recurrent and reciprocal recurrent selection - Diallel crossing - scale effect - threshold characters.

Practical: Estimation of gene frequencies in cases of autosomal, sex linked and multiple alleles - estimation of gene frequencies under selection, migration, mutation and chance - changes in population structure over several generations using deterministic and stochastic models. Estimation of heritability, repeatability, genetic, environmental and phenotypic correlation - calculation of genetic gain.

AGB 609*: Principles of Animal Breeding

I (Cr. Hrs. : 1 + 1)

Theory: History of animal breeding - concept of breed - Breeds of livestock - Economic traits in different species - Role of non-genetic effects, genotype environment interaction - adjustment of data - Formulation of breeding plans on the basis of genetic and phenotypic parameters of various sizes, different progeny groups, size, proportion of cows mated to young bulls, numbers of bulls to be tested and selected, optimum number of semen doses - culling of animals - Expected and actual genetic gain - trends in different breeding programmes - Progeny testing.

Practical: Examination of various records maintained in a dairy farm. Methods of collection, compilation, coding, analysis and adjustment of data of various breeding experiments. Methods of monitoring breeding and management of a herd, growth bands, breeding efficiency, performance levels, culling rates for dairy performance and other attributes.

AGB 610*: Principles of Selection in Animal Breeding **I** (Cr. Hrs.: 1 + 1)

Theory: General theory of selection - Basis of selection - Prediction and measurement of response - Factors affecting response. Variance and covariance of random variables - General linear models - Different methods of selection and their relative efficiencies - general selection index theory - true value - correlated response - genetic progress - Restricted selection indices - predictions of breeding value through Best linear unbiased prediction (BLUP) procedure - Breeding plans to exploit additive non-additive inheritance.

Practical: Estimation of Breeding value, genetic progress - construction of selection indices - sire indices - estimation of optimum culling levels.

AGB 611*: Breeding Systems **I** (Cr. Hrs.: 1 +1)

Theory: Introduction - Breed structure - pure breeding systems - out breeding - Crossbreeding - Grading up - Top crossing - back crossing - criss crossing - Rotational breeding - Theory of path coefficient - inbreeding co-efficient and co-efficient of relationship - co-ancestry - different types of inbreeding - effects of inbreeding - Assortative mating - positive and negative - Inbreeding depression and Heterosis - specific and general combining abilities - Evolving new breeds - Nucleus breeding schemes - CNBS - ONBS.

Practical: Path co-efficient analysis - Estimation of inbreeding co-efficient, co-efficient of relationship - calculation of heterosis - Estimation of General Combining and specific Combining Abilities.

AGB 612: Cattle and Buffalo breeding **II** (Cr. Hrs. :2 + 0)

Theory: Introduction to cattle, buffalo and their breeding, cattle and buffalo breeds for milk, draught and dual purpose - Economic traits in cattle and buffaloes and their inheritance - heritability and repeatability estimates of important economic traits - Breeding programmes recommended from time to time in India for cattle and buffaloes - Breed fixation in cattle and buffaloes - improvement through Multiple Ovulation and Embryo Transfer (MOET) and Open Nucleus Breeding Schemes (ONBS) - Maintenance of records - Evaluation of sires - sire summaries and their limitations.

AGB 613: Sheep and Goat Breeding **II** (Cr. Hr. : 1 + 0)

Theory: Sheep breeds of India and World - Breeding of sheep for wool, mutton, milk and skin - Wool quality and grading - methods of selection and systems of breeding - economic traits in sheep - economics of goat production - Indian and exotic goat breeds - Important economic traits and their inheritance - Selection of breeding stock and systems of mating - breeding of goats for milk, meat and hides - Reproductive efficiency traits and their improvement - Breeding programmes in India.

AGB 614: Swine Breeding **II** (Cr. Hr. : 1 + 0)

Theory: Importance of swine farming, its significance and contribution to national economy - Breeds of pigs - Economic traits and their inheritance - selection of breeding stock of pigs - mating system and breeding programmes - Fixation of new breeds - Recent trends in swine breeding in India & abroad.

AGB - 615: Poultry Breeding **II** (Cr. Hr.: 1 + 0)

Theory: Economic Traits and their inheritance in poultry - breeds - Formation of inbred lines and strains - Exploitation of heterosis - Recurrent selection and reciprocal recurrent selection - Diallel crossing – in-crossing – in-cross breeding - Breeding for higher egg production and meat - Auto sexing of chicks - Selection in poultry - Selection indices - Maintenance of records.

AGB 616: Laboratory Animal Breeding **II** (Cr. Hr.: 1 + 0)

Theory: Introduction - utility - importance and classification of various laboratory animals like rats, mice, guinea pigs, hamsters, rabbits etc. - genetics of various lab animals - breeding systems - Development of lines.

AGB 617: Equine Breeding **II** (Cr. Hr.:1 + 0)

Theory: Origin and domestication of Horse - Breeds and types of horses - draft light and ponies - Horse gaits - Horses bred for speed - Inheritance of colour in horses - Genetic parameters of quantitative characters - Selection criteria for horses and ponies - Breeding systems - Factors affecting selection and effectiveness of selection - Measurement of genetic differences - Pedigree in selection - Stud books - Interspecific crosses.

AGB 618: Conservation of Animal Genetic Resources **I** (Cr. Hr.:1 + 0)

Theory: Survey, genetic classification - Risk assessment including census and geographic distribution - Threatened breeds of animals in India and their status - principles and methods of characterization of animal genetic resources (Farm animals) - legal aspects of conservation - methods of conservation - Gene bank - Standards for genetic selection and evaluation of donor animals - Technical problems associated with conservation and preservation of animal genetic resources.

AGB 619: Modern technologies in Animal Breeding **II** (Cr. Hr.:1 + 0)

Theory: Perspectives on animal breeding - MOET - Sex selection in farm animals - preservation of ova and embryo – *In vitro* fertilization (IVF) - Nuclear transplantation - cloning in mammals - gene transfer - micromanipulation of embryo - embryo splitting and splicing - Transgenic animals.

AGB 620: Linear models in Animal breeding

II (Cr. Hrs.: 2 + 1)

Theory: Construction of linear models - linear unbiased estimation - Estimates and methods for its verification - Bivariate normal distribution, marginal and conditional distribution - central and non central chi-square, F and t distribution quadratic and bilinear forms - characteristic equation of matrix - Full rank models - Regression in dummy variables - Models not of full rank - Generalised inverse of a matrix - Best linear unbiased estimation (BLUE) least square method for non-orthogonal data, normal equations, restriction consequences of solution and differential properties - Testable and non-testable hypothesis - Restricted models - one way and two way crossed classification of non-orthogonal data - step wise fitting of linear model - prediction of random variables by maximum likelihood method - Best linear unbiased prediction - Regression models and regressed least squares.

Practical: Construction of various linear models - analysis of one way fixed and random models - Generalized inverse of a matrix - quadratic and bilinear forms - Estimation of characteristic roots or Eigen-values of matrix. BLUE and BLUP estimation - Two traits additive genetic models; estimation of components of co-variance.

AGB 621: Data Processing and Computer Application

I (Cr. Hrs.: 1 + 1)

Theory: Introduction to computers- Operating systems- Computer Programming languages- Database management system – Developing programme using Foxpro- Data Analysis- Designing web pages – Introduction to visual programming –Application of computers in the field of Veterinary Sciences- Geographical Information System (GIS) for Animal Health Monitoring.

Practical: Operating system commands- Word Processing – Spreadsheet and graphics – Powerpoint Presentation- Creation of Database Management systems – Programming in Foxpro- Use of statistical software packages – Designing Web pages.

Demo: GIS software – offline and online retrieval of information.

AGB 622: Statistical Methods

I (Cr. Hrs.: 2 + 1)

Theory: Classification & tabulation of data - simple correlation - simple linear regression - multiple linear regression step-wise regression analysis - probability - Theoretical distribution (Binomial, Poisson & Normal distribution) - Statistical inference - testing of hypothesis - Estimation theory - Tests of significance (Z-test, Student t-test, χ^2 -test, F-test) - Introduction to non-parametric analysis - some non-parametric tests - Analysis of variance (one-way, two-way analysis with one or more (equal/unequal) number of observation/cell) - Analysis of covariance - Sampling techniques - simple random sampling - stratified random sampling systematic random sampling - multistage sampling - sample size determination - Experimental studies - General principles of Design of experiments C.R.D., R.B.D. LSD, factorial Designs - Split plot design etc - Observational studies - cross sectional studies - prospective studies - retrospective studies - sources of Bias - controlling for Bias - Advantages & Disadvantages of observational studies. Introduction to Statistical Research Method - Drawing up of protocol - population under study - methods of dealing with non-response - data processing and Analysis - constraints.

Practical: Simple correlation & Regression - Multiple Regression - Test of significance (z-test, student t-test, χ^2 -test, F-test) - Non-parametric Analysis - Analysis of variance - Analysis of covariance - sampling techniques - Design of experiments.

AGB 680[#]: Special Assignment	II	(Cr. Hr. : 0 + 1)
AGB 690[#]: Seminar	II	(Cr. Hr.: 1 + 0)
AGB 700[#]: Research		(Cr. Hr.: 0 +30)

REFERENCE BOOKS:

AGB601

1. Animal Evolution Interrelationships of the Living Phyla by Claus Nielsen
2. Evolutionary Genetics by John Maynard Smith

AGB602

1. Cytogenetics of Animals Edited by Clive R.E. Halnan
2. Cytogenetics of Livestock by Franklin E.Eldridge

AGB603 & AGB604

1. Genetics by Strickberger
2. Genomes by T.A. Brown
3. Concepts of Genetics by William S. Klug & Michael R. Cummings
4. Genes by Benjamin Lewin

AGB605

Immunology and Immunogenetics by H.C. Hines

AGB606

Genetics – Behavioural and Molecular by Aslam

AGB607

Clinical Genetics – A short course by Golder N. Wilson.

AGB608, AGB609, AGB610 & AGB611

1. Textbook of Animal Breeding
2. Textbook of Population Genetics Vol.I Qualitative Inheritance by Sukhvir Singh Tomar.
3. Textbook of Population Genetics Vol.II Quantitative Inheritance by Sukhvir Singh Tomar.

AGB612

Livestock Production Management by NSR Sastry, CK. Thomas & RA. Singh

AGB613

1. The Genetics of Sheep Ed. L. Piper and A. Ruvinsky.
2. Breeding and improvement of Farm Animals by E.J. Warwick & J.E. Legates Handbook of Animal Husbandry ICAR Publication.
3. Animal production in the tropics and subtropics by Jean Pagot.

AGB614

1. The Genetics of Pig Ed. M.F.Rothschild & A. Ruvinsky.
2. Livestock production management by NSR Sastry, CK. Thomas & R.A. Singh
3. Handbook of Animal Husbandry – ICAR Publication.

AGB615

1. Scientific Poultry management by P.V. Sreenivasaiah
2. Principles and practice of poultry husbandry by Tom Newman

AGB616

1. Handbook of Laboratory Animals by Alastair N. Worden
2. Handbook of Laboratory Animals Management & Welfare by Sarah Wolfensohn and Maggie Lloyd

AGB617

Horse Genetics by Ann T. Bowling

AGB618

1. Introduction to conservation genetics R. Frankhan, J.D. Ballon and D.A. Briswe.
2. Animal Genetics Resources of India: Cattle & Buffalo by A.E. Nivsarkar, P.K. Vijn & M.S. Tantra.
3. A primer of Conservation Biology by Richard B. Primock.

AGB619

1. Animal Breeding by Richard Bourden
2. Reproduction in farm animals by Hazez

AGB620

Statistical methods in Animal Sciences by V.N. Amble.

AGB621

Introduction to Bio-information by Rajan.

AGB622

1. Biometrical methods in Quantitative genetics analysis by R.K. Singh and B.D. Chandhary

2. M.V.Sc. IN ANIMAL NUTRITION

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1	ANN601*	Animal Nutrition	3	0	3
2.	ANN602	Ruminant Nutrition	2	0	2
3.	ANN603*	Conventional & Unconventional Feedstuffs	2	1	3
4.	ANN604*	Evaluation of Feedstuffs and Feed Analysis	1	2	3
5.	ANN605*	Feed Technology	2	1	3
6.	ANN606	Poultry Nutrition	2	0	2
7.	ANN607	Forage Conservation and Processing	2	0	2
8.	ANN608	Feeding of cattle & buffaloes	1	1	2
9.	ANN609	Feeding of Sheep & Goats	1	1	2
10.	ANN610	Feeding of Poultry	1	1	2
11.	ANN611	Feeding of Swine & Equines	1	1	2
12.	ANN612	Pet Animal Nutrition	2	0	2
13.	ANN613	Zoo Animal Nutrition	1	0	1
14.	ANN614	Laboratory Animal Nutrition	2	0	2
15.	ANN615	Clinical Nutrition	1	0	1
16.	ANN680 [#]	Special Assignment	0	1	1
17.	ANN690 [#]	Seminar	1	0	1
18.	ANN700 [#]	Research	0	30	30

*Core Courses: (12 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Biochemistry (VBC)
2. Veterinary Physiology (VPY)
3. Livestock Products Technology (LPT)
4. Veterinary Medicine (VMD)
5. Poultry Science (PSC)
6. Livestock Production and Management (LPM)

ANN 601* : Animal Nutrition

I

(Cr. Hrs. : 3+0)

Theory: Composition of animal body and plants. Water and metabolic water. Nutrients - their digestion, absorption and metabolism. Minerals and vitamins - functions and interrelationships and deficiency & toxicity symptoms. Feed additives and their role in economic animal production. Quantitative Animal Nutrition. Advances in energy and protein metabolism. Interactions among nutrients. Role of biotechnology in improving the feeding value of feedstuffs and nutrient utilization

ANN 602 : Ruminant Nutrition

I

(Cr. Hrs. : 2+0)

Theory: Nutrients - their digestion, absorption and metabolism in ruminant animals. Rumen flora and fauna - their role in fermentative digestion of nutrients. Urea and other NPN compounds in ruminant nutrition. Protection of lipids and protein. Metabolizable protein concept. Importance of minerals, vitamins and feed additives in ruminant nutrition

ANN 603*: Conventional and Unconventional feedstuffs

I

(Cr. Hrs. : 2+1)

Theory: Requirement and availability of feedstuffs for farm animals. Feeds of different origin and their classification. Feed vocabulary and international nomenclature. Chemical composition and nutritive value. Non - conventional feed resources (NCFR) - characteristics - utilization of NCFR in livestock and poultry feeding. Agro industrial byproducts (AIBP), slaughter house byproducts and rendered animal byproducts and their utilization in livestock and poultry feeding. Antinutritional/incriminating factors present in feedstuffs and processing methods to utilize such feedstuffs in feeding of animals. BIS specifications and their significance in quality control of feed ingredients and compounded feeds. Scarcity feeds and formulations.

Practical: Identification and chemical composition of unconventional feedstuffs. Methods of detection of antinutritional/toxic factors. Estimation of aflatoxin, tannin, cyanogenetic glycosides, ADIN. Preparation of urea molasses mineral block, urea molasses liquid diet, mineral mixture and vitamin premix. Formulation of rations using unconventional feedstuffs for livestock and poultry.

ANN 604*: Evaluation of feedstuffs and Feed Analysis

I

(Cr. Hrs. : 1+2)

Theory: Chemical composition and nutritive value of feedstuffs. Evaluation of feedstuffs for energy - energy partition, TDN, SE and carbon & nitrogen balance studies. Protein evaluation of feedstuffs - measures of protein quality in ruminants and non-ruminants. Common adulterants in feedstuffs.

Practical: Methods of analysis - Weende system and Detergent method of analysis, In-vivo, In-vitro, In-sacco methods of feed analysis - Merits and demerits. Estimation of minerals, energy. Feed microscopy. Physical, chemical and spot tests.

ANN 605*: Feed Technology

II (Cr. Hrs. : 2+1)

Theory: Profile of the feed industry; History of formula feed industry; Feed manufacturing terminology. Basic processing operations in manufacturing formula feeds; Principles of heat and moisture transfer, grinding and rolling, feed mixing, pelleting, extrusion cooking systems. Processing of grains, oilseeds and roughages. Use of hydrothermal processing in feed manufacturing; Processing of animal byproducts. Conveying systems used in feed industry. Types of feed mills.

Practical: Principles of heat and moisture transfer - problems on calculation of steam, etc. Formulation of feeds - Linear Programming; Ingredient variation and effects on feed quality. Physical properties of feed ingredients - Particle size analysis, etc. Types of mixers - testing of their performance. Feed mill designs.

ANN 606 : Poultry Nutrition

I (Cr. Hrs. : 2 + 0)

Theory : Digestive tract of the fowl and its various functions. Digestion, absorption and metabolism of carbohydrates, lipids and proteins. Minerals and vitamins in poultry nutrition. Nutritional deficiencies and imbalances. Evaluation of feeds for poultry. Feed additives in ecofriendly poultry production.

ANN 607: Forage Conservation and Processing

II (Cr. Hrs. : 2+0)

Theory: Various roughage processing techniques - grinding, mixing, pelleting, fodder expanders. Densification of crop residues, grasses and tree leaves. Preparation of complete feed blocks. Enrichment of crop residues and various lignocellulosic materials. Application of ensiling principles. Use of animal excreta, poultry droppings for improved utilisation.

ANN 608: Feeding of Cattle and Buffaloes

II (Cr. Hrs. : 1+1)

Theory: Feeding standards - Systems for expressing energy and protein values and nutrient requirement. Recent concept in protein nutrition of ruminants - Protected protein, fat and starch. Utilisation of urea. Feeding of cattle & buffaloes for various physiological functions. Feeding of high milk producers; Common metabolic disturbances and their control. Comparative aspects of cattle and buffalo nutrition and feeding. Efficiency of cattle and buffaloes in feed conversion.

Practical: Composition and nutritive value of common feeds and fodders. Nutrient requirement for various physiological functions and computations of rations. Characteristics of an ideal ration for dairy cattle and buffaloes. Scarcity feeds for dairy cattle and buffaloes.

ANN 609: Feeding of Sheep and Goats

II (Cr. Hrs. : 1+1)

Theory: General considerations in sheep and goat feeding. Feeding standards - Nutrient requirement for various physiological functions. Pasture/Browse in sheep and goat nutrition and feeding. Mineral supplementation under Pasture/Browse condition. Flushing, Feeding systems - Intensive sheep and goats rearing and its limitations. Common nutritional disorders and their management. Efficiency of feed conversion.

Practical: Feeds and fodders for sheep and goats and their nutritive value. Feeding standards for sheep and goats. Feed formulation for sheep and goats for meat, milk and wool production. Supplemental feeds for sheep and goats under grazing and browsing conditions.

ANN 610: Feeding of Poultry

II

(Cr. Hrs. : 1+1)

Theory: Feeding standards - Nutrient requirement for egg type, Meat type and breeding stock of poultry (Chicken, quails, Ducks). Energy system for poultry and their determination. Concept of amino acid nutrition and their supply in practical diets. Formulation of rations - layers and broilers. Utilization of unconventional feeds. Poultry feeding in hot weather conditions. Nutritional problems and their management.

Practical: Composition and nutritive value of poultry feeds. Formulation of rations for poultry using conventional and unconventional feeds. Linear Programming in feed formulation for poultry. Suggested rations for egg type, meat type and breeding stock of poultry. Preparation of mineral mixture and Vitamin premix.

ANN 611: Feeding of Swine and Equines

II

(Cr. Hrs. : 1+1)

Theory: Feeding standards for swine (NRC, BIS). Nutrient requirement for different categories of swine. Ideal protein concept - Energy protein ratio. Common nutritional deficiencies and their amelioration. Feeding of swine for pork production and efficient breeding. Scavenging and Garbage feeding. General aspects of equine nutrition-feeding standards for equines and their use in feed formulations. Suggested feeding schedule for horses for work, lactation and race purposes. Peculiar aspects of equine nutrition and feeding.

Practical : Nutrient requirement of Swine for various Physiological functions. Feed formulations - Conventional/Unconventional feeds for Swine - Linear programming. calculation of feed conversion efficiency and feed costs. Feeding standards for horses. Forage based rations for horses. Suggested rations for breeding, working & lactating horses.

ANN 612: Pet Animal Nutrition

I

(Cr. Hrs. : 2+0)

Theory: Dog and cat nutrition - significance of water, carbohydrates, fats, protein, minerals and vitamins. Nutrient requirements of cats and dogs. Balanced diet formulation, preparation and feeding practices for various age groups of dogs and cats. Feeding of sick animals. Commercial feeds for cats and dogs.

ANN 613: Zoo Animal Nutrition

I

(Cr. Hrs. : 1+0)

Theory: Zoo Animals-Digestion, absorption and metabolism of nutrients. Significance of water, minerals, and vitamins. Nutrient requirements. Feeds for zoo animals and feeding of zoo animals. Peculiar aspects.

ANN 614: Laboratory Animal Nutrition **I** **(Cr. Hrs. : 2+0)**

Theory: General considerations for feeding and feed formulation of lab animals (Rat, Mice, Guinea pigs, etc). Feeding of lab animals for normal health and production (breeding). Guidelines for feed formulations. Feedstuffs for lab animals and their processing. Formulation of feeds. Feed additives in lab animal feeding. Rabbit nutrition - Behavioural aspects of rabbit feeding. Factors affecting feed intake and feed conversion. Forages for rabbit feeding. Feed formulations for different categories of rabbits. Feed additives. Feeding of rabbits for meat Production. Peculiar aspects of Lab animal Nutrition.

ANN 615: Clinical Nutrition **II** **(Cr. Hrs. : 1+0)**

Theory : Production diseases due to nutritional disturbances and their dietary correction. Metabolic profile test. Nutritional factors affecting immunity of the animal. Gastrointestinal parasitism and nutrition. Importance of colostrum in feeding of new borns. Therapeutic diets. Modified diets. Enteral and Parenteral nutrition.

ANN 680[†]: Special Assignment **II** **(Cr. Hrs. : 0+1)**

ANN 690[#]: Seminar **II** **(Cr. Hrs. : 1+0)**

ANN 700[#]: Research **(Cr. Hrs.: 0+30)**

REFERENCE BOOKS

1. Feeds and Principles of Animal Nutrition by GC Banerjee 1998.
2. Principles of Animal Nutrition and Feed Technology by DV Reddy 2001.
3. Applied Nutrition by DV Reddy 2001.
4. Health of Dairy Cattle (Ed) by AG Andrews 2000.
5. Advances in Buffalo – Cattle Nutrition & Rumen Ecosystem by SK Bhatia, Shiv Kumar and DC Sangwan 2004.
6. Fodder production and grassland management by DV Reddy 2006.
7. Handbook of poultry (eds) by V. Ramasubba Reddy and DT Bhosale.
8. The evaluation of feeds through digestibility experiments by Burch H Schneider and William P. Flatt.
9. Official methods of Analysis of AOAC International Edited by Patricia Cuniniff, 16th Ed., 1995, Vol. I & II.
10. Review articles, Internet, Journal contents.

3. M.V.Sc. IN VETERINARY GYNAECOLOGY & OBSTETRICS

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VGO601	Reproduction in female farm animals and its aberrations	1	1	2
2.	VGO602*	Infertility in female farm animals	2	1	3
3.	VGO603	Semen production and andrological techniques in farm animals	1	1	2
4.	VGO604	Biochemistry of semen	1	1	2
5.	VGO605	Infertility in male farm animals	1	1	2
6.	VGO606*	Canine and Feline reproduction	1	1	2
7.	VGO607*	Veterinary Obstetrics	1	1	2
8.	VGO608	Current therapy in reproductive failures	1	1	2
9.	VGO609	Herd fertility management	1	1	2
10.	VGO610*	Biotechnology of Animal Reproduction	2	1	3
11.	VGO611	Cyropreservation of gamets and Embryos	1	1	2
12.	VGO612	Wild and Zoo animal reproduction	1	1	2
13.	VGO613*	Clinics – I	0	1	1
14.	VGO614*	Clinics – II	0	1	1
15.	VGO680 [#]	Special Assignment	0	1	1
16.	VGO690 [#]	Seminar	1	0	1
17.	VGO700 [#]	Research	0	30	30

*Core courses: (12 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Anatomy (VAN)
2. Veterinary Biochemistry (VBC)
3. Veterinary Surgery and Radiology (VSR)
4. Veterinary Pathology (VPP)
5. Veterinary Medicine (VMD)
6. Veterinary Physiology (VPY)

VGO 601: Reproduction in female farm animals and its aberrations

I

(Cr. Hrs. : 1+1)

Theory: Development and differentiation of the brain and endocrine glands - Neuro endocrine relationship - patterns of gonadotropin secretion - manifestation of sexual behaviour in female farm animals - cyclic changes including folliculogenesis its affect on sexual behaviour and its aberrations - coital behaviour and role of nervous system - gametic encounter - Effect of stress on reproduction.

Practical: Observation of normal female genitalia of different farm animals and their sexual behaviour. Abnormal sexual behaviour of females of different farm animals - methods to be adopted to diagnose the abnormalities in female reproductive tract. Abnormal sexual behaviour and the techniques to correct them

VGO 602*: Infertility in female farm animals

I

(Cr. Hrs. : 2 + 1)

Theory: Detailed study of causes, diagnosis, treatment and prophylaxis of infertility in cows, buffaloes, Ewe, Doe, Mare, Sow etc.

Practical: Observation of pathological female reproductive organs of different farm animals obtained from slaughterhouse - Examination of different female infertile cases - collection and sending the material for laboratory examination - Diagnosis and treatment.

VGO 603: Semen production and andrological techniques in farm animals

I

(Cr. Hrs. : 1 + 1)

Theory: Embryological origin and function of male reproductive organs - spermatogenesis and its control - Structure of spermatozoa - Sperm metabolism and motility - Seminal plasma and its constituents – Male sexual behaviour and techniques to study the sex libido of the males - methods of semen collection - semen evaluation - Assessment of the reproductive capacity of the male.

Practical: Study of male genitalia of different farm animals - Practical study of spermatogenesis by different methods - semen collection by different methods in different farm animals - semen evaluation and its interpretation - Assessment of the overall reproductive capacity of the male farm animals.

VGO 604: Biochemistry of semen

II

(Cr. Hrs. : 1 + 1)

Theory: Gross and biochemical composition of spermatozoa - Functional integrity of spermatozoa - sperm metabolism and motility - seminal plasma and role of electrolytes, proteins, sugars, lipids, enzymes etc in seminal plasma - interactions between seminal plasma and spermatozoa - effect of feed additives, antiandrogens and chemotherapeutics on spermatogenesis.

Practical: Collection of whole and split ejaculates - estimation of reducing substances, Glucose, lipids, proteins, enzymes etc. In seminal plasma - testing the metabolic activity and functional integrity of spermatozoa.

VGO 605: Infertility in male farm animals **I** (Cr. Hrs. : 1 + 1)

Theory: Methods to assess the fertility of the bull - different forms of infertility in male farm animals with their causes, symptoms, collection and sending the materials for laboratory examination, diagnosis, treatment and prophylaxis.

Practical: Different techniques to identify the infertility including semen collection and evaluation - Examination of slaughter house specimens and clinical cases of various reproductive disorders of males in different farm animals.

VGO 606*: Canine and Feline reproduction **I** (Cr. Hrs. : 1 + 1)

Theory: Reproductive anatomy and endocrinology - cyclicity, vaginal cytology and breeding management - Factors affecting fertility - structural and functional abnormalities causing infertility - infectious agents causing infertility - pregnancy and its diseases - parturition and dystocia - postpartum management.

Practical: Study of normal and abnormal genitalia - Detection of proper time of mating - pregnancy diagnosis - Anesthesia for pregnant and non-pregnant animals - population control and contraceptives - Diagnosis and treatment of infertility cases - Dystocia management of canine and Feline.

VGO 607*: Veterinary Obstetrics **I** (Cr. Hrs. : 1 + 1)

Theory: Pregnancy and its duration in different farm animals - Diseases of gestation - parturition and care of new born and dam - causes and different methods of relieving dystocia - postpartum complications in different farm animals.

Practical: Pregnancy diagnosis in farm animals - studying of slaughter house specimens and clinical cases of gestational diseases - observation of parturition in different farm animals - studying different methods of relieving dystocia both in phantom boxes and clinical cases - studying clinical cases of postpartum complications in farm animals.

VGO 608: Current therapy in reproductive failures **II** (Cr. Hrs. : 1 + 1)

Theory: Principles of hormone therapy - mechanism of action, metabolism and residues of peptide, glycoprotein, steroid and other hormones - principles of antibiotic therapy, drug selection, dosage, route of administration and hazards of antimicrobial drugs - Drug interaction and incompatibility - Factors affecting the disposition of drug in female genital tract - Alternatives to antibiotics.

Practical: Diagnostic and therapeutic methods of endocrinology - tubal patency test - therapeutic uterine flushing - cervical mucus penetration test - collecting and despatching the sample for antibiotic sensitivity test etc.

VGO 609: Herd fertility management **II** (Cr. Hrs. : 1 + 1)

Theory: Fertility indexes of a herd - managerial practices in relation to herd size for optimum fertility - role of computers in herd fertility management - Infertility problems of herd with their diagnosis, treatment and prophylaxis.

Practical: Record keeping and usage of computers in herd fertility management - usage of teasers, synchronization of estrus and parturition etc. for better management of herd fertility - prophylactic measures for herd fertility.

VGO 610*: Biotechnology of Animal Reproduction **II** (Cr. Hrs. : 2 + 1)

Theory: Biotechnology of animal reproduction - Diagnostic biotechniques including RIA, ELISA - Biotechniques of male reproduction including artificial insemination of both liquid and frozen semen - Advanced techniques like separation of X and Y chromosome bearing spermatozoa - Laboratory methods improving semen quality - Biotechniques of female reproduction, induction of cyclicity, synchronization of estrus and parturition, super ovulation and embryo transfer – *In vitro* fertilization - micromanipulation of embryos.

Practical: Studying methods of semen collection, evaluation, extension, freezing and insemination in different species - Laboratory methods to separate X and Y chromosome bearing spermatozoa and to improve the semen quality - methods of synchronization of estrus and parturition - methods of super ovulation, collection, preservation and transfer of embryos – *in vitro* fertilization - techniques of micromanipulation of embryos.

VGO 611: Cryopreservation of gamets and embryos **II** (Cr. Hrs. : 1 + 1)

Theory: Principle, advantages and disadvantages of cryopreservation - cryoprotectents and their affects - cold shock and its prevention - different procedures of cryopreservation of gamets and embryos - care in the preservation of frozen samples etc.

Practical: Studying different freezing techniques of gamets and embryos.

VGO 612: Wild and Zoo animal reproduction **II** (Cr. Hrs. : 1 + 1)

Theory: Puberty, cyclicity, sexual behaviour, infertility problems, gestation, parturition and dystocia, care and management of new born and dam of different wild animals in their habitation and captivity.

Practical: Observation of different events of reproduction of different wild animals with the helps of videocassettes and zoo - study of infertility cases of different wild animals in zoo.

VGO 613*: Clinics- I **I** (0 + 1)

VGO 614*: Clinics- II **II** (0 + 1)

VGO 680#: Special Assignment **II** (0 + 1)

VGO 690#: Seminar **II** (1 + 0)

VGO 700#: Research (0 + 30)

REFERENCE BOOKS:

1. Reproduction in Farm Animals by Hafez & Hafez
2. Applied Animal Reproduction by Bearden, H. Joe
3. Reproduction in Domestic Animals by Cupps, Perry T.
4. Cattle Fertility & Sterility by Asdell
5. Allen's fertility obstetrics in the Horse by England Gary, C.W.
6. Canine & Feline Endocrinology & Reproduction by Feldman & Nelson
7. Current Therapy in Theriogenology by Marrow, David A.
8. Current Therapy in large animal Theriogenology by Youngquist
9. Arthur's Veterinary Reproduction & Obstetrics by Noakes et al
10. Diagnostic & Therapeutic Techniques in Animal Reproduction by Zemjanis
11. Veterinary Obstetrics & Genital Diseases by S.J. Roberts
12. Veterinary Obstetrics by Benesch
13. Fleming's Veterinary Obstetrics by Graig
14. Physiology of Reproduction and A I of Cattle by Salisbury
15. Text Book of Veterinary Andrology by Sahni & Varma
16. Semen of Animals and its use for A I by Anderson & James
17. Breeding problems & Artificial Insemination by Renseberg
18. Animal Biotechnology by Babiack et al
19. Practical Veterinary Ultrasound by Robert E. Cartee et al

4. M.V.Sc. IN POULTRY SCIENCE

Sl. No.	Course No.	Title	Credits		Total
			T	P	
1.	PSC601*	Poultry Management	2	1	3
2.	PSC602*	Bioclimatology and Housing	2	1	3
3.	PSC 603*	Incubation and hatchery management	1	1	2
4.	PSC 604	Management of Ducks, Turkeys, Quails and other species	1	1	2
5.	PSC 605	Pest Control and Waste Management	1	0	1
6.	PSC 606*	Poultry Genetics	2	1	3
7.	PSC 607*	Quantitative Genetics in Poultry Breeding	2	1	3
8.	PSC 608	Methods of selection	1	1	2
9.	PSC 609	Egg science and Technology	2	1	3
10.	PSC 610	Feeds and Feeding Poultry	2	1	3
11.	PSC 611	Poultry metabolic disorders	2	0	2
12.	PSC 680#	Special Assignment	0	1	1
13.	PSC 690#	Seminar	1	0	1
14.	PSC 700#	Research	0	30	30

*Core courses: (14 Credits) # Compulsory

Minor Fields of Study

1. Veterinary and Animal Husbandry Extension(AHE)
2. Animal Nutrition(ANN)
3. Veterinary Pathology(VPP)
4. Livestock Products Technology(LPT)
5. Animal Genetics and Breeding(AGB)
6. Veterinary Anatomy(VAN)

PSC 601*: Poultry Management

I (Cr. Hrs.:2+1)

Theory: Indian Poultry industry; Science and art of brooding and rearing broilers, growers and layers; Dubbing, beak trimming, restricted feeding, judging, forced molting and identification of different species of Poultry; Litter management; Cage management; Study of equipments; Record keeping; Principles of disease prevention and control, Biosecurity.

Practical: Brooding practices – floor and battery brooding; Methods of identification – wing-band, wing badge, leg band; Practice of dubbing, debeaking; Demonstration of various equipments in brooder, grower and layer houses; Judging layers; Litter management; Cage management; Vaccination programs; Records and record keeping.

PSC 602*: Bioclimatology and Housing

II (Cr. Hrs.: 2+1)

Theory: Fundamentals of Poultry housing; Environmental factors affecting Poultry housing; Climate and bioclimate-effects on growth, production and reproduction; Heat production Vs. Environment; Housing systems – extensive, semi-extensive, semi-intensive, intensive; Shelter engineering concepts; Planning a house, construction, design, layout;

Environmentally controlled houses; Housing systems – cage, floor and requirements for chicks, growers, layers breeders and broilers, Ducks Turkeys, Quails etc.; Estimation of cost of construction of house; Low-cost houses.

Practical: Drawing a farm layout; Floor diagram and cross-sections; Design of Poultry house depending on species, age and type of rearing; Shelter Engineering – study of building material for poultry houses, their advantages and disadvantages; Methods of estimation of cost of construction; Low-cost Poultry houses and their limitations.

PSC 603*: Incubation and Hatchery Management **II** (Cr. Hrs.: 1+1)

Theory: Male and female reproductive system; Egg formation; Sperm production; Factors affecting fertility; Artificial insemination; Characteristics of good hatching eggs; Selection, storage, disinfection, handling and care of hatching eggs, Candling; Incubation – natural/artificial, conditions during incubation and hatching; Embryonic development; Hatchery equipments; Hatchery operations; Pedigree hatching; Hatchery sanitation; Handling of chicks/sexing; Factors affecting hatchability.

Practical: Demonstration of male and female reproductive system; Collection of semen and artificial insemination; Handling and selection of hatching eggs; Layout and design of hatchery; Hatchery equipment; Setting of eggs; Fertility testing; Operating setter and hatcher; Pedigree hatching; Demonstration of wing-banding and dubbing; Analyzing hatchability; Hatchery sanitation.

PSC 604: Management of Ducks, Turkeys, Quails and other Species **I** (Cr. Hr.: 1+1)

Theory: Classification and breeds of Ducks, Turkeys, Quails and other species; Housing requirements of various species and different housing systems suitable for them; Management of different age groups of various species; Breeding, handling and sexing; feeds and feeding; Disease prevention and control.

Practical: Study of different breeds; Housing design for various species; Handling and sexing of different species; Equipment – feeders, waterers etc. for different species; feed and feeding different species; Vaccination and disease control.

PSC 605: Pest control and waste management **I** (Cr. Hr. : 1+0)

Theory: Common pests in Poultry farms – flies, termites, mosquitoes etc.; Rodents and their control; Poultry farm wastes – characteristics, collection, transportation, utilization and disposal; Stabilization ponds, activated sludge processes, activated digestion, composting, drying and incineration; Rendering of by-products; Planning waste handling system.

PSC 606*: Poultry Genetics **I** (Cr. Hrs. : 2+1)

Theory: Evolution of class Aves; Origin of modern-day Poultry breeds, Classification and characteristics of common breeds of chicken, Ducks and Turkeys; Inheritance of Mendelian traits – feathering, comb type, plumage and skin colour; Lethal genes and variation in skeleton; Epistatic gene action; Sex-linked characters – Autosexing; Gene and genotype frequencies, Hardy-Weinberg's law, breeding value; Parent and grand-parent stocks; Random sample tests.

Practicals: Study of different breeds and varieties of chicken, Turkeys, ducks etc.; Law of probability and Mendelian genetics – calculation of Mendelian ratios in mono and di-hybrid crosses and epistatic interactions; Calculation of phenotypic and genotypic frequencies of autosomal and sex-linked genes

PSC 607*: Quantitative Genetics in Poultry Breeding **I** (Cr. Hrs.: 2+1)

Theory: Introduction to quantitative genetics; Economic traits, mode of inheritance and factors affecting them; Heritability and correlations – concepts, methods of computation and utility in breeding; Genotype – Environment interaction; Mating systems – merits and demerits inbreeding and crossbreeding – genetic consequences and effects on economic traits; Methods of estimation of inbreeding coefficient, formation of inbred lines; Concept of Diallel crossing.

Practical: Hardy-Weinberg's Law – calculation of gene and genotypic frequencies under different conditions; Quantitative inheritance – calculation of mean, variance, average effect, breeding value; Heritability and genetic correlation – estimation for various economic traits; calculation of inbreeding coefficient by different methods.

PSC 608: Methods of Selection **II** (Cr. Hrs.: 1+1)

Theory: Basis of selection; Natural and artificial selection; Different methods of selection, response to selection – its measurement; Selection limit, factors affecting response, genetic gains; Indirect selection; Correlated response; Relative merits and demerits of selection methods; Control population.

Practical: Estimation of population mean, selection differential, intensity of selection, Selection response, correlated response, realized heritability; Construction of selection indices.

PSC 609: Egg Science and Technology **I** (Cr. Hrs.: 2+1)

Theory: Formation of egg, egg quality, factors influencing egg quality; Deterioration of egg quality during storage and its preventive measures; Microbiology of eggs; Egg proteins – physico-chemical and functional properties; Changes in egg proteins during storage and processing; Egg lipids – physico-chemical and functional properties; Fatty-acids – saturated and unsaturated; Micro-nutrients in eggs; vitamins and minerals, their losses during storage; Manufacture of processed egg products; Utilization of damaged eggs; Egg in Human food; Comparison of nutritive value of eggs of different species of Poultry.

Practical: Physico-chemical and functional properties of albumen and yolk and effects of cooking; Egg quality studies during storage of shell-eggs; Preparation of ready-to-eat egg products and study of their shelf-life; Sensory evaluation of egg products.

PSC 610: Feeds and Feeding Poultry **II** (Cr. Hrs.: 2+1)

Theory: Feedstuffs – energy, protein, mineral and vitamin sources and Agro-industrial by-products – levels of inclusion and anti-nutritional factors, if any; Feed additives – antibiotics, coccidiostats, growth-promoters, amino-acids, enzymes etc.; Nutrient requirements – BIS and NRC recommendations; feed formulation, least-cost formulation based on season, market rate,

age etc.; Types of Poultry feed – mash, pellets, crumbles etc.; Feed-mixing; storage and quality control of feed ingredients and mixed feeds.

Practical: Lay-out of a feed-mixing plant; Equipment in a feed mixing unit; Demonstration of various feed ingredients and types of poultry feed viz., mash, pellets and crumbles; Storage of various feed ingredients; Feed formulation – use of conventional and non-conventional feed ingredients.

PSC 611*: Metabolic Disorders of Poultry **I** (Cr. Hrs.: 2+0)

Theory: Regulation of feed and water intake; role of B-complex vitamins; Fate of excess nutrients; Metabolic disorders – FLKS, ascites, gout, FLHS, oily bird syndrome etc., their etiology, prevention and control; stress – causes and control; Skeletal disorders; Toxicoses – Vitamins and mineral toxicities.

PSC 680#: Special Assignment **II** (0 + 1)

PSC 690#: Seminar **II** (1 + 0)

PSC 700#: Research (0 + 30)

REFERENCE BOOKS:

1. Scanes, C.G.; Brant, G and Ensminger, M.E. (2004) Poultry Science, 4th Ed.
2. Sreenivasaiah, P.V. (2006) Scientific Poultry Production – a unique encyclopedia, 3rd Ed.
3. Jull, M.A. (2003) Successful Poultry Management
4. Sainsbury, D. (1984) Poultry Health and Management
5. Roberts, V. (2003) British Poultry Standards
6. Leeson, S and Summers, J.D. (1993) Commercial Poultry Production
7. North, M.O and Bell, D.D. (1990) Commercial Chicken Production Manual, 4th Ed.
8. Murd, L.M. (2003) Modern Poultry Farming
9. Leeson, S and Summers, J.D. (1993) Commercial Poultry Nutrition
10. Johari, D.C. and Hussain, K.Q. (1996) Commercial Broiler Production
11. Reddy, R.V and Bhosale, D.T. (2004) Handbook of Poultry Nutrition
12. Taylor, L.W. (2003) Fertility and Hatchability of Chicks and Turkey egg
13. Smith, A.J. (1993) The Tropical Agriculturist – Poultry
14. Perry, G. C. (2004) Welfare of the Laying Hen
15. Solomon, S.E. (1991) Egg and Eggshell Quality
16. Daghin, N.J. (1995) Poultry Production in Hot Climates
17. Etches, R.J. (1996) Reproduction in Poultry
18. Appleby, M.C.; Mench, J.A. and Hughes, B.O. (2004) Poultry Behaviour and Welfare
19. Leeson, S. and Summers, J.D. (2000) Broiler Breeder Production
20. Olsen, G.H. and Orosj, S.E. (2000) Manual of Avian Medicine
21. Bremner, A and Johnston, M (1996)
Poultry Meat Hygiene and Inspection

5. M.V.Sc. IN LIVESTOCK PRODUCTION AND MANAGEMENT

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	LPM601*	Livestock Production Systems	2	0	2
2.	LPM602*	Animal Welfare	1	0	1
3.	LPM603	Ecological Aspects of Livestock Production	2	0	2
4.	LPM604*	Animal Environment and Shelter Management	2	1	3
5.	LPM605*	Concepts of Animal Ethology	2	1	3
6.	LPM606*	Cattle and Buffalo Production & Management	1	1	2
7.	LPM607*	Goat and Sheep Production & Management	1	1	2
8.	LPM608*	Swine Production & Management	1	1	2
9.	LPM609	Equine Management	1	1	2
10.	LPM610*	Wildlife Resources and Conservation	2	0	2
11.	LPM611	Care & Management of Captive Animals	1	1	2
12.	LPM612	Management of Pet / Companion Animals	1	1	2
13.	LPM613	Management of Laboratory Animals	1	1	2
14.	LPM614*	Instructional Farm Practice	0	2	2
15.	LPM680 [#]	Special Assignment	0	1	1
16.	LPM690 [#]	Seminar	1	0	1
17.	LPM700 [#]	Research	0	30	30

*Core Courses: (19 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary and Animal Husbandry Extension (AHE)
2. Animal Genetics and Breeding (AGB)
3. Veterinary Physiology (VPY)
4. Animal Nutrition (ANN)
5. Veterinary Gynaecology and Obstetrics (VGO)

LPM 601*: Livestock Production Systems

II

(Cr. Hrs.: 2+0)

Theory: Livestock Production Systems in different regions of the world – ecological characteristics, resource use, production in relation to land use - Livestock production and profitability – factors affecting livestock production in the tropics - Planning for livestock development – macro and micro level planning - Role of livestock in Indian economy – status – scope and future - Livestock production under adverse conditions - Management of livestock enterprises – farm plans – record keeping, analysis of records - Livestock farming systems in the tropics – structural and functional characteristics - Small holder livestock production systems, large holder livestock production systems, landless livestock production systems, intensive, extensive and semi-intensive livestock - production systems, commercial and subsistence farming systems, homestead farming system, integrated farming systems - Economics and sustainability of different farming systems - Role of women in livestock production systems.

LPM 602*: Animal Welfare

I

(Cr. Hrs.: 1+0)

Theory: Approaches to animal welfare – animal needs and behavioural requirements, concept of stress and welfare, empathy, animal awareness - Five freedoms for livestock, animal rights - Animal regulations, protection of animals during transport, protection of animals for slaughter, protection of animals kept for farming purpose - International animal regulations, animal regulations in India, agencies concerned with animal welfare, SPCA - Prevention of cruelty to animals act.

LPM 603: Ecological Aspects of Livestock Production **I**

(Cr. Hrs.: 2+0)

Theory: Livestock production in different agro-ecological zones - Regional considerations for appropriate livestock development strategies in the tropics with specific reference to India - Population dynamics of different domestic livestock, logistic population growth and factors affecting them - Livestock production in different regions of the world – ecological characteristics, case studies of recent changes in production systems, strategies for development - Basic concepts in social grouping of animals, spatial relationship in domestic livestock, spatial patterns and relationships between two or more species - Influence of environmental factors on spatial and social organization under intensive husbandry systems.

LPM 604* : Animal Environment and Shelter Management **I**

(Cr. Hrs. : 2+1)

Theory: General concepts of environment – classification, environmental aspects of animal production - Bio-climatological factors affecting health and productivity of livestock, measurement of responses to different environments, computation of comfort indices - Stress and strain due to physical environment, management factors to alleviate stress due to environment - Animal adaptability, adaptation to hot and cold environments and to different ecological regions. Species variability to adaptation. Mechanisms of adaptation in different domestic species of livestock - Housing systems for different species of domestic animals - Ventilation and lighting requirements of different domestic species, different ventilation systems, effect of light on animal behaviour and productivity - Sanitation, farmyard manure – storage and disposal.

Practical: Measurement of environment variables - Computation of comfort indices for different species of livestock - Study of animal reactions to stress - Lay out and design of

different animal houses, housing for thermal comfort, whole farm plans - Drainage grid for different farm houses - Study of cost effective animal houses, rural animal housing patterns.

LPM 605*: Animal Ethology

II

(Cr. Hrs.: 2+1)

Theory: Animal ethology, ethology as an applied science, role of ethology in animal science and animal welfare - Behavioural development – neonatal behaviour – imprinting – learning mechanisms, bonding and play - Types / patterns of animal behaviour – ingestive, eliminative, care seeking, care giving, sexual, agonistic, allelomimetic, investigatory, shelter seeking, dominance, leadership, territoriality, social behaviour - General behavioural patterns of domestic animals - General behavioural patterns of wild and captive animals - Behavioural disorders – vices, their etiology, prevention and cure - Management of behaviour, behavioural control by use of mechanical, chemical and electronic methods

Practical: Species-specific behavioural patterns - Behaviour of farm animals in confinement - Study of ethogram in different species

LPM 606*: Cattle and Buffalo Production and Management

II

(Cr. Hrs. : 1+1)

Theory: Origin and domestication of cattle and buffaloes - Types of cattle and buffaloes – classification - General behavioural features of cattle and buffaloes - World distribution of cattle and buffaloes - Adaptation of cattle and buffaloes to different ecologies - Breeds of cattle and buffaloes - Role of cattle and buffalo production in Indian economy – present status and future prospects - Cattle and buffalo farming systems in India and the world - Care and management of cattle and buffaloes of different age groups for milk, meat and draught, selection considerations - Strategies for improving milk and meat production - Recent developments in the housing, feeding, breeding and health care of cattle and buffaloes - Herd health management programme. Management of sick animals - Management of cattle and buffalo enterprise – management and its relationship with health and production - Economic traits and factors affecting production performance

Practical: Economics of rearing cattle and buffaloes – field survey, farm plans – record keeping – analysis of records – cost of production – project preparation – planning for year round fodder production.

LPM 607*: Goat and Sheep Production and Management

I

(Cr. Hrs.: 1+1)

Theory: Origin and domestication of goats and sheep - World distribution – adaptation of goats and sheep to different agro-ecological zones - General behavioural features of goats and sheep - Breeds of goats and sheep – classification of breeds - Goat and sheep farming systems in the world - General care and management of different categories and age groups of goats and sheep - Recent developments in the housing, feeding, breeding and health care of goats and sheep - Flock health management programme, management of sick animals - Characteristics of milk, meat, wool/fibre, production and profitability - factors affecting productivity - Economic traits of goats and sheep.

Practical: Economics of rearing goat/sheep, field survey, farm plans – record keeping – analysis of records – cost of production – project preparation – use of shrubs and tree leaves in the feeding of goats and sheep.

LPM 608*: Swine Production and Management

I

(Cr. Hrs.: 1+1)

Theory: Origin and domestication of pigs - World distribution – population trends - Scope and significance of pigs in rural farming systems - Breeds of pigs, adaptation of pigs to different ecologies - General behavioural patterns of pigs - Care and management of different age groups and categories of pigs - Recent developments in the housing, feeding breeding and health care of pigs, management of sick animals.

Practical: Economics of rearing pigs under different systems, field surveys – farm plans – record keeping – analysis of records – project preparation - Instructional visit to different pig production and processing units.

LPM 609 : Equine Management

I

(Cr. Hrs. : 1+1)

Theory: Origin and domestication of equines – classification - World distribution– population status - Significance of equines in India and the world – utilization pattern - Adaptation of equines to various ecologies - Breeds of horses and other equids (donkeys, mules) - General behavioural patterns of different equids - Conformation of horses – static and dynamic conformation - Care and management of different categories of horses, mules and donkeys - Stabling management, feeding management, breeding management and health care - Management of sick animals

Practical: Routine stable management practices – grooming, exercising, saddlery, foot care and shoeing - Instructional visit to stud farms

LPM 610*: Wildlife Resources and their Conservation

II

(Cr. Hrs.: 2+0)

Theory: Common terminologies and definitions - Natural resources – causes for depletion – conservation and management - Land use pattern – forestry – importance of forests – classification of forests - Census operations, methodologies - Classification of different wild animals and birds, their zoo-geography - Wildlife conservation in India – endangered flora and fauna of India, their conservation strategies - Conservation of bio-resources and bio-diversity, man and biosphere - International conservation agencies - Role of Veterinarians in the conservation of wildlife resources - Wildlife reserves, sanctuaries, national parks, protected areas bio-reserves in India - Wildlife legislation, Wildlife (protection) Act

LPM 611 : Management of Captive Animals

I

(Cr. Hrs. : 1+1)

Theory: Common terminologies and definitions - Zoos, zoological parks, biological parks, biological reserves in India – objectives, Organizational set-up, minimum standard requirements - Regulations regarding animal enclosures, zoo animal health care and treatment - Veterinary facilities in zoos, role of veterinarians in zoo management - Regulations regarding transportation of animals, import and export regulations - General care and management of different groups of animals in captivity – management of sick animals - Familiarisation of habits, habitat and housing requirements of captive wild animals - Behavioural patterns of animals in captivity – group behaviour – behavioural problems – causes – treatment and prevention - Welfare of animals in captivity, environment enrichment programme - Maintenance of stud books and record keeping in zoos.

Practical: Design and layout of animal enclosures with environment enrichment
Instructional visit to zoological park

LPM 612: Management of Pet /Companion Animals **II** (Cr. Hrs.: 1+1)

Theory: Animals commonly used as pets, their origin, domestication and classification - Utility of dogs, different breeds, breed standards/profile - Breeds of cats and other animals commonly used as pets - General behavioural patterns of common pet/companion animals, behavioural problems – vices, their development and prevention - Selection of young animals, training, handling and control, breeding, feeding, housing, Management of sick animals - Preparation of animals for shows - Registration of animals - Health care management of various pets.

Practical: Routine management practices - Preparation of animals for shows - Training of dogs - Preparation of layouts of pet animal houses

LPM 613: Management of Laboratory Animals **I** (Cr. Hrs.: 1+1)

Theory: Common laboratory animals and their importance - Classification of laboratory animals - Handling of common laboratory animals - General behavioural patterns of laboratory animals, behavioural problems, vices, treatment and prevention - General care and management of common laboratory animals – identification methods – housing pattern – feeding – breeding – health care - Selection of breeding stock - Regulations in the use of laboratory animals

Practical: Classification of animals - Routine management practices – Handling of lab animals - Identification of lab animals - Preparation of layouts of lab animal houses

LPM 614*: Instructional Farm Practice **I** (Cr. Hrs.: 0+2)

LPM 680[#]: Special Assignment **II** (Cr. Hrs.: 0+1)

LPM 690[#]: Seminar **II** (Cr. Hrs.: 1+0)

LPM 700[#]: Research (Cr. Hrs.: 0+30)

REFERENCE BOOKS:

1. Sastry, N.S.R. and Thomas, C.K. (2005) Livestock Production Management, 4th Ed.
2. Thomas, C.K. and Sastry, N.S.R (1991) Dairy Bovine Production
3. Cockrill, R.W. (1974) The Husbandry and Health of the Domestic Buffalo
4. Ensminger, M.E. (2002) Sheep and Goat Science, 6th Ed.
5. Clutton Brock, J.(2004) A Natural History of Domesticated Mammals, 2nd Ed.
6. Watson, J.A.S. and Mills, W.J. (2005) Farm Animals and their Management
7. Taylor, R.E. and Field, T.G. (1977) Scientific Farm Animal Production
8. Pagot, J. (1992) Animal Production in the Tropics and Sub-tropics
9. Mason, I.L. (1988) World Dictionary of Livestock Breeds, 3rd Ed.

10. Anderson, R.H. and Edney, A.T.B. (1991) Practical Animal Handling
11. Sastry, N. S. R. (1995) Livestock Sector of India – Regional Aspects
12. Hemsworth, P.H. and Coleman, G.J. (1998) Human – Livestock Interactions
13. Warren, M.D. (2002) Small Animal Care and Management, 2nd Ed.
14. Zutphen, L.F.M.V.; Bumans, V and Beymen, A.C. (1993) Principles of Laboratory Animal Science
15. Collinson, M (2000) A History of Farming Systems Research
16. Clark, J.A. (1981) Environment Aspects of Housing for Animal Production
17. Sainsbury, D (1986) Farm Animal Welfare (Cattle, Pigs and Poultry)
18. Alwek, J. (2001) Animal Behaviour 7th Ed.
19. Blaxter, S.H. Baxter, M.R. Cormac, J.A.C. (1983) Farm Animal Housing and Welfare
20. Overcast, M.R. Humenik, F.J. and Miner, D.R. (2000) Livestock Waste Management, Vol. I and II
21. Poole. T. (1994) The UFAW Handbook on the Care and Management of Laboratory Animals, 6th Ed.
22. Wolfenson. S and Lloyd, M. (1994) Handbook of Laboratory Animal Management and Welfare
23. Brown, J.H and Smith, V.P. (1994) Horse and Stable Management
24. Worden, A.L. (1992) Handbook of Laboratory Animals
25. Grandin. T. (2000) Livestock Handling and Transport

6. M.V.Sc. IN LIVESTOCK PRODUCTS TECHNOLOGY

Sl. No.	Course No.	Course Title	Credits		Total Credits
			T	P	
1.	LPT601*	Abattoir Practices and Meat Inspection	2	1	3
2.	LPT602*	Principles of Meat Science	2	1	3
3.	LPT603*	Microbiology of Livestock Products	2	1	3
4.	LPT604	Chemistry of Milk and Milk Products	1	1	2
5.	LPT605*	Processing and Utilization of Slaughter house By- products	2	1	3
6.	LPT606*	Meat Products Processing	2	1	3
7.	LPT607	Packaging of Livestock products	1	0	1
8.	LPT608	Sensory Evaluation of Livestock Products	1	1	2
9.	LPT609	Processing of Milk and Milk Products	1	1	2
10.	LPT610	Handling and Processing of Fish	1	1	2
11.	LPT611	Poultry Products Technology	1	1	2
12.	LPT612	Dairy By-products	1	1	2
13.	LPT680 [#]	Special Assignment	0	1	1
14.	LPT690 [#]	Seminar	1	0	1
15.	LPT700 [#]	Research	0	30	30

* Core courses: (15 Credits) [#] Compulsory

Minor Fields of Study:

1. Veterinary Biochemistry (VBC)
2. Veterinary Public Health & Epidemiology (VPH)
3. Veterinary Pathology (VPP)
4. Poultry Science (PSC)
5. Veterinary & Animal Husbandry Extension (AHE)
6. Animal Nutrition (ANN)
7. Veterinary Anatomy (VAN)

LPT 601*: Abattoir Practices and Meat Inspection:

I

(Cr. Hrs. : 2+1)

Theory: Layout, construction, design, organisation, operation and maintenance of abattoirs and meat processing plants. Pre slaughter care and slaughtering techniques for different animals and birds. Meat inspection, objectives, antemortem and postmortem inspection, General principles of judgement, Meat borne zoonosis, specific diseases - parasitic, bacterial and viral. Non-specific affections. Judging and grading of animal carcasses. Disposal of condemned materials. Sanitation, sanitary standards for meat plants, disposal of slaughter house effluents. Regulations pertaining meat, meat food products order, detection of adulteration and misrepresentation of meat.

Practical: Design and layout of different slaughter houses (Modern, semi modern & booth type) with specifications. - Slaughter of small and large animals - Evaluation of sanitary quality of floor, water and equipments used for slaughter - Tests for perfect bleeding - Detection of odour - Estimation of pH of fresh meat

LPT 602*: Principles of Meat Science

I

(Cr. Hrs.: 2+1)

Theory: Structure, composition and Biochemistry of meat, muscle contraction, Rigor mortis, conversion of muscle to meat, conditioning, PSE, DFD. Chemistry of protein, lipids, meat colour, flavour, protein lipid interaction, Factors affecting meat quality, quality characteristic of meat (Physico chemical & organoleptic), Chilling & freezing of fresh meat, changes during freezing, Tenderization, electrical stimulation and Irradiation of meat.

Practical: Microscopic structure of muscle - Muscle fibre diameter - Estimation of total pigment - Estimation of proximate composition - Protein & lipid fractionation - WHC, pH of fresh and aged meat - Glycogen/lactic acid estimation of pre rigor/post rigor muscle - Demonstration of cold shortening and thaw rigor.

LPT 603*: Microbiology of Livestock Products

II

(Cr. Hrs.: 2 +1)

Theory: Microorganisms important in foods bacteria, yeast and mold. Factors affecting microbial growth, General principles of spoilage. Chemical and deteriorative changes caused by microorganisms. Contamination and spoilage of meat, fish, poultry, eggs, milk and milk products, General principles of preservation of livestock products. Food poisoning, food borne infection and intoxication. Use of microbes in fermented meat and dairy products. Microbiological aspects of food preservation. Microbiological standards for different livestock products.

Practical: Enumeration of different groups of organisms(SPC, PPC, TPC, yeast & Mould etc) in livestock products - pH & ERV to judge freshness of meat - Detection and enumeration of specific organisms important in livestock products (Salmonella, Enterobacteriaceae, Coliform, Staphylo) - Detection of endotoxin in livestock products - Direct microscopic count in milk.

LPT 604: Chemistry of Milk & Milk Products

I (Cr. Hrs.: 1+1)

Theory: Physico-chemical properties of milk from different species and their importance in processing. Chemistry of protein, lipid and carbohydrate and other constituents of milk. Flavour and off flavour in milk and Milk Products.

Practical: Estimation of fat, protein, lactose etc. in milk and milk products - Physico-chemical analysis, judging and grading of milk products - Detection of adulterants and preservatives in milk and milk products.

LPT 605*: Processing and Utilization of Slaughter house By-products

I (Cr. Hrs.: 2+1)

Theory: Layout of a byproduct plant, classification of slaughter house byproducts and offals, Processing and utilization of slaughterhouse and poultry byproducts. Methods of utilization of blood, fat, hides & skin, bones, horns & hooves, wool & hair, feathers, glands and other byproducts, Industrial importance and quality control of by-products.

Practical: Layout of a by-product utilization plant - Estimation of yields of different by products - Degreasing and Deodourization of bones - Preparation of meat meal, bone meal, blood meal and casing - Refining of technical fat - Preparation of neat's foot oil - Preparation of feather meal & poultry by-products - Fibre diameter of wool and hair.

LPT 606*: Meat Products Processing

II (Cr. Hrs.: 2+1)

Theory: Principles of product development. Equipment and technology for meat processing, Drying, curing, smoking, canning of meat. Meat emulsion and comminuted meat products, new product development. Intermediate moisture meats, fermented product, restructured meat, Meat analogues.

Practical: Drying of meat & its quality evaluation - Curing & smoking of meat and quality evaluation - Preparation of meat emulsion and different emulsion type products. - Estimation of emulsifying capacity, emulsion stability and cooking yield. - TBA and peroxide value estimation - Organoleptic evaluation of meat products - Demonstration of different cooking methods including microwave cooking - Restructured meat products.

LPT 607: Packaging of Livestock Products

I (Cr. Hrs.: 1+0)

Theory: Principles of food packaging, types of packaging material, characteristics, methods of packaging. Packaging of different livestock products - Product attributes & packaging requirements.

LPT 608: Sensory Evaluation of Livestock Products

II

(Cr. Hrs.: 1+1)

Theory: Sensory evaluation - differences between organoleptic and sensory evaluation. General testing conditions. Basic tastes - organoleptic attributes - colour, texture, flavour. Sensory laboratory. Sampling, trained and consumer panel - selection and training. Different tests. Sample preparation and presentation.

Practical: Determination of threshold level of different basic tastes - Preparation and presentation of sample for sensory evaluation - Subjective evaluation of cooked meat for different attributes with different treatments - Triangle, Paired and Duo-trio test - Organoleptic evaluation of comminuted meat products.

LPT 609: Processing of Milk and Milk products

II

(Cr. Hrs.: 1+1=2)

Theory: Processing of Milk - Reception, Pasteurization, packaging storage and distribution. Judging and grading of milk, defects in milk, sterilized milk and UHT processed milk. Processing of Butter, Cheese, Ice Cream. Indigenous dairy products - ghee, khoa, dahi, makhan, channa, paneer etc.

Practical: Demonstration of Pasteurization, cream separation, sterilization - Judging and grading of milk - Preparation of ice-cream, cheese, paneer, dahi, ghee etc.

LPT 610: Handling and Processing of Fish

II

(Cr. Hrs.: 1+1)

Theory: Fish resources, marine and fresh water fish production/harvesting, transportation, processing preservation, grading, quality control, packaging, labeling and marketing of fish and fish products. Utilization of fish processing waste.

Practical: Dressing percentage of fresh water and marine fish - Preservation of fish - Preparation of fish products - Microbiological evaluation of fish and fish products.

LPT 611: Poultry Products Technology

I

(Cr. Hrs.: 1+1)

Theory: Poultry processing plant. Slaughter and dressing of poultry. Processing of indigenous poultry products. Comminuted poultry products. Canned poultry products. Structure composition and functions of different parts of egg. Preservation of egg. Processing of egg products.

Practical: Slaughter and dressing of poultry - Preparation of cut-up-parts of poultry and estimation of yield and meat bone ratio - Preparation chicken products (Tandoori, barbeque, grilled/roasted chicken) - Comminuted chicken products - Preparation of chicken gizzard pickle - Processing of egg products - Boiled and poached eggs.

LPT 612: Dairy By-Products**II** (Cr. Hrs.: 1+1)

Theory: Method of manufacture, properties, nutritive value of skim milk, casein, co-precipitates, caseinate, lactose, whey protein concentrate. Ghee residue, lassi, butter milk, uses of dairy byproducts.

Practical: Preparation of casein, co-precipitate, caseinate. Physico chemical analysis of dairy byproducts.

LPT 680[#]: Special Assignment**II** (Cr.Hrs.:0+1)**LPT 690[#]: Seminar****II** (Cr.Hrs.1+0)**LPT 700[#]: Research**

(Cr.Hrs.:0+30)

REFERENCE BOOKS:

1. Textbook of Dairy plant layout and design by Lalat Chander (2004) – ICAR, New Delhi.
2. Textbook of Dairy Chemistry by Mathur MP, Dattaroy D and Dinakar P (1999) – ICAR New Delhi.
3. Fundamentals of Dairy Chemistry (3rd Edition) by Webb BH, Johnson AH and Alford JA (1987) – CBS Publ. N.Delhi.
4. Encyclopedia of Dairy Science by Roginski H, Fuguay JW and Fox PF(2003) – Academic Press, N.York.
5. Concentrated and Dried Dairy Products by Caric M (1994) – VCH N.York
6. Dairy India – 2007 (6th Edi) by Gupta PR (2007) – Dairy India Year Book, N.Delhi.
7. Standard Methods for Examination of Dairy Products by Marshall RT (1992) – APHA Washington, DC.
8. Modern Dairy Technology Vol.2 (Advances in Milk Products 2nd Edn.) by Robinson RK (1993) – Elsevier Appl. Sci., London.
9. Technology of Indian Milk Products by Aneja RP, Mathu BN Chanddran RC and Banerjee AK (2002) – Dairy India Publ., New Delhi.
10. Ice Cream Manufacture & Technology by Bhandari V (2001) – Tata McGraw Hill Publ. New Delhi.
11. Meat Hygiene (10th ed.) by Gracey JF, Collins DS and Huey RJ (2000) – WB Saunders Co. Ltd.
12. Meat Science – An Introductory Text by Warris PD (2000) – CABI Publ. Co., UK.
13. Principles of Meat Science (3rd Ed) by Hedrick HB, Aberle ED, Forrest JC, Judge MD and Markel RA (1994) – WH Freeman & Co., New York.
14. Meat Science (6th Ed.) by Lawrie RA (2002). – Pergmon Press UK.
15. The Technology of Food Preservation (Fist Edition) Desrosier MW and Desrosier JN – CBS Publ. N.Delhi.
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31. Flavour of Meat and Meat Products by Shahid F (1994) – Blackie Academic and Professional London.
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33. Advances in meat research by Pearson AM and Dutson TR (1988) – AVI Book, N.York.
34. Poultry Meat and Engg Production by Parkhurst CR and Mountney GJ (1997) – CBS Publ., N.Delhi.
35. Wilson's Practical Meat Inspection (6th Ed.) by Wilson WG (1998) – Blackwell Sci Oxford.
36. Marketing of Livestock and Meats by Lesser WH (1993) – Food Products Press, USA
37. Food Emulsions by Friberg SE and Larsson K (1997) – Marckel Dekkar Inc.
38. Sensory Evaluation of Foods – Statistical Methods and Procedures by O'Mohony M (1986) – Marckel Dekkar.
39. Meat and meat products Technology, Chemistry and Microbiology by Varnam AH and Sutherland JP (1995) – Chapman & Hall, London
40. The Meat We Eat (13th Ed) by Romans JR, Costello WJ, Carlson CW, Greaser, ML and Jones KW (1994) – Intersate Pbl. Inc. Illinois, USA.

7. M.V.Sc. IN VETERINARY ANATOMY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VAN601*	Anatomy of Domestic Ruminants-I	1	2	3
2.	VAN602*	Anatomy of Domestic Ruminants-II	1	2	3
3.	VAN603	Anatomy of reproductive and endocrine organs in domestic animals	1	1	2
4.	VAN604	Equine Anatomy	1	1	2
5.	VAN605	Swine Anatomy	1	1	2
6.	VAN606	Avian Anatomy	1	1	2
7.	VAN607	Anatomy of the dog and cat	1	1	2
8.	VAN608	Anatomy of Laboratory mammals	1	1	2
9.	VAN609	Neuroanatomy	1	1	2
10.	VAN610*	Veterinary Histology	2	2	4
11.	VAN611*	Developmental Anatomy	1	1	2
12.	VAN612	Histological techniques	1	1	2
13.	VAN613	Radiological Anatomy	1	1	2
14.	VAN614	Surgical Anatomy	1	1	2
15.	VAN680 [#]	Special Assignment	0	1	1
16.	VAN690 [#]	Seminar	1	0	1
17.	VAN700 [#]	Research	0	30	30

*Core courses: (12 Credits) ` # Compulsory

Minor Fields of Study

1. Veterinary Biochemistry (VBC)
2. Veterinary Pathology (VPP)
3. Livestock Products Technology (LPT)
4. Veterinary Gynaecology and Obstetrics (VGO)
5. Veterinary Surgery and Radiology (VSR)

VAN 601*: Anatomy of Domestic Ruminants-I **I** (Cr. Hrs.: 1+2)

Theory: Anatomy of the head, neck, fore limb and hind limb. The bones, muscles, joints, nerves, and the blood vascular system associated with the above regions.

Practical: Gross study of the bones present in the regions mentioned above. Dissection of joints, muscles, nerves, eye, ear and other structures in the head, neck, fore limb & hind limb.

VAN 602* : Anatomy of Domestic Ruminants-II **I** (Cr. Hrs. : 1+2)

Theory: Anatomy of the thorax, abdomen & pelvis, the udder and scrotum. The bones, muscles, joints, nerves, the blood vascular system associated with the above region and the details of the viscera contained in these cavities.

Practical: Gross study of the bones present in the regions mentioned above. Dissection of joints, muscles, nerves, and the viscera in the thoracic, abdominal and pelvic cavities. Dissection of the udder and scrotum.

VAN 603: Anatomy of reproductive and endocrine organs in domestic animals **I** (Cr. Hrs. : 1+1)

Theory: Gross and Microscopic anatomy of organs of reproduction and endocrine organs of domestic animals.

Practical: Dissection of the reproductive and endocrine organs of domestic animals. Histological structure of reproductive and endocrine organs.

VAN 604 : Equine Anatomy **II** (Cr. Hrs. : 1+1)

Theory: Topographic and systematic Anatomy of the equines. Gross Anatomy of bones, muscles, joints, nerves, the blood vascular system and visceral organs.

Practical: Gross study of the bones and viscera of equines. Dissection of donkey / horse.

VAN 605 : Swine Anatomy **I** (Cr. Hrs. : 1+1)

Theory: Topographic and systematic Anatomy of the pigs(swine). Gross Anatomy of the bones, muscles, joints, nerves, the blood vascular system and the visceral organs.

Practical: Gross study of the bones and viscera of pig. Dissection of pig.

VAN 606 : Avian Anatomy **II** (Cr. Hrs. : 1+1)

Theory: Topographic and systematic Anatomy of the domestic fowl. Gross Anatomy of the bones, muscles, joints, nerves, the blood vascular system and visceral organs.

Practical: Gross study of the bones and viscera of domestic fowl. Dissection of the domestic fowl.

VAN 607: Anatomy of the dog and cat **I** **(Cr. Hrs. : 1+1)**

Theory: Topographic and systematic Anatomy of the dog and cat. Gross Anatomy of the bones, muscles, joints, nerves, the blood vascular system and visceral organs.

Practical: Gross study of the bones and viscera of dog and cat. Dissection of dog / cat.

VAN 608 : Anatomy of Laboratory mammals **I** **(Cr. Hrs. : 1+1)**

Theory: Gross anatomical study of the Rabbit, Guinea pig, Rat, and Hamster.

Practical: Gross study of the bones and viscera of Rabbit, Guinea pig, Rat, and Hamster. Dissection of Rabbit, Guinea pig, Rat, and Hamster.

VAN 609 : Neuroanatomy **II** **(Cr. Hrs. : 1+1)**

Theory: Gross and microscopic study of the central and peripheral nervous system.

Practical: Dissection of the brain, spinal cord and the peripheral nervous system of ox / buffalo and dog.

VAN 610* : Veterinary Histology **II** **(Cr. Hrs. : 2+2)**

Theory: Microscopy, Microscopic study of the different organs of the various systems in domestic animals and fowl.

Practical: Collection, preservation, processing and microtomy of specimens from various organs; Routine and special staining of sections; Study of different histological slides of the various organs.

VAN 611* : Developmental Anatomy **II** **(Cr. Hrs. : 1+1)**

Theory: Basic principles of embryology and organogenesis in birds and mammals.

Practical: Structural study of ova and sperm of the domestic animals and birds. Morphological and serial sectional study of typical avian and mammalian foetuses at various stages of development.

VAN 612 : Histological techniques **II** **(Cr. Hrs. : 1+1)**

Theory: Techniques in collection, fixing, processing of tissues and microtomy. Routine and special staining techniques used in histological and histochemical study of tissues.

Practical: Preparation of fixatives, processing of tissues, microtomy. Preparation of routine & special stains and staining for histological and histochemical studies.

VAN 613 : Radiological Anatomy **II** **(Cr. Hrs. : 1+1)**

Theory & Practical: Gross study of the bones and viscera of domestic animals. Study of normal radiographs of bones and organs of domestic mammals.

VAN 614 : Surgical Anatomy **I** (Cr. Hrs. : 1+1)

Theory & Practical: Topographical study and approach of various organs, vessels, nerves and other structures of the domestic animals.

VAN 680[#] : Special Assignment **II** (Cr. Hrs. : 0+1)

VAN 690[#] : Seminar **II** (Cr. Hrs. : 1+0)

VAN 700[#] : Research **(Cr. Hrs. : 0+30)**

REFERENCE BOOKS:

1. The Anatomy of the Domestic Animals- R. Nicle, A. Schummer, E. seiferie.
2. The Anatomy of the Domestic Animals- Septimus Sisson
3. Clinical Dissection Guide for Large Animals Horse and Large Ruminants-Georghe M. Contantinescu, Ileana A. Contantinescu
4. Primary Veterinary Anatomy- R.K. Ghosh.
5. Text Book of Veterinary Histology-H. Dieter Dellmann.
6. Atlas Of Histology-Victor P. Eroschenko.
7. Human Embryology- Inderbir Singh.
8. Essentials of Veterinary Embryology-R. K. Ghosh.
9. Medical Embryolgy-Jan Langman
10. The Embryolgy of Domestic animals, developmental Mechanisms and Malformations- Drew M. Noden, Alexander Delahunta.
11. Developmental Biology-Scott F. Gilbert.
12. A colour Atlas of Avian Anatomy-J. Mc Lelland.
13. A colour Atlas of the Buffalo Anatomy-H. P. Singh & K. S. Roy, ICAR Publication.
14. A colour Atlas of Clinical Anatomy of the Dog & Cat-J. S. Boyd.
15. A colour Atlas of basic distology-Irwin Berman.
16. A colour Atlas of Veterinary Anatomy of the Ruminants-Raymond, R. Ashdown, Stanley done.
17. Applied Veterinary Anatomy-Alexander De Lahunta, Robert E. Habel.
18. Applied Anatomy of the Domestic Animals-P. A. Ommer, K. R. Harshan.
19. applied Veterinary Histology-William J. Banks.
20. Colour Atlas of Veterinary Histology-William J. Bacha, Jr. Linda M. Bacha.
21. Histology- A Text and atlas-Michael, H. Ross. Gordon I. Kaye, Wojciech Pawlina.
22. Atlas of Feline Anatomy for Veterinarians-Hudson/ Hamilton.
23. Veterinary Neuro Anatomy and clinical Neurology-De. Lahunta.
24. Histological & Histochemical Methods- Theory & Practice-J. A. Kiernan.
25. Anatomy and Physiology of Farm Animals-R. D. Frandson, W. Leewilke, Anna Dee Fails.
26. Text book of Veterinary anatomy-Dyce . sack. Wensing

27. Comparative anatomy of the Vertebrates - George C. Kent.
28. Miller's Anatomy of the Dog
29. A colour atlas of Anatomy of small laboratory animals-P. Popesko, V. Rajtova, J. Horak.
30. Comparative Veterinary Histology-Elizabeth Aughey, Fredric L. Frye.
31. A Practical guide to Vertebrate Mechanics-Christopher Mc Gowan, Julian Mulock.
32. A Comparative Methods approach to the Study of Oocytes and Embryos-Joel. Richter.
33. Text book of Anatomy and Physiology-Anthony and Kolthoff.
34. Reproduction in Farm Animals-E. S. E. Hafez, B. Hafez.
35. Veterinary Obstetrics and Genital diseases.Stephen J. Roberts.
36. Veterinary Surgical Techniques-Amresh kumar
37. Congenital Malformations in Laboratory and Farm Animals-Kalman T. Szabo.
38. Vertebrate Embryology- Robert S. McEWEN.
39. Essentials of bovine Anatomy-K. M. Dyce and C. J. Wensing.

8. M.V.Sc. IN VETERINARY AND ANIMAL HUSBANDRY EXTENSION

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1	AHE601*	Fundamentals of Extension Education	2	0	2
2	AHE602*	Programme Planning for Livestock Development	1	2	3
3	AHE603*	Introduction to Psychology	1	1	2
4	AHE604*	Communication and Extension Teaching Methods	2	1	3
5	AHE605	Diffusion of Innovations	1	1	2
6	AHE606	Rural Sociology	1	1	2
7	AHE607	Training in Extension	1	1	2
8	AHE608*	Introduction to Social Research	2	1	3
9	AHE609	Rural Development Programmes	2	1	3
10	AHE610	Group Dynamics and Leadership	1	0	1
11	AHE611*	Extension Management	2	1	3
12	AHE612*	Developments in the Concepts of Extension	1	0	1
13	AHE613	Marketing of Livestock Products	1	0	1
14.	AHE680 [#]	Special Assignment	0	1	1
15.	AHE690 [#]	Seminar	1	0	1
16.	AHE700 [#]	Research	0	30	30

*Core courses: (17 Credits) [#] Compulsory

Minor Fields of Study

1. Livestock Production and Management (LPM)
2. Poultry Science (PSC)
3. Animal Nutrition (ANN)
4. Livestock Products Technology (LPT)
5. Veterinary Medicine (VMD)

AHE 601*: Fundamentals of Extension Education

I

(Cr. Hrs.: 2+0)

Theory: Extension education as a science, profession and its relationship with other professions; Genesis and growth of extension education in India and abroad; Concepts, Philosophy, Principles and Scope of extension education in Livestock development; Agricultural Extension and Veterinary Extension; Role of veterinarian as a Social scientist; Challenges and problems in promotion of veterinary extension in rural areas; Different approaches and models of extension.

AHE 602* : Programme Planning for Livestock Development

I

(Cr. Hrs. : 1+2)

Theory: Nature and importance of extension programme planning; Principles and process in developing extension programmes; Situation analysis, identifying problems and needs, determining priorities; Selected models of programme planning; Programme execution procedure, securing participation of livestock owners and various agencies in the development programmes; Planning Commission, Livestock development programmes under Five year Plans; Concepts of PERT, CPM, FSR.

Importance and types of evaluation; Criteria for evaluation of extension programmes; Steps in extension evaluation; Monitoring and its importance in extension programmes.

Practical: Situation analysis ;Identification of problems and needs related to livestock production- use of RRA and PRA techniques ;Preparation of livestock development programme in a village; Organisation of Campaigns/Exhibitions; Studies on impact of livestock development programmes

AHE 603* : Introduction to Psychology

I

(Cr. Hrs. : 1+1)

Theory: Orientation to Psychology, important branches and schools of thought; Sensation and Perception; Learning principles and theories; Principles and practices of effective adult learning, Intelligence- meaning and measurement; Frustration and adjustments; Attitude its concept, characteristics, formation and measurement; Personality - its concept and types; Aspiration- meaning and its importance in extension; Motivation - theories of motivation and techniques of motivating people; Understanding social psychology.

Practical: Measurement of attitudes – Thurstones, Likerts, Guttman scales etc.; Measurement of aspirations; Study of social interactions in a village situation.

AHE 604*: Communication and Extension Teaching Methods

I

(Cr. Hrs. : 2+1)

Theory: Concept and Scope of Communication; Functions and role of communication; Elements of communication process; Theories and models of communication; Types of communication; Important concepts associated with communication - feedback, distortion, fidelity, credibility and empathy; Problems and barriers in communication - social, cultural and psychological; Developmental communication; Communication and Social Change; Communication strategy for livestock development; Use of ICT for livestock development; Rapport building with clientele;

Classification of Extension teaching methods; Merits and demerits of various audio-visual aids used in Extension teaching; Teaching and learning process; Cone of experience; Selection and use of audio-visual aids.

Practical: Preparation and use of visual aids; Handling and use of Audio visual aids including Multimedia projector; Preparation of news stories, feature articles, TV and Radio scripts; Visit to AIR, TV stations; Photography; Field visits for group discussion, meetings, campaigns, method and result demonstrations

AHE 605 : Diffusion of Innovations **II** (Cr. Hrs. : 1+1)

Theory: Concept of diffusion; Elements in diffusion process, models and theories of diffusion; Innovation development process; Decision-making, Stages in diffusion-adoption process; Concepts and stages of adoption; Adoption models, Adopter categories and their characteristics; Factors influencing adoption, Attributes of innovations, rate of adoption and sources of information; Role of change agents in transfer of technology; Diffusion studies in Veterinary Extension.

Practical: Study of selected animal husbandry innovations- the adoption and non-adoption of various practices. Reasons for adoption and non-adoption of innovations.

AHE 606 : Rural Sociology **I** (Cr. Hrs. : 1+1)

Theory: Definition, concepts, scope and its relation with other social sciences including veterinary extension; concepts of social systems and social processes; Rural social systems Vs urban social systems; Concept of Eco-sociology: Livestock, Environment and Society; Social structure - groups, Social stratification, Culture and its influence on livestock development; Social institutions; Social change: Types, Factors and Indicators.

Practical: Study of rural social institutions; Study of social change with reference to livestock development; Patterns of livestock rearing.

AHE 607 : Training in Extension **II** (Cr. Hrs. : 1+1)

Theory: Concept of education, training and development in HRD for institutional effectiveness; Training of extension personnel and livestock owners in India; Assessment of HRD needs; Types and levels of training; Training strategies, models of training; Planning, development and execution of training and follow up; Various training methods; Supervision, monitoring and evaluation of training.

Practical: Assessment of training needs; Development and execution of a training programme; application of information and skill session; Evaluation of training programme.

AHE 608*: Introduction to Social Research

I

(Cr. Hrs.: 2+1)

Theory: Basic concepts and Philosophy of Science; Hypothesis and theories; Measurement and levels of measurement; Reliability and Validity of Measurements; Meaning and Purpose of Social Research; Selection of Research problems; Research Designs, Survey methods; Sampling methods; Sources of errors; Methods of data collection; Projective techniques, Content Analysis, Sociometry, Action Research; Data Processing and Report Writing; Review of studies in Social research; Social statistics – Parametric and Non parametric.

Practical: Selecting a research problem and working it out with all the steps; Report Writing and Presentation of the report.

AHE 609: Rural Development Programmes

II

(Cr. Hrs.: 2+1)

Theory: Concept of development, social and economic development; Historical overview on Rural Development in India; Various rural development programmes: the Concept, Objectives, Achievements and Constraints of various programmes viz. CD, NES, KVS, ICDP, OF, Technology missions; IRDP and associated programmes- NREP, RLEGP, JRY, TRYSEM etc. T & V system; Transfer of Technology Projects of ICAR – KVK, TTC and IVLP; Extension systems in SAUs and State Departments of Animal Husbandry; Panchayat Raj; Role of NGO in rural development with special emphasis on Livestock Development.

Practical: Study of rural development programmes in selected areas of Pondicherry; Identification and understanding the functioning of NGOs associated with livestock development.

AHE 610: Group Dynamics and Leadership

II

(Cr. Hrs.: 1+0)

Theory: Concept and types of groups; Typology and importance in rural development; Group structures - attraction, coalition, communication and power; Processes in group development and group identity; Factors affecting group performance; Conflicts in groups; Group belongingness. Concept, theories and styles of leadership; Scope and importance of local leaders and key communicators in livestock development.

AHE 611*: Extension Management

II

(Cr. Hrs. : 2+1)

Theory: Concept and Principles of management; Organisation and its structure, elements of management; Theories and models of management; Supervision- meaning, definition, scope; Work motivation, Coordination, organisational communication, Conflicts in organisation, Organisational climate, Organisational development, Personnel management in Livestock Development organisations; Functions of an administrator; Administrative processes, techniques and principles; Decision making process; Problems in administration; Project management.

Practical: Study of administrative concepts, set-up, Organogram, procedures and problems in a Livestock development department / organisation.

AHE 612*: Developments in the concepts of Extension **II** (Cr. Hrs. : 1+0)

Theory: Important concepts in Extension science; various schools of thought; Systems concept in Extension; Changing approaches - Bottom-up and Top down approaches; Global concepts of extension as applied to Indian Context; Recent trends in extension; Privatisation of Extension; Gender and livestock; Indicators of livestock sustainability.

AHE 613 : Marketing of Livestock Products **II** (Cr. Hrs. : 1+0)

Theory: Livestock Production and supply characteristics; Consumption of Livestock products and related demands; Types of Markets and trends in marketing of livestock products and by products; Corporate Bodies in regulating markets, Market boards, Cooperative agencies, internal and international trade organizations; Operation and sanitation of Milk, Meat, Poultry, Fish and Egg retailing units; Fast food chains and super markets; WTO.

AHE 680[#] Special Assignment **I** (Cr. Hrs.:0+1)

AHE 690[#] Seminar **II** (Cr. Hrs.: 1+0)

AHE 700[#] Research (Cr.Hrs.: 0+30)

REFERENCE BOOKS:

AHE 601*: Fundamentals of Extension Education **I** (Cr. Hrs.: 2+0)

Dahama OP & Bhatnagar OP. 1987. Education and Communication for Development. Oxford & IBH.

Mosher AT. 1978. An Introduction to Agricultural Extension. ADC.

Roling N. 1988. Extension Science. Information Systems in Agricultural Development. Cambridge Univ. Press.

Swanson BE. (Ed). 1984. Agricultural Extension: A Reference Manual. 2nd Ed. FAO.

Van den Ban AW & Hawkins HS. 1998. Agricultural Extension. Longman Scientific Tech.

Chambers R Rural Development, Longman group

Owen, E; Kitalyi A; Jayasuryia, N and Smith T.(Eds). 2005 Livestock and wealth creation – improving of the Husbandry of animals kept by resource poor people in developing countries. Nottingham University press, UK

Rivera, W.M. and Schram S.G. (Eds) 1987 Agricultural Extension World wide – issues, practices and emerging priorities. Croome Helm, London

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Rivera, W. M., and D. J. Gustafson (1991), (Eds.) Agricultural Extension: Worldwide: Institutional Evolution and Forces for Change, Amsterdam: Elsevier.

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Adams M.E. 1982 Agricultural extension in developing countries, Longman, Singapore publishers pvt. Ltd.

Burton, E.Swanson; Robert P Bentz and Andrew J. Sofranko 1997 Improving agricultural extension – a reference manual. FAO

AHE 602* : Programme Planning for Livestock Development I (Cr. Hrs. : 1+2)

Dantwala ML & Beroneda JN. 1990. Rural Development, Approaches and Issues in Indian Agricultural Development since Independence. Oxford & IBH.

Penders JMA. 1958. Methods and Programme Planning in Rural Extension. Veenman & Zonen.

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Sandhu, A.S. Programme planning .

AHE 603* : Introduction to Psychology I (Cr. Hrs. : 1+1)

Baron RA. 1995. Psychology. Prentice Hall.

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Secord P.F. and Backman C.W 1964 Social Psychology McGraw Hill Book Co, New York

Kagan J and Havemann E 1980 Psychology – An introduction, Harcourt Brace Javanovich Inc. New York.

AHE 604*: Communication and Extension Teaching Methods I (Cr. Hrs. : 2+1)

Ray GL. 1991. Extension, Communication and Management. Naya Prokash.

Rogers, Everett M & Shoemaker FF. 1971. Communication of Innovations: A Cross – Cultural Approach. The Free Press.

Roloft Michael F. 1981. Interpersonal Communication. Sage Publ.

Mcquail D and Windahl S. 1993 Communication models for the study of mass communications, Longman publishers, London

Servaes J; Thomas L Jacobson and Whitle A. Shirley (eds) 1997 Participatory communication for social change, SAGE Publications

Cragan, F.John and Wright W. David 1999 Communication in small groups – Theory, Process, Skills , Wadsworth Publishing co., London

Arnon, I. (1989) Agriculture Research and Technology Transfer. Elsevier Science Publishers Ltd., Essex, England.

Ramkumar S and Rao SVN 2004 Knowledge dissemination on cattle health through information kiosks in veterinary centres, RAGACOVAS, Pondicherry.

Arvind Singhal & Rogers E.M. 1989 India's information revolution, SAGE

Hass KB & Packer HQ. 1962. Preparation and Use of Audio-Visual Aids. Prentice Hall.

Priyanjam Kartik. 2005 Audio visual aids and Education, Dominant publishers Priyanjam Kartik.
2005 Audio visual aids and Education, Dominant publishers

AHE 605 : Diffusion of Innovations II (Cr. Hrs. : 1+1)

Brown Lawrence A. 1981. Innovation Diffusion: A New Perspective. Methuen.

Rogers , E.M 2003 Diffusion of innovations, Free Press, New York

Servaes J; Thomas L Jacobson and Whittle A. Shirley (eds) 1997 Participatory communication for social change, SAGE Publications

Cragan, F.John and Wright W. David 1999 Communication in small groups – Theory, Process, Skills , Wadsworth Publishing co., London

Mody Bella 1992. Designing Messages for Development Communication. An Audience Participation based Approach. Sage Publ.

Ray GL. 1991. Extension, Communication and Management. Naya Prakash.

AHE 606 : Rural Sociology I (Cr. Hrs. : 1+1)

Chitambar, J.B (1993). Introductory Rural Sociology.

Kuppuswamy,B. (1994). Social Change in India.

Indian Society of Agricultural Economics (1989). Livestock Economy of India.

Hans Raj (1992). Theory and Practice in Social Research.

Horton, P, B and Hunt C.L. 1984. Sociology. Mc Graw Hill International Book Company: London

Ramachandran V.K. and Madhura Swaminathan (Eds) Financial Liberalization and Rural Credit in India Tulika Books New Delhi

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Dore, C. V.1992A history of knowledge, Allan tine Books, New York Holt G.C. & Reed M. (Eds). 2006. Sociological perspectives of organic agriculture CAB international

A.P.J. Abdul Kalam. 2006. Evolution of Enlightened Societies Institute of Southeast Asian Studies.

A.P.J. Abdul Kalam, A. Sivathanu Pillai. 2005. Envisioning an empowered nation: Technology for societal transformation

AHE 607 : Training in Extension ***II*** ***(Cr. Hrs. : 1+1)***

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Lynton R and Pareek U 2000 Training for organizational transformation part I (for policy makers and change makers) and Part II (for trainers, consultants and principals) SAGE

Mishra DC. 1990. New Directions in Extension Training. Directorate of Extension, Ministry of Agriculture, Govt. of India, New Delhi.

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AHE 608*: Introduction to Social Research ***I*** ***(Cr. Hrs.: 2+1)***

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Henerson E.M; Morris, L.L. and Gibbon C.T. 1987 How to measure attitudes, SAGE

Edwards A. L. 1969 Techniques of attitude scale construction, Vakil, Feffer and Simons Pvt. Ltd. Bombay

Guilford J.P. 1971 Psychometric methods, TATA McGraw Hill, Bombay

Garrett H.E. 1966 Statistics in Psychology and education, International Book Bureau, Hyderabad.

Ranjit Kumar 1999 Research Methodology – a step by step for beginners, SAGE

Oppenheim A.N. 1979 Questionnaire design and attitude measurement, Heinemann Educational books ltd., London

AHE 609: Rural Development Programmes ***II*** ***(Cr. Hrs.: 2+1)***

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Mathialagan P. 2005. Text Book of Animal Husbandry and Livestock Extension. International Book Distributing Co.

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AHE 610: Group Dynamics and Leadership ***II*** ***(Cr. Hrs.: 1+0)***

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Napier R.W. and Gershenfeld M.K. 2006 Groups – Theory and experience, AITBS Publishers & Distributors, New Delhi

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AHE 611*: Extension Management ***II*** ***(Cr. Hrs. : 2+1)***

Buford JA, Bedeian AG & Lindner JR. 1995. Management in Extension. Ohio State Univ., USA.

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Keith Davis 2004 Human Behaviour, 8th ed.,

Dwivedi, R.S. 1979 Human Relations and organizational behaviour – a global perspective , 5th Ed McMillan India Pvt.Ltd.

AHE 612*: Developments in the concepts of Extension ***II*** ***(Cr. Hrs. : 1+0)***

Blackburn D.J. 1989 Foundations and changing practices in Extension, University of Guelph, Canada.

Roling N 1988 Extension Science, Cambridge University Press.

Jones G.E. (ed.) 1985 Investing in Rural Extension: Strategies and Goals. London: Elsevier

Seth Mira 2001 Women and Development – Indian Experience, SAGE

Samanta R.K.(Ed) Women in Agriculture – Perspectives, issues and experiences, MD Publications Pvt.Ltd., New Delhi

Ramkumar S; Garforth C ; Rao SVN and Waldie, K (Eds) 2001 Landless livestock farming – problems and prospects, RAGACOVAS , Pondicherry

Waldie, K and Ramkumar S 2002 Landless women and dairying – opportunities for development within a poverty perspective, RAGACOVAS, Pondicherry

Bura N; Deshmukh, J; Ranadive and Murthy K.Ranjani (Eds) 2006 Micro credit , poverty and empowerment – linking the triad, SAGE

AHE 613 : Marketing of Livestock Products ***II*** ***(Cr. Hrs. : 1+0)***

1. **Acharya, S. S & Agarwal N.L** (1994) Agriculture marketing in India, Oxford.
2. **Indian Society** (1989) Livestock Economy of India Agricultural Economics: Oxford and IBH Publications
3. **Singh, G.N. Singh .D.S & Ram Iqbal Singh** (1987) Agricultural Marketing in India: Chugh Publications
4. **M.B. Dastagiri 2004** Demand and Supply Projections for Livestock Products in India, National Centre For Agricultural Economics And Policy Research (ICAR) New Delhi, India March 2004

9. M.V.Sc. IN VETERINARY BIOCHEMISTRY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VBC601*	Cellular Biochemistry	1	0	1
2.	VBC602*	Chemistry of Biomolecules	2	1	3
3.	VBC603*	Enzymology	1	1	2
4.	VBC604	Biochemistry of Vitamins and Hormones	2	0	2
5.	VBC605	Mineral metabolism	1	0	1
6.	VBC606*	Intermediary metabolism	2	0	2
7.	VBC607	Biochemistry of specialized tissues	1	0	1
8.	VBC608*	Biochemical Techniques	1	2	3
9.	VBC609*	Molecular Biochemistry	2	0	2
10.	VBC610*	Molecular Techniques for Biochemical Research	1	1	2
11.	VBC611*	Clinical Biochemistry	2	1	3
12.	VBC680 [#]	Special Assignment	0	1	1
13.	VBC690 [#]	Seminar	1	0	1
14.	VBC700 [#]	Research	0	30	30

*Core Courses: (18 Credits) [#] Compulsory

Minor Fields of Study

1. Veterinary Physiology (VPY)
2. Veterinary Microbiology (VMC)
3. Veterinary Pharmacology and Toxicology (VPT)
4. Animal Genetics and Breeding (AGB)
5. Animal Nutrition (ANN)

VBC 601*: Cellular Biochemistry

I

(Cr. Hrs. : 1+0)

Theory: Cellular structures and Organisation - Prokaryotes and Eukaryotes - Structure and functions of Cell organelles - Cytoskeletal proteins and their functions - Intracellular distribution of enzymes and compartmentalization of metabolic reactions - Membrane Biochemistry - receptor - transport mechanism - Molecular basis of cell differentiation - cellular response to injury and related defense mechanism - Effect of Ionising radiations - Cell-cell interaction and adhesion proteins - General description of tissue and culture methods and their application. Cell division.

VBC 602*: Chemistry of Biomolecules

I

(Cr. Hrs. : 2+1)

Theory: Carbohydrates - Classification - Biological Significance - Structure, Properties and occurrence of the monosaccharide and their derivatives - Disaccharides - Oligosaccharides - Polysaccharides - Structure and classification - Structural analysis of polysaccharides – Glycoproteins - Lipids - Biological significance - Fatty acids - Structure, Properties and chemical reactions - Triacylglycerols - Structure - Phospholipids - Chemistry and Properties - Formation of monolayers and bilayers. Liposomes - Structure and their uses - Glycosphingolipids - Cerebrosides and Gangliosides - their importance - Derived lipids - Sterols, structure and function, Sterols present in animals, plants and fungi - Chemistry and importance of fatty acid derivatives - Prostaglandins, Thromboxanes and Leukotrienes.

Amino acids - Structure, classification, acid-base properties, stereoisomerism and chemical reactions.

Structure and geometry of peptide bond - Chemical synthesis of polypeptide - Biologically important peptides - Peptide antibiotics and hormones - Structure of proteins - Primary, Secondary, Tertiary and quaternary structure of proteins - Purification and Characterization of proteins.

Nucleic acids - Structure, Biological functions and Properties of nucleic acids - Structure of DNA and RNA - Isolation, Purification and characterization of nucleic acids - Acid base properties, Sedimentation behaviour, hyperchromic effect, melting of DNA - Chemical and enzymatic hydrolysis of nucleic acids - Base sequence analysis of DNA - Nucleic acid and Protein interaction.

Practicals: Isolation of liver glycogen and estimation - Isolation and estimation of Starch - Determination of Saponification and iodine value of lipids - Precipitation of proteins (Salt, Isoionic and solvent) - Different methods of protein estimation - Acid and Enzymic hydrolysis of proteins - N-terminal determination of proteins. Lipid extraction/ separation and estimation of lipid fractions .

VBC 603*: Enzymology

I

(Cr. Hrs. : 1+1)

Theory: Enzymes as biocatalyst - Specificity of the enzymes - Concepts of Activation energy and transition state - Nomenclature and classification of enzymes - co-enzymes, co-factors, active site, zymogen - holoenzyme -Mechanism of action of enzymes - Enzyme -

substrate complex- Enzyme kinetics - Factors affecting enzyme reaction - Line Weaver-burk plot, Michaelis - Menton constant - Enzyme inhibition - Competitive, non-competitive and uncompetitive inhibitors - Regulation of enzymes - Allosteric regulation - covalent modification - Intracellular localization of enzymes and marker enzymes - Isolation, purification and characterization of enzymes - Constitutive and inducible enzymes. Ribozymes.

Practical: Effect of temperature, pH and substrate on enzyme activity - Determination of Km value - Assay of enzymes - kinetic & fixed time coupled assay - Effect of Inhibitors on enzyme activity - Determination of specific activity of enzyme - Problems on kinetic and turnover.

VBC 604: Biochemistry of Vitamins and Hormones **I** **(Cr. Hrs. : 2+0)**

Theory: Vitamins - Definition - Differences between fat-soluble and water soluble vitamins. Chemistry and physiological forms - Metabolic and physiological functions - Active analogs, Inactive analogs - Mode of action - Deficiency diseases - Metabolic changes associated with hypo- and hyper-vitaminosis - Source of fat soluble and water soluble vitamins.

Hormones - an overview - classification based on chemical structure -Mechanism of hormone action - Chemistry and metabolic role/ physiological functions - deficiency diseases and regulation of synthesis of hormones of pancreas, Thyroid, Parathyroid, Adrenals, Sex organs, Pituitary and hypothalamus - Test for functional status of the endocrine glands.

VBC 605: Mineral Metabolism **I** **(Cr. Hrs. :1+0)**

Theory: Minerals - Major minerals (Ca, P, Mg, Na, K, S) - Minor minerals (Fe, Cu, Mn, F, I, Mo) - Absorption, Tissue Distribution and metabolism - Physiological and metabolic functions - Deficiency diseases.

VBC 606*: Intermediary Metabolism **I** **(Cr. Hrs. :2+0)**

Theory: Bioenergetics - Biological oxidation reductions - Carbohydrate metabolism - Major pathways - Glycolysis - Reactions, functions and its control - Metabolism of other sugars - Fructose, Galactose, Mannose and lactose - Pyruvate dehydrogenase and reactions of citric acid cycle - Regulation - Anaplerotic reactions - energetics of glucose oxidations. Alternate pathways of glucose metabolism - HMP pathway and its importance - glucuronic acid cycle - Gluconeogenesis - Substrates - pathway and control of amino sugar - Glycogen metabolism - Glycogenolysis and glycogenesis reactions - Enzymes and their regulation - Endocrine influence on carbohydrate metabolism.

Lipid metabolism - Lipid transport and storage - Plasma lipoproteins - Role of liver and adipose tissue in fat metabolism - Role of brown adipose tissue in thermogenesis - Catabolism of triacyl glycerols - Betaoxidation of fatty acids - Biosynthesis of triacylglycerols, phospholipids and cholesterol - Metabolism of Eicosanoids.

Metabolism of amino acids - Protein turnover - amino acid pools - catabolism of amino acids - Deamination, transamination, Excretion of nitrogen - urea cycle. Catabolism of carbon

skeletons of amino acids. Conversion of amino acids to specialized products. Biosynthesis of essential and non-essential amino acids.

Catabolism of purine and pyrimidine nucleotides/ deoxynucleotides - Biosynthesis of purine and pyrimidine nucleotides - Biosynthesis of nucleotide coenzymes - Inhibitors of purine and pyrimidine metabolism.

Biosynthesis of milk constituents.

Comparative ruminant metabolism - metabolism of nutrients by rumen microflora.

Metabolism of xenobiotics.

VBC 607: Biochemistry of specialized tissues

II

(Cr. Hrs. :1+0)

Theory: Liver - metabolic functions of liver - biotransformation - Muscle metabolism - muscle proteins - contraction of muscle - role of ATP - biochemistry of connective tissue - collagen, elastin and other fibrous proteins. Metabolism of adipose tissue - synthesis - uptake and esterification of fatty acid - lipolysis - mammary tissue - uptake and metabolism of nutrients in mammary tissue - Composition, structure and formation of cartilage, bone and teeth - Calcium and other factors affecting bone and teeth metabolism - Nervous tissue, its composition, metabolism and functions - Biochemistry of vision, taste and smell.

VBC 608* : Biochemical Techniques

II

(Cr. Hrs. : 1+2)

Theory: Theory and application of pH meter, Theory and application of spectrophotometer. Major components of a spectrophotometer and their function.

Flame photometry - Principle and application.

Mass spectrophotometry- Nuclear Magnetic Resonance Spectrophotometry.

Principle of Partition and adsorption chromatography - Paper, column and thin layer chromatography - gel filtration, Ion-exchange and affinity chromatography - Factors affecting chromatographic resolutions - Methods of preparation of biological samples for chromatographic analysis - Qualitative and quantitative chromatography of amino acids, lipids and sugars including elution and densitometry.

Gas liquid chromatography - High performance liquid chromatography - Theory and application.

Electrophoresis - theory and application - factors affecting migration of charged particles - electrophoresis of amino acids, proteins and nucleic acids - Variations of electrophoresis.

Southern, Northern and Western blotting - theory and application - *in situ* hybridization.

Centrifugation - theory and application - Ultra centrifugation.

Radioisotopes - Application – Autoradiography - Scintillation and Gamma counters.

Practical: Preparation of buffers - Isolation and purification of proteins - Desalting of proteins (Dialysis and gel-filtration) - Thin layer chromatography of carbohydrates and phospholipids - Polyacrylamide gel electrophoresis of proteins and its molecular weight determination - Agarose gel electrophoresis of nucleic acids - Differential and iso-pycnic centrifugation.

VBC 609*: Molecular Biochemistry

II (Cr. Hrs. :2+0)

Theory: DNA replication - Prokaryotes and Eukaryotes - Mode, Mechanism and regulation.

Transcription - Prokaryotes and eukaryotes - Process - Regulation - post-transcription modification - antibiotics which inhibit transcription.

Genetic code - concept of genetic code - deciphering of genetic code - characteristic features of genetic code - Codon and anticodon interaction (wobble hypothesis).

Translation - Prokaryotes and Eukaryotes - Activation of amino acids - Process of translation - Post-translational modification - Regulation - Drugs and inhibitors of protein synthesis.

Gene sequencing - Chemical and enzymatic method.

Regulation of gene expression - Prokaryotes and Eukaryotes.

VBC 610*: Molecular Techniques for Biochemical Research

II (Cr. Hrs. : 1+1)

Theory: Recombinant DNA technology - Process - Vectors - Restriction enzymes - Selection and propagation of recombinants - Polymerase Chain Reaction-method-Variety of types of PCR-DNA & RNA Probes - Anti sense RNA - *in situ hybridization*-RNA interference - Nucleic acid transfer - Southern & Northern Blots - Gene sequencing - Enzymatic and chemical methods-Sequence retrieval from Gene bank and sequence analysis - Methods of transgenic animal production and cloning.

Practical: DNA & RNA Isolation - Plasmid preparation - Restriction enzyme digestion-DNA cloning -Transformation & Selection of Recombinants - PCR and its variations-Development of DNA & RNA Probes-Southern & Northern Blots - cDNA synthesis-Gene expression.

VBC 611*: Clinical Biochemistry

II (Cr. Hrs. : 2+1)

Theory: Scope of clinical Biochemistry and its applications in disease diagnosis - Acquisition of Biochemical data in health and disease.

Disorders of carbohydrate metabolism - Blood glucose source - factors influencing blood glucose - Hyperglycemia - diabetes mellitus - Biochemical signs - Diagnostics tests - Glucose

tolerance tests - Hypoglycemia - Tests for hypoglycemia - Hypoglycemia in baby pigs - Bovine ketosis - pregnancy toxemia.

Disorders of lipid metabolism - disorders of lipoprotein metabolism - cholesterol metabolism and hypercholesterolemia - atherosclerosis - equine lipemia - canine hyperlipemia.

Liver function tests - indications and limitations - classification of tests - tests based on uptake and conjugation of organic anions -serum enzyme activities - specific biochemical tests.

Clinical enzymology - functional and non-functional plasma enzymes -enzyme assays - plasma enzymes of diagnostic importance - ALP, CK, LDH, AST, ALT, OCT - Iso-enzymes and their diagnostic importance.

Disturbance in water, electrolytes and acid-base balance - electrolyte abnormalities - respiratory acidosis and alkalosis - metabolic acidosis and alkalosis - compensation - role of kidney in regulation of acid base balance.

Urine analysis - physical characteristics - volume, color, acidity, pH, specific gravity - normal urinary constituents - pathological constituents and sediments.

Biochemical tests for kidney, thyroid, pituitary and adrenal cortical diseases.

Clinical significance of cerebrospinal fluid analysis

Practical: Examination of Blood and urine samples for disease diagnosis - Glucose, Cholesterol, Uric acid, Urea, Haemoglobin A_{1C}, Alkaline phosphatase, Aspartate transaminase, Alanine transaminase, Lactate dehydrogenase and iso-enzymes.

VBC 680[#]: Special Assignment **II** (Cr.Hrs.: 0+1)

VBC 690[#]: Seminar **II** (Cr.Hrs.: 1+0)

VBC 700[#]: Research (Cr.Hrs. 0+30)

REFERENCE BOOKS:

1. **Principles of Gene Manipulation** – An introduction to genetic Engineering. V edition. 1994. R. W. Old & S. B. Primrose. Published by Blackwell Science ltd. Berlin.
2. **Molecular Biology of the Cell**. IV edition. 2002. Bruce Alberts; Alexander Johnson; Julian Lewis; Martin Raff; Keith Roberts & Peter Walter. Published by Garland Sciences. Taylor & Francis group, New York.
3. **Harper's Biochemistry**. XXV edition. 2002. Robert K. Murray; Daryl K Granner; Peter A. Mayes & Victor W. Rodwell. Published by McGraw – Hill Health professions Division, London.
4. **Textbook of Biochemistry**. IV edition. 1974. Edward Staunton West; Wilbert R. Todd; Howard S. Manson & John T. Van Brugeen. Published by Oxford and IBM publishing co. Pvt. Ltd., New Delhi.

5. **Biochemistry**. V edition. 2002. Jeremy M. Berg; John L. Tymoczko & Lubert Stryer. Published by W. H. Freeman & company, New York.
6. **Biochemistry**. II edition. 1995. Donald Voet & Judith G. Voet. Published by John Wiley & Sons. Inc., New York.
7. **Lehninger Principles of Biochemistry**. IV edition. 2005. David L. Nelson & Michael M. Cox. Published by Wily Freeman & Company, New York.
8. **Molecular Biology of the Gene**. V edition. 2004. James D. Watson; Tania A. Baker; Stephen P. Bell; Alexander Gann; Michael Levine; Richard Losick. Published by Pearson Education. (Singapore) Pte. Ltd. New Delhi (branch).
9. **Molecular Biotechnology – Principles and Applications of Recombinant DNA**. III edition. 2003. Bernard R. Glick & Jack J. Pasternak. Published by ASM Press, Washington.
10. **Molecular Cell Biology**. V edition. 2004. Lodish; Berk; Matsudaira; Kaisel; Krieger; Scott; Zipursky & Darnell. Publised by W. H. Freeman & company, New York.
11. **The Cell – A Molecular Approach**. II edition. 2000. Geoffrey M. Cooper. Published by ASM Press, Washington.
12. **Mc Donald’s Veterinary Endocrinology & Reproduction**. V edition. 2003. Ed. By Mauricio H. Pineda & Michael P. Dooley. Published by Iowa state Press- A Blackwell Publish company, Iowa..
13. **Introduction to Biotechniques – PCR**. II edition. 1997. C. R. Newton & A. Graham. Published by BIOS Scientific Publishers ltd. Oxford.
14. **Methods in Molecular Biology**. Volume 132. **Bioinformatics – Methods & Protocols**. Ed. By Stephen Misener & Stephen A. Krawetz. Published by Human Press, New Jersey.
15. **Molecular Cloning (3 Volumes) – A laboratory Manual**. III edition. 2001. Joseph Sambrook & David. W. Russell. Published by Cold Spring Harbor Laboratory Press, New York.
16. **Enzymes – Biochemistry, Biotechnology, Clinical Chemistry**. 2004. Trevor Palmer. Published by Affiliated East-West press private ltd., New Delhi.
17. **Enzyme Kinetics – A Modern Approach**. 2003. A. G. Marangoni. Published by A. John Wiley & sons. Inc. publication. New Jersey.
18. **Biochemical methods – A concise Guide for students & researchers**. 2002. A. Pingoud; C. Urbanke; J. Hoggett & A. Jeltsch. Published by Wiley – VCH.
19. **Physical Biochemistry – Application to Biochemistry & Molecular Biology**. II edition. 1982. David Freifelder. Published by W. H. Freeman & Company, Oxford.
20. **Clinical Biochemistry of Domestic Animals**. V edition. 1997. Jerry J. Kaneko; John W. Harvey & Michael L. Bruss. Published by Academic Press, California.
21. **Clinical Biochemistry -Metabolic and Clinical Aspects**. 1995. Ed. by William J. Marshall & Stephen K. Bangert. Published by Churchill Livingstone, New York.

* Latest editions may be followed.

10. M.V.Sc. IN VETERINARY MEDICINE

Sl. No	Course No	Course Title	Credits		Total credits
			T	P	
1.	VMD 601*	Internal Medicine of farm animals – I	2	1	3
2.	VMD 602*	Internal Medicine of farm animals – II	2	1	3
3.	VMD 603	Production and deficiency diseases of farm animals	2	1	3
4.	VMD 604	Canine Gastroenterology	2	0	2
5.	VMD 605	Canine Dermatology	2	0	2
6.	VMD 606	Canine Cardiology	1	1	2
7.	VMD 607*	Infectious diseases of farm animals- I	2	1	3
8.	VMD 608*	Infectious diseases of farm animals- II	2	1	3
9.	VMD 609*	Avian diseases	1	1	2
10.	VMD 610	Canine and Feline Medicine	2	1	3
11.	VMD 611	Infectious diseases of swine	1	1	2
12.	VMD 612	Veterinary Jurisprudence and forensic medicine	1	0	1
13.	VMD 613	Veterinary Hospital management	2	0	2
14.	VMD 614*	Clinics –I	0	1	1
15.	VMD 615*	Clinics-II	0	1	1
16.	VMD 680#	Special Assignment	0	1	1
17.	VMD 690#	Seminar	1	0	1
18.	VMD 700#	Research	0	30	30

* Core courses -16

Compulsory

Minor fields of Study

1. Veterinary Microbiology (VMC)
2. Veterinary Pathology (VPP)
3. Veterinary Pharmacology and Toxicology (VPT)
4. Veterinary Surgery and Radiology (VSR)
5. Veterinary Biochemistry (VBC)

VMD 601*: Internal Medicine of farm animals-I **I** **(Cr. Hrs.:2+1)**

Theory: Etiology, Pathogenesis, symptoms, diagnosis and treatment of various systemic diseases affecting digestive, respiratory and cardiovascular systems of farm animals.

Practical: General examination of various systems of the body for diagnosis. Collection and laboratory examination of rumen liquor, Examination of various secretions and excretions for diagnosis. Percussion and Auscultation of lung and cardiac areas, liver biopsy and other liver function tests. Pancreatic function tests. ECG and its interpretation, Echocardiography. Collection of clinical materials like faeces, blood and serum for laboratory diagnosis. Clinical case records with respect to above diseases.

VMD 602* Internal Medicine of Farm animals-II **II** **(Cr.Hrs. ; 2+1)**

Theory: Etiology, Pathogenesis, symptoms and general principles of diagnosis and treatment of various diseases of urinary, mammary and integumentary systems of farm animals. Nephrosis, Nephritis, Cystitis, renal failure (Acute and chronic) diseases of lower urinary tract, diseases of mammary gland (mastitis, thelitis) including dry udder therapy. Diseases of skin and its appendages – dermatitis, eczema, parakeratosis, hyperkeratosis, pyoderma and dermatomycoses etc.

Practical: Examination/palpation of kidneys in animals, Renal function tests, Collection of urine for various laboratory tests in farm animals. Detailed examination of milk for various abnormal constituents in mastitis. Collection and examination of skin scrapings for diagnosis of various skin disorders including skin biopsy.

VMD 603 : Production and Deficiency Disease of Farm animals **(Cr.Hr. 2 + 1)**

Theory: Compton's metabolic profile testing programme, mini metabolic profile test, etiology clinical signs, pathogenesis, diagnosis treatment and control of various metabolic/production diseases viz. milk fever, ketosis, pregnancy toxemia, fat cow syndrome, hypomagnesemia, eclampsia, Nutritional haemoglobinuria and azoturia, diabetes, hypothyroidism; diseases due to deficiency of various minerals (Ca, P, Mg, Fe, Mn, Co, Zn, Se and Cu) and Vitamins (fat soluble and B complex) in different farm animals.

Practical: clinical examination of patients suffering from diseases. Estimation of Ca, Mg, P, Total proteins and minerals in blood/serum and interpretation in clinical cases.

VMD 604: Canine Gastroenterology **I** **(Cr. Hrs: 2 + 0)**

Theory: Clinical approach to gastro-intestinal disorders – General principles of dysfunction and treatment –Fluid and electrolyte therapy – Diseases of

oropharynx – salivary glands – oesophagus and diseases of swallowing – diseases of stomach – vomiting – diseases of intestine – small bowel and large bowel diarrhoea – diseases of liver and biliary system – diseases of exocrine pancreatic diseases – pancreatic and liver function tests, ano – rectal diseases.

VMD 605: Canine Dermatology

(Cr. Hrs: 2 + 0)

Theory : Structure and function of canine skin – fundamentals of dermatologic diagnosis – dermato pharmacology – principles of treatment of dermatologic diseases – allergic diseases – parasitic diseases – bacterial diseases – fungal and rickettsial diseases – endocrinopathies (hypothyroidism, hyperadrenocorticism, diabetes mellitus, growth hormone – dependent syndromes), cutaneous neoplastic and cystic diseases – nutritional disorders – congenital hereditary syndromes (genodermatoses).

VMD 606: Canine cardiology

II

(Cr. Hrs: 1 + 1)

Theory: Special features of structure and functions of heart – special examination of cardiovascular system – auscultation of heart sounds and phonocardiography, angiocardiology, cardiac catheterization – congestive heart failure, peripheral circulatory failure and miscellaneous conditions affecting cardiovascular system – cardiac emergencies and their management.

Practical: Physical methods of examination – percussion – Auscultation – blood pressure monitoring – Recording of ECG and its interpretation – echocardiography – its interpretation – cardiac catheterization – Radiological examination of the heart.

VMD 607* : Infectious diseases of farm animals I

I

(Cr. Hrs: 2 + 1)

Theory: Principles of host parasite relationship; mechanism of infection and resistance, incidence, etiology, epidemiology, pathogenesis, transmission, clinical findings, clinical pathology, diagnosis, treatment, prevention and control of diseases caused by bacteria, rickettsia and fungi in cattle, sheep and goat.

Practical: Collection, preservation and dispatch of clinical samples, (blood, urine faeces, biopsy or other body fluids etc) from diseased and healthy bovine, equine, ovine and Caprine population for laboratory examination for bacteria, rickettsia and fungi. Various diagnostic tests and prevention measures against bacterial, rickettsial and fungal diseases of farm animals.

VMD 608*: Infectious diseases of farm animals II

II

(Cr. Hrs: 2 + 1)

Theory: Incidence, etiology, epidemiology, pathogenesis transmission, clinical findings, clinical pathology, diagnosis, treatment, prevention and control of diseases caused by virus, protozoa and endo and ecto parasites in cattle, sheep and goats.

Practical: Collection, preservation and dispatch of clinical samples from farm animals suffering from viral, protozoan, endo and ecto parasitic diseases. Various diagnostic tests and preventive measures against viral, protozoan, endo and ecto parasitic diseases.

VMD 609*: Avian Diseases **I** **(Cr. Hrs: 1 + 1)**

Theory: Incidence, etiology, epidemiology, pathogenesis transmission, clinical findings, clinical pathology, post mortem lesions, treatment, prevention and control of infectious diseases of poultry caused by bacteria, virus, rickettsia, fungi, protozoa, ecto and endo parasites.

Practical: Visits to various poultry farms; diagnostics tests and preventive measures against infectious diseases of poultry.

VMD 610: Canine and Feline Medicine **II** **(Cr. Hrs: 2 + 1)**

Theory: Incidence, etiology, epidemiology, pathogenesis transmission, clinical findings, clinical pathology, diagnosis, treatment, prevention and control of infectious diseases of dogs and cats caused by bacteria, virus, rickettsia, fungi, protozoa, ecto and endo parasites.

Practical: Attending clinical cases of infectious disease in dogs and cats. Collection of clinical material from dogs and cats for laboratory examination. Various diagnostic tests, treatments and preventive measures for infectious diseases of dogs and cats.

VMD 611: Infectious diseases of Swine **I** **(Cr. Hrs: 1 + 1)**

Theory: Incidence, etiology, epidemiology, pathogenesis, transmission, clinical findings, clinical pathology, Diagnosis, treatment, prevention and control of infectious diseases of Swine caused by bacteria, Virus, rickettsia, fungi, protozoa, endo- and ecto-parasites.

Practical: Collection, preservation and dispatch of clinical samples from pigs suffering from viral, protozoan, endo and ecto parasitic diseases. Various diagnostic tests, treatment trial and preventive measures for infectious diseases of swine.

VMD 612: Veterinary Jurisprudence and forensic medicine **I** **(Cr. Hrs: 1 + 0)**

Theory: Legal duties of veterinarians, evidence procedure in courts, common offences against animals, legal aspects of examination of injuries, soundness and rules for veterolegal P.M. examination. Collection and dispatch of materials for examination in the forensic lab, forensic medicine laws. Veterolegal aspects of death, provisions in the Indian penal code 1860(45 of 1860) relating to animals. Laws relating to adulteration of drugs. Several central and provincial Acts relating to animals. Prevention of cruelty to animals Act and role of SPCA, code of

conduct and ethics for vets. The regulations made under Indian Veterinary Council Act, 1984 (No.52 of 1984)

VMD 613: Veterinary Hospital Management **I** (Cr. Hrs: 2 + 0)

Theory: History of Veterinary Medicine, Hospital management, Hospital design, planning and administration, sanitation and maintenance of hospital equipments, clinical ethology, Animal nursing, including nutrition of sick animals, Veterinary medical data programme use of computers for data processing and Veterinary practice management.

VMD 614*	Clinics –I	I	(Cr. Hr.:0+1)
VMD 615*	Clinics-II	II	(Cr. Hr.:0+1)
VMD 680#	Special Assignment	II	(Cr. Hr.:0+1)
VMD 690#	Seminar	II	(Cr. Hr.:1+0)
VMD 700#	Research		(Cr. Hr.:0+30)

REFERENCE BOOKS:

1. Radostitis, O.M., Gay, C.C., Blood, D.C. and Hinchcliff, K.W. 2000. *Veterinary Medicine. A textbook of the Disease of Cattle, Sheep, Pigs, Goats and Horses.* IX edn. Book Power – WB Saunders, London, U.K.
2. Geo. F. Boddie. 2000. *Diagnostic Methods in Veterinary Medicine.* 5th edn. Greenworld Publishers, Lucknow.
3. Craig. E. Greene. 1998. *Infectious Diseases of the Dog and Cat.* 2nd edn. W.B. Saunders Company, London, U.K
4. Ettinger, S. J and Feldman E.C .2000. *Text book of Veterinary Internal Medicine.* 5th Edn. Vol1. W.B. Saunders, London,U.K
5. Amalendu Chakrabarti. 1988. *A textbook of Preventive Veterinary Medicine.* Kalyani Publishers, New Delhi.

11. M.V.Sc. IN VETERINARY MICROBIOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VMC601*	General Bacteriology	2	1	3
2.	VMC602	Techniques in Bacteriology	1	2	3
3.	VMC603	Bacterial Physiology	1	0	1
4.	VMC604*	Systematic Bacteriology	3	1	4
5.	VMC605	Pathogenic Anaerobes	1	1	2
6.	VMC606	Clinical Bacteriology	1	1	2
7.	VMC607	Bacterial Genetics	2	0	2
8.	VMC608	Bacterial Pathogenesis	1	0	1
9.	VMC609	Antimicrobial Agents	1	1	2
10.	VMC610	General Mycology	1	1	2
11.	VMC611	Clinical Mycology	0	1	1
12.	VMC612*	Systematic Mycology	1	1	2
13.	VMC613*	General Immunology	2	1	3
14.	VMC614	Clinical Immunology	2	1	3
15.	VMC615	Biological Products	2	1	3
16.	VMC616*	General Virology	2	1	3
17.	VMC617	Virological Techniques	2	2	4
18.	VMC618*	Systematic Virology	2	1	3
19.	VMC680 [#]	Special Assignment	0	1	1
20.	VMC690 [#]	Seminar	1	0	1
21.	VMC700 [#]	Research	0	30	30

*Core Courses : (18 Credits)

[#] Compulsory

Minor Fields of Study:

1. Veterinary Pathology (VPP)
2. Veterinary Medicine (VMD)
3. Veterinary Public Health & Epidemiology(VPH)
4. Veterinary Biochemistry (VBC)

VMC 601*: General Bacteriology

I (Cr. Hrs.: 2 + 1)

Theory: History, Distribution, morphology and cytology of bacteria; growth, reproduction and cultivation - Bacterial metabolism, respiration and physiology, isolation and identification. Effects of physical and chemical agents. Association of bacteria - bacterial variation - pathogenicity and virulence. Infection, Koch's postulates. Sterilization, antiseptics and disinfectants. Bacterial antigens - General classification of microorganisms - International rules of nomenclature as applied to bacteria - Problems of classification, review of the classification followed in Bergey's Manual of determinative Bacteriology. Study of representative forms of Bacteria.

Practical: Preparation of simple, compound, differential and special stains used in Bacteriology. Staining of bacteria using various methods. Preparation of common media used for cultivation of bacteria. Study of bacteria based on morphological and staining characters - colonial, biochemical, physical and antigenic character - Antibioqram, phage typing, bacteriocin typing etc. Principles of microscopy - various microscopes used in bacteriology.

VMC 602: Techniques in Bacteriology

I (Cr. Hrs. : 1 + 2)

Theory: Common Instruments used in Bacteriology laboratory - micrometry; Principles of staining, various staining techniques. Preparation of different culture media, sterilization of media; biological products, glass wares and instruments. Experimental bacteriology - emphasizing methods used in study of pathogenic bacteria. Functions of various ingredients of culture media. Stock culture methods, microbiological assay, isolation, identification and study of morphology, physiology and nutrition of bacteria.

Practical: Detailed study of working of various instruments used in bacteriology. Isolation of bacterial organisms in pure culture and their identification using morphological and staining characters, biochemical and physiological characters. Serology, antibiogram; phage and bacteriocin sensitivity and pathogenicity, collection, preservation and transport of clinical specimens for diagnostic purpose. Microscopy, micrometry and special staining techniques.

Use of experimental animals in identification of bacteria and diagnosis of diseases. Inoculation and blood collection techniques.

Antibiogram - different techniques agar dilution and agar diffusion. Preparation of stock cultures of bacteria.

Detection of modes of drug resistances transfer conjugation - transfer of R - plasmids etc.

VMC 603: Bacterial Physiology

I (Cr. Hr. : 1 + 0)

Theory: General principles of intermediary metabolism - enzymes, co-enzymes and their reaction. Biological oxidation - storage and utilization of energy - role of metabolism in biosynthesis and growth - specialized aspects of microbial metabolism - usefulness in identification and classification of microorganisms.

VMC 604*: Systematic Bacteriology

II (Cr. Hrs.: 3 + 1)

Theory: Systematic study of bacteria pathogenic to animals and birds - definition, morphology, cultural and biochemical properties, Pathogenesis, immunology, epidemiology, and control of pathogenic bacteria of the species Campylobacter, Pseudomonas, Brucella, Bordetella, Francisella, Escherichia, Salmonella, Shigella, Klebsiella, Enterobacter, Serratia, Proteus, Yersinia, Vibrio, Haemophilus, Pasteurella, Actinobacillus, Bacteroides, Neisseria, Micrococcus, Staphylococcus, Streptococcus, Bacillus, Clostridium, Lactobacillus. Listeria, Erysipelothrix & Corynebacterium. Systematic study of bacteria under the genus Actinomyces, Mycobacteria, Nocardia, Treponema, Borrelia, Leptospira, Rickettsia, Coxiella, Chlamydia, Mycoplasma, Acholeplasma, and Ureplasma. Role of bacteriophages in classification and identification of bacteria, drug resistance and pathogenicity of bacteria.

Practical: Isolation of gram +ve and gram -ve bacteria from disease conditions in animals/birds. Identification of the isolate using various techniques. Special methods of cultivation of bacteria. Maintenance of cultures and preservation of bacteria. Study the morphological, cultural, biochemical, antigenic and pathogenic characters of the given Mycobacteria. Isolation of Leptospira and Mycoplasma from normal/diseased animals and birds. Dark ground illumination and phase contrast techniques. Preservation and maintenance of cultures.

VMC 605: Pathogenic Anaerobes

I (Cr. Hrs.: 1 + 1)

Theory: Introduction to pathogenic anaerobes - classification, general description of the groups, cultural and biochemical studies and diseases produced by them. Anaerobic methods of cultivation - anaerobic types and nature of media - toxins produced by anaerobes - immunity to infections - antitoxins and vaccines.

Practical: Preparation of culture media for anaerobic bacteria. Anaerobic methods of cultivation - anaerobic jars, gas pack systems, anaerobic chambers etc. Demonstration of toxin producing capacity of anaerobic organisms. Identification of anaerobic bacteria and their toxins.

VMC 606: Clinical Bacteriology

I (Cr. Hrs.: 1 + 1)

Theory: Practical exercises in diagnostic bacteriology - Methods of collection, preservation and dispatch of clinical materials for microscopical, cultural and serological examination. Isolation of bacteria from clinical cases, their antibiogram and interpretations.

Practical: Collection, preservation and dispatch of clinical materials for diagnosis of disease isolation of the aetiological agent. Antibiogram of the isolates serological tests for diagnosis of bacterial infection - Use of experimental animals in clinical bacteriology, routes of inoculation - collection of specimens, blood separation, processing and preservation of sera for diagnosis of bacterial diseases.

VMC 607: Bacterial Genetics

I

(Cr. Hrs.: 2 + 0)

Theory: Bacterial genetic material; Bacterial variation; phenotypic- and genotypic. Mutation and Mutagenesis; Types of bacterial mutants; Detection of mutants. Nature of DNA alteration; Properties of some common mutagenic agents. Plasmid; Conjugative and non-conjugative plasmid; Fertility plasmid, antimicrobial resistance, plasmid, colicin plasmid.. Transposing elements; insertion sequences, transposons, bacteriophage.

Gene transfer (a) Conjugation; Mechanism; transfer of DNA, plasmid and chromosome, repression of transfer genes, incompatibility Transformation: Mechanism; Physiological and artificial Transformation; Transduction Mechanism. generalised and specialised transduction. Recombination mechanism, reciprocal, non-reciprocal, and illegitimate recombination.

VMC 608: Bacterial Pathogenesis

II

(Cr. Hrs.: 1 + 0)

Theory: Introduction; Entry of Microbes in the body; growth in the Epithelium and inflammation; Encounter with the phagocytic system; spread of the microbes and generation of immune response; virulence mechanism of microbes and the host tissue injury; Mechanism of fever; Recovery from infection; Elimination of the microbes; pathogenesis of the following important bacterial diseases of livestock. Tuberculosis, Haemorrhagic septicaemia, Black quarter, Johne's disease, Brucellosis and Mycoplasmosis.

VMC 609: Antimicrobial Agents

II

(Cr. Hrs.: 1 + 1)

Theory: History and development of antimicrobial agents. Standardization of disinfectants - Mechanism of action of antimicrobial drugs. Drug resistance - drug dependence – *in-vivo* and *in-vitro* antimicrobial activity. Drug parasite relationship, host parasite relationship, Antibiotic synergism and antagonist. Chemoprophylaxis, Titration of antimicrobial agents in body fluids, Antiviral drugs, their development and mechanisms of action.

Practical: Standardization of disinfections - Ridealwalker test, Chick Martin test, Antibiogram of bacteria - agar dilution and agar diffusion methods. Assay of antibiotics in blood and other tissue fluids. Preparation of antibiotic sensitivity discs - Methods of detection of transfer of drug resistance between various strains and species of bacteria.

VMC 610: General Mycology

I

(Cr. Hrs.: 1 + 1)

Theory: Scope and historical development of Mycology, Glossary, Morphology of fungi, Reproduction, growth and nutritional requirement of fungi, classification of fungi.

Practical: Mycological media preparation, sterilization, safety in Mycology Lab., Stains & staining, fungal growth patterns, processing & maintenance of fungal cultures. Reproductive structures of fungi.

VMC 611: Clinical Mycology

II (Cr. Hrs.: 0 + 1)

Practical: Collection and processing of clinical specimen, slide culture technique, cover slip culture, Carbohydrate fermentation test. Isolation and identification of fungal isolates. Morphological and cultural studies of the following fungi: Dermatophytes, Sporotrichum, Penicillium, Aspergillus, Rhinosporidium, Candida, Sacchromyces, Alternaria, Rhizopus, Fusarium, Mucor, Absidia, Cryptococcus sp.

VMC 612*: Systematic Mycology

I (Cr. Hrs.: 1 + 1)

Theory: Systemic studies - Classification, morphology, cultural characters, pathogenicity, symptoms, diagnosis, treatment and control of dermatophytosis, Rhinosporidiosis, Epizootic lymphangitis, Sporotrichosis, Mycotic mastitis, Aspergillosis, Candidiasis, Cryptococcosis, Histoplasmosis, Mycotic abortion, Blastomycosis, Coccidioidomycosis.

Practical: Cultivation of pathogenic fungi based on morphology and cultural characteristics, examination of direct mounts, strains and staining methods, preservation of stock cultures, antimycotic susceptibility testing and sero diagnosis of fungal infections of man and animals.

VMC 613*: General Immunology

II (Cr. Hrs.: 2 + 1)

Theory: Types of immunity - natural, acquired, adaptive Nonspecific defense mechanisms of the body. Immune system - cells and tissues - anatomy and histology, Cellular interactions. Cell differentiation and mitogens. Antigens - various types, characteristics of antigens. Immunoglobulins - structure, properties and functions. Classification, phylogeny and ontogeny of immune system.

Synthesis of antibody, genetics of immune responses, secondary responses, adjuvants, immunopotential, immune tolerance, immuno-suppression - Various methods of detection of humoral immune responses in an animal. Cell mediated immunity *in-vitro* and *in-vivo* tests of CMI reactions. Complement system. Histo-compatibility antigens, tumour immunology, immune deficiencies and autoimmune disease.

Practical: Identification of organs of immune system - primary and secondary. Handling of laboratory animals. Inoculation of rabbits/mouse with one of the antigens - bacteria/virus bovine serum/sheep RBC with or without adjuvant at different intervals. Collection, processing and preservation of sera for electrophoresis immunoelectrophoresis, two dimensional and rocket electrophoresis. Separation of peripheral blood lymphocytes and identification of subpopulations by rosette technique. Detection of antibodies in serum and body fluids by agglutination, precipitation and complement fixation.

Use of immunoperoxidase and counter immunoelectrophoresis for detection of antigens. Skin hypersensitivity tests and passive cutaneous anaphylaxis.

VMC 614 : Clinical Immunology

II (Cr. Hrs. : 2 + 1)

Theory: Clinical laboratory methods for detection of antigens, antibodies and cellular immune functions - principles and applications, Quantification and characterization of immunoglobulins, Separation and purification of lymphocytes and mononuclear phagocytes and other effector cells from blood, lymph nodes, spleen and bone marrow, Lymphokines, Mononuclear phagocytes and myeloid system in defence and their functional tests, Common tests used in diagnosis of microbial and parasitic diseases, Haemagglutination and its inhibition, Neutralization and protection test, Immunodeficiency and autoimmunity.

Practical: Preparation of antigen from fluid, Raising of antisera in rabbits, immunodiffusion, Precipitation, Radial immunodiffusion, Complement fixation, Delayed hypersensitivity reaction, Separation of leukocyte from blood of domestic animals for leukocyte/macrophage migration test.

VMC 615: Biological Products

II (Cr. Hrs.: 2 + 1)

Theory: Theories and principles of acquired immunity. Types of vaccines - Criteria to be taken into account while developing a vaccine strains from virulent strains; inactivated vaccines - advantages and disadvantages. Methods of establishing immunity - modern trends - Preparation, purification and standardization of biological products. Preparation of hyperimmune sera for therapeutic and research purpose. Methods of conferring immunity to common bacterial, viral and parasitic diseases - freeze drying.

Practical: Isolation of organism in pure cultures - and their identification. Methods of attenuation and inactivation of microorganism and viruses. Preparation of auto-vaccines; bacterins and attenuated - live viral vaccine form the given seed virus. Safety and potency tests. Freeze drying, preservation and dispatch of vaccines.

Preparation of hyperimmune serum and its standardization. Preparation of antigens and antisera for diagnostic purposes.

VMC 616*: General Virology

I (Cr. Hrs.: 2 + 1)

Theory: History and development of Virology. Definition and evolution of virus - Structure - Chemical composition, biophysical properties, cultivation, concentration and purification of viruses. Isolation and identification of unknown viruses.

Taxonomy of viruses - Basis of virus classification, various criteria used for classification - General features of various families of viruses; viruses classified as unclassified. Virions and prions. Replication of viruses, various stages, cell virus interactions, - pathogenesis, perpetuation of viruses and viral immunity - Viral interference and interferons. Chemotherapy and chemoprophylaxis. Immunoprophylaxis, viral vaccines, various types. Bacteriophages, their characteristics, replication and classification.

Practical: Various equipments used in virology, their handling and working. Importance of special treatments of glasswares, instruments and materials used in virological studies. Techniques used in the propagation of viruses in the laboratory.

Animal inoculation - various routes of inoculation - collection and preservation of specimens for virus isolation.

Chick embryo inoculation - candling, harvesting of materials - detection of virus in the harvested samples.

Inoculation of monolayer cultures with different virus - identification by CPE, HA, haemadsorption etc. Commonly employed serological tests for diagnosis of viral infections - haemagglutination inhibition, Agar gel diffusion; passive haemagglutination and complement fixation.

VMC 617 : Virological Techniques

II (Cr. Hrs. : 2 + 2)

Theory: Collection, preservation and transport of specimens for virus isolation. Various methods of virus cultivation - chick embryo inoculation; cell culture methods and experimental animal inoculation. Virus purification - various methods and concentration. Methods of characterization of viruses - physical and chemical properties. Electron microscopy - Principles and applications in virology. Processing of specimens of ultra thin sections and direct EM examination by negative staining. Immune electron microscopy in diagnosis of virus infections. Applications of scanning electron microscope in virology. Various serological tests for specific identification of viruses.

Practical: Laboratory design, cleaning of glasswares, their drying and processing for sterilization; Preparation of various buffers and media used in virology; Preparation of cell culture media chemically defined and others, their sterilization and storage; Collection of specimens from normal as well as diseased animals and birds for virus isolation/detection of viral antigens; Collection of sera, its separation, processing and preservation for serological studies.

Processing of specimens and their inoculation into experimental animals and studying signs of virus infections.

Selection and Procurement of eggs for incubation for virological studies. Preinoculation incubation and its maintenance. Selection of suitably aged active embryos for different routes of inoculation - chick embryo inoculation - detection of presence of virus by various procedures.

Preparation of primary monolayer cultures from various species - animals and chick embryos - both fibroblastic and epithelial cells. Inoculation of clinical specimen - various types of cytopathic changes before and after staining. Methods of preservation of cell lines and their revival.

Concentration and purification of virus by various techniques. Characterization of viral isolates based on their physico-chemical properties - specific methods of virus identification.

VMC 618*: Systematic Virology

II (Cr. Hrs. : 2 + 1)

Theory: Brief description of major virus families. Etiology, Transmission, Epidemiology, diagnosis, prevention and control of major viral diseases of animals. Poxviridae : Sheep pox and goat pox, Herpesviridae: Infectious Bovinerhinotracheitis, Marek's Disease, Infectious Equine Abortion, Adenoviridae: Parvoviridae: Canine parvovirus; Hepadnaviridae: Hepatitis virus Picornaviridae: FMD, Caliciviridae: Transmissible gastroenteritis; Bunyaviridae: Nairobi sheep diseases; Orthomyxoviridae: Equine, Swine and Avian influenza; Paramyxoviridae: Ranikhet disease, Rinderpest and Canine distemper; Rahabdoviridae: Rabies, Vesicular stomatitis; Arenaviridae: Lymphocytic choriomeningitis; Reoviridae: Blue-tongue, African Horse Sickness, Rotaviruses of calf; Retroviridae: Bovineleukosis, Equine infectious anemia, Visna-maedi; Birnaviridae: Infectious bursal disease; Filoviride: Marburg Ebola virus; Unclassified viruses: Astro, Toro and Borna ; African Swine Fever, Prions- BSE.

Practical: Study of the symptoms, course of disease, gross lesions, histopathological lesions in animals infected with viral diseases like RP, FMD and goat pox. Collection, preservation, processing of clinical specimens for viral disease diagnosis. Study of inclusions and cytopathic changes.

VMC 680#: Special Assignment

II (Cr.Hrs.:0+1)

VMC 690#: Seminar

II (Cr.Hrs.: 1+0)

VMC 700#: Research

(Cr.Hrs.:0+30)

REFERENCE BOOKS:

1. VMC – 601 General Bacteriology

1. Microbiology – 4th ed. Prescott, Herley and Klein
2. Medical Microbiology – Greenwood, Slack and Peutherer
3. Microbiology – Nester and Robers
4. Manual Clinical Microbiology – Vol. 1 & 2 P.R. Murray *et.al.*
5. Practical Medical Microbiology – Collee, Dugid, Frazer and Marnion

2. VMC – 604 Systematic Bacteriology

1. Veterinary Microbiology – Dwight C. Hirsh
2. Bergey's Manual of Systemic Bacteriology – Vol. 1 – 4
3. The Prokaryotes V-I. 1 – 4
4. Principles of Bacteriology, Virology and Immunity – Vol. 1 – 8
5. Diagnostic Microbiology – Baily and Scotts

3. VMC – 612 Systematic Mycology

1. Veterinary Medical Mycology – J.F. Jungerman
2. A Text Book of Medical Mycology – Jagdish Chander
3. Hand book of applied Mycology – Vol. 1 – 4 D.K. Arora

4. A Guide to Identification of Medically Important Fungi – D.H. Larone, 4th Edition – 2002

4. VMC – 613 General Immunology

1. Veterinary Immunology – 7th ed. Tizard
2. Immunology – Janus Kuby
3. Immunology – Ivan Roitt
4. Immunology – Klein
5. Immunology of Infectious diseases – Kaufmann

5. VMC – 616 General Virology

1. Veterinary Virology – Murphy, Gibbs, Horzineck and Studert
2. Essentials of Veterinary Microbiology – Carter & Wise
3. Veterinary Microbiology & microbial diseases – Quinn, Markey & Carter
4. Veterinary Microbiology – Dwight C. Hirsh
5. Field's Virology

6. VMC – 618 Systematic Virology

1. Veterinary Virology – Murphy, Gibbs, Horzineck and Studert
2. Principles of Bacteriology, Virology and Immunity – Topley and Wilson
3. Veterinary Microbiology & microbial diseases – Quinn, Markey & Carter
4. Veterinary Microbiology – Dwight C. Hirsh
5. Field's Virology

12. M.V.Sc. IN VETERINARY PARASITOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VPA601*	General Parasitology	1	0	1
2.	VPA602*	Veterinary Helminthology	2	1	3
3.	VPA603*	Clinical Parasitology	1	1	2
4.	VPA604*	Veterinary Entomology & Acarology	2	1	3
5.	VPA605*	Veterinary Protozoology	2	1	3
6.	VPA606*	Immunoparasitology	2	1	3
7.	VPA607	Parasitological Techniques	0	2	2
8.	VPA608	Parasitic Zoonoses	2	1	3
9.	VPA609	Treatment and Control of Parasitic Diseases	1	1	2
10.	VPA610	Avian Parasitology	1	1	2
11.	VPA611	Parasites of Zoo and Wild animals	2	1	3
12.	VPA612	Parasites of Laboratory Animals	2	1	3
13.	VPA613	Malacology	1	1	2
14.	VPA680 [#]	Special Assignment	0	1	1
15.	VPA690 [#]	Seminar	1	0	1
16.	VPA700 [#]	Research	0	30	30

*Core Courses: (15 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Biochemistry (VBC)
2. Veterinary Medicine (VMD)
3. Veterinary Pharmacology and Toxicology (VPT)
4. Veterinary Public Health & Epidemiology (VPH)
5. Veterinary Pathology (VPP)

VPA-601*: General Parasitology

I

(Cr. Hrs. : 1+0)

Theory: Parasites and parasitism. Parasite ecology and evolution, Systematics and Taxonomy of parasites. Intra and inter specific associations, parasite adaptations. Host-parasite interaction. Nomenclature rules and regulations. Transmission and dissemination of parasitic diseases. Effect of parasites, host response and tissue reactions. General introduction, history, classification, structure, life cycle patterns, epidemiology, biochemistry, physiology and nutrition of parasites. Pathogenesis, immunity, treatment and control of parasitic diseases in general including planning of integrated control strategies.

VPA-602*: Veterinary Helminthology

I

(Cr. Hrs. : 2+1)

Theory: Classification, detailed study of the main orders and chief families, morphology, epidemiology, life cycle, pathogenesis, symptoms, diagnosis, treatment and control of parasites belonging to the families.

Trematoda: Dicrocoeliidae, Opisthorchiidae, Fasciolidae, Echinostomatidae, Heterophyidae, Plagiorchiidae, Prosthogonimidae, Brachylaemidae, Troglotrematidae, Notocotylidae, Cyclocoelidae, Paramphistomatidae, Schistosomatidae, Strigeidae, Clinostomidae, Diplostomatidae, Paragonimidae.

Cestoda: Mesocestoididae, Anoplocephalidae, Davaineidae, Dilepididae, Hymenolepididae, Taeniidae, Diphyllbothriidae.

Nematoda: Anisakidae, Ascarididae, Oxyuridae, Heterakidae, Subuluridae, Rhabditidae, Strongylidae, Strongyloididae, Trichonematidae, Stephanuridae, Syngamidae, Ancylostomatidae, Amidostomidae, Trichostrongylidae, Dictyocaulidae, Metastrongylidae, Protostrongylidae, Filaroididae, Spiruridae, Thelaziidae, Acuariidae, Tetrameridae, Physalopteridae, Gnathostomatidae, Filariidae, Setariidae, Onchocercidae, Dracunculidae, Trichinellidae, Trichuridae, Dioctophymidae, Soboliphymidae, Tetradonematidae.

Acanthocephala: Polymorphidae, Oligacanthorhynchidae.

Practical: Collection, fixation, preservation, despatch and identification of helminth parasites. Faecal examination, principles and techniques for qualitative and quantitative detection of helminth ova. Staining and mounting of parasitic specimens including larval stages of helminths. Worm count and assessment of worm burden. Coproculture and identification of larvae. Detection of microfilariae. Maintenance and breeding of snails and recovery of cercariae from infected snails.

VPA-603* : Clinical Parasitology

II

(Cr. Hrs. : 1+1)

Theory: Study of history, clinical manifestations and characteristic lesions of common parasitic infections of domesticated animals and poultry. Application of parasitological and serological techniques for diagnosis and interpretation of results. Collection and despatch of material to the laboratory.

Practical: Procurement of parasitic material from clinical cases. Examination of faecal, blood, body fluid, biopsy material and skin scrapings for diagnosis. Faecal ova/oocyst count, coproculture and identification of larval stages. Detection of microfilariae. Modified ZN staining.

VPA 604*: Veterinary Entomology and Acarology **I** **(Cr. Hrs.: 2+1)**

Theory: Introduction to Veterinary Entomology, classification, distribution, life history, seasonal pattern, pathogenesis, diagnosis, economic significance and role of insects and acarines belonging to the following families as vectors.

Culicidae, Ceratopogonidae, Simuliidae, Psychodidae, Tabanidae, Muscidae, Oestridae, Gasterophilidae, Sarcophagidae, Calliphoridae, Hippoboscidae, Pediculidae, Haematopinidae, Linognathidae, Menoponidae, Philopteridae, Trichodectidae, Pulicidae, Cimicidae, Reduviidae, Dermanyssidae, Ixodidae, Argasidae, Sarcoptidae, Psoroptidae, Trombiculidae, Demodicidae, Analgesidae, Linguatulidae.

Physical, chemical biological and immunological control of parasitic arthropods and vectors. Resistance to insecticides.

Practical: Collection, preservation and identification of adult and larval stages of arthropods of veterinary importance. Techniques involved in rearing, examination of scrapings for detection and identification of mange mites. Despatch of both live and preserved specimens. *In vitro* breeding of arthropods and testing of drugs on their developmental stages.

VPA 605*: Veterinary Protozoology **II** **(Cr. Hrs. : 2+1)**

Theory: Introduction to veterinary protozoology, systematics and classification. Morphology, life cycle, clinical symptoms, pathogenesis, diagnosis, treatment and control of parasites belonging to the following families.

Trypanosomatidae, Monocercomonadidae, Hexamitidae, Trichomonadidae, Endamoebidae, Eimeriidae, Cryptosporidiidae, Toxoplasmatidae, Sarcocystidae, Haemogregarinidae, Plasmodiidae, Babesiidae, Theileriidae and Balantidiidae. Mechanism of immunity, host immune response against protozoan infections.

Practical: Collection, preservation, identification, laboratory culture and diagnosis of protozoan parasites of veterinary importance.

VPA 606*: Immunoparasitology **II** **(Cr. Hrs. : 2+1)**

Theory: Host-parasite relationship, types of immunity, resistance to parasitic infections, antigenic characterization of parasites, cellular and humoral immunity to parasites, premunition, self-cure phenomenon, evasion of immunity application of irradiation, hypobiosis, spring rise, concomitant immunity, immunomodulation and their uses, immunodiagnostic tests and their techniques, application of biotechnological tools in the diagnosis and control of parasitic diseases. Genetic control of parasites.

Practical: Preparation of various (somatic, secretory and excretory) antigens and their fractionation and characterization, raising of antisera and demonstration of various immunodiagnostic methods (DID, IEP, CIEP, IFAT, ELISA etc.) for diagnosis.

VPA 607 : Parasitological Techniques

I (Cr. Hrs. : 0+2)

Practical: Microscopy, micrometry. Collection, fixation, staining, whole mounts and identification of parasites. Camera lucida drawings, culturing techniques for important helminths, protozoa and breeding of arthropods. Cryopreservation of parasites. Faecal, blood, urine, skin scraping examination for parasitic infection(s)/infestation(s). Examination of intermediate host for larval stages. Faecal, egg/oocyst count, coproculture, identification of larval stages and pasture larval count. Laboratory methods of rearing and maintenance of arthropods and dissection of arthropods for the examination of developmental stages of parasites. Microtomy, preparation of serial sections of parasites and tissues and their staining. Recovery of larval stages of helminths from herbage and soil and their identification. Worm count. *In vitro* excystment of metacercariae. *In vitro* culture of parasitic protozoa and tissue culture techniques.

VPA 608 : Parasitic Zoonoses

II (Cr. Hrs.: 2+1)

Theory: Introduction and importance of parasitic zoonoses, classification of parasitic zoonoses. Role of ecology, environmental pollution, intermediate and reservoir hosts, human habitat, customs and occupation in disseminating the infection among human beings and animals. Epidemiology, pathogenesis, diagnosis and control of hydatidosis, cysticercosis, trichinellosis, toxocarosis, ancylostomosis, schistosomosis, fasciolopsosis, filariosis, fasciolosis, paragonimiosis, amoebiosis, leishmaniosis, toxoplasmosis, babesiosis, balantidosis, trypanosomosis, giardiosis, malaria, sarcocystosis and cryptosporidiosis, scabies and other mite infestation, myiasis and infestation by fleas.

Practical: The morphological features of the parasites and their larval stages transmissible from animals to man and lesions caused by them. Collection, identification and diagnosis of important agents responsible for parasitic zoonoses.

VPA 609: Treatment and Control of Parasitic Diseases

I (Cr. Hrs. : 1+1)

Theory: Information regarding different anthelmintics, antiprotozoan compounds and insecticides including acaricides; mode of their administration and their therapeutic and prophylactic doses with due precautions, problem of drug resistance. Methods for the detection of anthelmintic resistance in nematodes. Various measures recommended for controlling parasites of livestock and poultry and formulation of deworming schedules.

Practical: *In vitro* studies of different compounds on different stage of laboratory reared parasites to evaluate their efficacy. Anaerobic storage of nematode eggs, collection of eggs and egg hatch test for detecting anthelmintic resistance.

VPA 610: Avian Parasitology **II** (Cr. Hrs. : 1+1)

Theory: Detailed study of main orders, chief families, epidemiology, life cycle, pathogenesis, symptoms, diagnosis, treatment and control of parasites of poultry and wild birds.

Practical: Collection, identification of adult and larval stages of parasites of birds along with lesions caused by them and methods for their diagnosis.

VPA 611: Parasites of Zoo and Wild Animals **I** (Cr.Hrs:2+1)

Theory: A detailed study of major helminth , protozoa and arthropod of zoo and wild animals with particular emphasis on morphological features, epidemiology, life cycle, pathogenesis ,diagnosis and control.

Practical: Methods for investigating parasitic diseases in wild animals. Collection of parasites and their identification. Visit to Zoo and Wild Life Parks/ Sanctuaries.

VPA 612: Parasites of Laboratory Animals **II** (Cr. Hrs: 2+1)

Theory: A detailed study of major helminth, protozoa and arthropod of laboratory animals with particular emphasis on morphological features, epidemiology, life cycle, pathogenesis, diagnosis and control.

Practical: Methods for investigating parasitic diseases in laboratory animals. Collection of parasites and their identification.

VPA 613: Malacology **I** (Cr. Hrs:1+1)

Theory:Characters and classification of Mollusca into classes, subclasses, orders and families of vector mollusks of Veterinary importance. Occurrence, distribution, ecology, life history, morphology and control of vector snails belonging to families, Planorbidae, Lymnaeiidae, Amnicolidae, Thiridae, Helicidae, Succineidae and Zonitidae. Examination of vector mollusks for parasitic infections. Hematology, internal defense mechanisms, parasite-induced pathology and molluscan tissue culture.

Practical: Collection of vector mollusk, study of their shells and internal organs, breeding, rearing and maintenance of vector mollusk in the laboratory

VPA 680#: Special Assignment **II** (Cr. Hr. : 1+0)

VPA 690#: Seminar **II** (Cr. Hr. : 0+1)

VPA 700#: Research (Cr. Hrs.: 0+30)

REFERENCE BOOKS:

1. Veterinary Protozoology - N.D. Levine
2. Helminthology in India - M.L. Sood
3. Systema Helminthum (Complete set of 7 vol.) - S. Yamaguti
4. Nematode parasites of Vertebrates - R.C. Anderson
5. Text Book of Medical Parasitology - S. C. Parija
6. Georgi's Parasitology for Veterinarians - D.D. Bowman
7. Parasitology & Vector Biology - W.C. Marquardt *et al.*
8. Advances in Trematode Biology - B. Fried & T.K. Graczyk
9. Opportunistic Infections - D.S. Lindsay & L.M. Weiss
10. The Trypanosomiases - I. Maudlin
11. The Pathogenic Enteric Protozoa - C.R. Sterling & R.D. Adam
12. Molecular Medical Parasitology - J.J. Marr, T.W. Nilsen & R.W. Komuniecki
13. Cryptosporidium from molecules to disease – R.C. Andrew Thompson, *et. al.*
14. Parasitism - C. Combes
15. Parasitic Nematodes - M.W. Kennedy
16. Fasciolosis - J.P. Dalton
17. *Taenia solium* Cysticercosis - G. Singh
18. Parasitic Diseases of Wild Animals - W. Samuel
19. Flea Biology and Control : The Biology of the Cat Flea – Control and Prevention F. Kramer & N. Mencke
20. The Genus Rhipicephalus (Acari : Ixodidae) : Guide to the Brown Ticks of the World J.B. Walker *et al.*
21. The Biology of Nematodes - D.L. Lee
22. Veterinary Ectoparasites: Biology, Pathology & Control - Richard Wall & David Shearer
23. Parasitic diseases of wild mammals - W.M. Samuel, Margo Pybus & A. Alan Kocan
24. Modern Parasitology - F.E.G. Cox
25. Amphistomes: Systemics & Biology - N.K. Gupta
26. Zoonoses - A.C. Palmer, Lord Soulsby and Simpson
27. Fundamentals of Parasitic Zoonoses - K.M.L. Pathak
28. Worms and Human Disease - R. Muller
29. The Behavioral Ecology of Parasites - E.E. Lewis, J.F. Cambell & M.V. Sukhdeo
30. Avian Malarial Parasites - G. Valkunas
31. Diagnostic Veterinary Parasitology - Hendrix
32. Theileria - D. Dobbelaere & D. McKeever
33. Clinical Parasitology: A Practical Approach - E.A. Zeibig
34. Color Atlas of Clinical Helminthology of Domestic Animals, Revised Edition – N. Taira, *et al.*
35. Protozoology – R.P. Hall
36. The Biology of *Echinococcus* & Hydatid disease – R.C.A. Thompson
37. Tropical Medicine & Parasitology – W. Peters & G. Pasvol
38. Helminthology – N. Chowdhury & I. Tada
39. Diagnostic Medical Parasitology – L.S. Garcia
40. Encyclopedia Reference of Parasitology - H. Mehlhorn
41. Veterinary Clinical Parasitology – M.V. Sloss, R.L. Kemp & A.M. Zajac
42. Parasitic Diseases of Buffalo in India – B.B. Bhatia & P.P.S. Chauhan
43. Helminths of wildlife – N. Chowdhury & A.A. Aguirre
44. Canine Clinical Parasitology – J.R. Georgi & M.E. Georgi

45. A colour Atlas of Clinical Parasitology – T. Yamaguchi
46. Atlas of Medical Helminthology & Protozoology – P.L. Chiodine *et al.*
47. Immunity to Parasites – D. Wakelin
48. Parasitic Diseases Vol. I. The Immunology – J.M. Mansfield
49. Parasitic Antigens & Parasitic Genes – R.M. Maizels *et al.*
50. Parasitism: The diversity & ecology of animal parasites – A.O. Bush *et al.*
51. Keys to the Cestodes Parasites of Vertebrates – L.F. Khalil, A.Jones and R.A. Bray
52. Medical Entomology – B.F. Eldridge & J.D. Edman
53. Foundations of Parasitology – L.S. Roberts & J. Janovy, Jr.
54. General Parasitology – T.C. Cheng
55. Medical and Economic Malacology- E. A Malek and T. C. Cheng

13. M.V.Sc. IN VETERINARY PATHOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VPP601*	Necropsy procedures and Diagnosis	0	1	1
2.	VPP602*	Histopathological and Histochemical techniques	1	1	2
3.	VPP603*	General Pathology	3	1	4
4.	VPP604*	Systemic Pathology- I	2	1	3
5.	VPP605*	Systemic Pathology – II	2	1	3
6.	VPP606*	Pathology of Microbial Diseases	2	1	3
7.	VPP607	Pathology of Parasitic Diseases	1	1	2
8.	VPP608	Nutritional Pathology	2	0	2
9.	VPP609	Toxicologic Pathology	1	1	2
10.	VPP610	Immunopathology	1	1	2
11.	VPP611*	Comparative Oncology	1	1	2
12.	VPP612	Clinical Pathology	1	1	2
13.	VPP613	Avian Pathology	2	1	3
14.	VPP614	Wild life Pathology	1	1	2
15.	VPP615	Pathology of laboratory Animals	1	1	2
16.	VPP680 [#]	Special Assignment	0	1	1
17.	VPP690 [#]	Seminar	1	0	1
18.	VPP700 [#]	Research	0	30	30

*Core Courses: (18 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Microbiology (VMC)
2. Veterinary Parasitology (VPA)
3. Veterinary Anatomy (VAN)
4. Veterinary Biochemistry (VBC)
5. Veterinary Medicine (VMD)
6. Veterinary Gynaecology and Obstetrics (VGO)

VPP 601*: Necropsy Procedures and Diagnosis **I / II (Cr. Hrs.: 0+1)**

Practical: General aspects of necropsy, techniques and procedures of necropsy (including vetero-legal cases) in different species. Study of morbid changes and their correlation in arriving at a diagnosis. Collection and dispatch of materials for confirmatory diagnosis. Techniques for preparation of museum specimens.

VPP 602*: Histopathological and Histochemical techniques **I (Cr. Hrs. : 1+1)**

Theory: Collection and preservation of tissues. Fixation and fixatives. Processing of tissues and preparation of sections. Handling of biopsy materials. Routine staining procedures. Special staining techniques. Histochemical and immunohistochemical techniques.

Practical: Collection, processing, sectioning (including cryostat sectioning) and routine H&E staining of tissues. Special staining techniques for demonstration of glycogen, lipids, nucleic acids, amyloid, iron, calcium, connective tissue, muscle, bacteria, chlamydia, inclusion bodies, fungi, protozoa. Important immunohistochemical techniques.

VPP 603*: General Pathology **I (Cr. Hrs. : 3+1)**

Theory: Introduction. General principles of predisposition to and causation of diseases. Reversible and irreversible cell injury. Disturbances in cell metabolism- Degeneration- apoptosis- necrosis. Intracellular and extra cellular depositions including mineral deposition and pigmentation. Circulatory disturbances/haemodynamic derangements. Disturbances of growth and development. Inflammation and Repair. Pathologic effects of heat, light, electricity, atmospheric pressure, ionizing radiation and chemical injuries.

Practical: Study of patho-morphological alterations in cell injury, degenerative and infiltrative changes, necrosis, circulatory/haemodynamic derangements, calcification and pigmentation. Growth disturbances. Alterations in different types of inflammatory reactions and healing.

VPP 604*: Systemic Pathology- I **I (Cr. Hrs. : 2+1)**

Theory: Cardiovascular system- Developmental anomalies, cardiac failure. Pathological conditions affecting the pericardium, myocardium and endocardium. Pathological conditions affecting the arteries, veins and lymphatics. Haemopoietic system- Pathological conditions of the bone marrow, thymus, lymph nodes and spleen. Non-neoplastic disorders of erythrocytes and leucocytes- anaemia- purpura haemorrhagica. Respiratory system- Pathological conditions affecting the upper nasal passages, sinuses, larynx, trachea, bronchi, lungs and pleura. Digestive system- Congenital and acquired pathological conditions affecting the mouth, adnexa, teeth, salivary glands, oesophagus, fore stomachs of ruminants, stomach, and intestines. Pathology of the liver, gall bladder, pancreas and peritoneum. Nervous system- Functional disturbances, Cells and structures of the nervous system, Reaction of the cells and tissues to injury, degenerative and inflammatory changes. Circulatory disturbances. Congenital and inherited disorders including inborn errors of metabolism. Disorders of myelin. Neurodegenerative diseases.

Practical: Study of gross and microscopic changes in tissues following pathological alterations of cardiovascular, haemopoietic, respiratory, digestive and nervous systems.

VPP 605* : Systemic Pathology - II

I

(Cr. Hrs. : 2+1)

Theory: Urinary system- General response to injury. Kidneys- developmental abnormalities, renal failure, circulatory disturbances, degenerative, necrotic and inflammatory conditions. Pathological conditions of the lower urinary tract- ureters, bladder and urethra. Reproductive system- Female reproductive system- Developmental anomalies. Pathological conditions affecting the ovary, fallopian tubes, non-gravid and gravid uterus, cervix, vagina and vulva. Abortion. Pathological conditions of the placenta and foetus. Mammary gland- Immune mediated and non-immune mediated defense mechanisms of the mammary gland. Mastitis in different species. Male reproductive system- Developmental anomalies. Pathological conditions of the testes, prostate, seminal vesicles, bulbo-urethral glands, penis and prepuce.

Endocrine system- General concepts of endocrine disorders including primary and secondary hypo- and hyper functions. Pathophysiology of conditions affecting the pituitary, thyroid, parathyroid, adrenal, pineal glands and pancreatic islets. Skin and appendages- Congenital and hereditary diseases of the skin. Response of the skin to injury. Diseases of epidermis, dermis, adnexal appendages and panniculus. Organs of special sense- Pathological conditions affecting the eye and ear - Musculo-skeletal system- Muscle- Response of muscle to injury. Congenital, neonatal and hereditary diseases of muscles. Circulatory, degenerative and inflammatory conditions of the muscles - Bones- Normal structure and development. Reaction of bone to injury including fracture repair. Abnormalities of growth and development of bone. Metabolic bone diseases. Necrotic and inflammatory changes, non-neoplastic proliferative and cystic lesions. Diseases of joints- Reaction to injury. Abnormalities of growth and development. Inflammatory and degenerative joint diseases.

Practical: Study of gross and microscopic changes in pathological conditions affecting the urinary system, reproductive system, endocrine system, musculoskeletal system, skin, eye and ear.

VPP 606* : Pathology of Microbial diseases

II

(Cr. Hrs. : 2+1)

Theory: Viral Diseases- Pathogenesis and Pathology of important diseases caused by viruses belonging to Poxviridae, Herpesviridae, Adenoviridae, Iridoviridae, Papovaviridae, Parvoviridae, Picornaviridae, Calciviridae, Reoviridae, Togaviridae, Paramyxoviridae, Orthomyxoviridae, Rhabdoviridae, Retroviridae, Arenaviridae, Coronaviridae, Bunyaviridae, Hepadnaviridae - Pathogenesis and Pathology of important diseases caused by organisms belonging to Mycoplasmataceae, Rickettsiaceae, Bartonellaceae, Anaplasmatocaceae and Chlamydiaceae - Bacterial Diseases- Pathogenesis and Pathology of Diseases caused by Bacillus, Clostridium, Streptococci, Staphylococci, Campylobacter, Erysipelothrix, Haemophilus, Escherichia, Klebsiella, Brucella, Bordetella, Francisella, Pseudomonas, Salmonella, Actinobacillus, Shigella, Pasteurella, Yersinia, Listeria, Moraxella, Spirochaetales - Higher Bacterial Diseases- Pathogenesis and Pathology of diseases caused by Actinomyces, Nocardia, Rhodococcus, Corynebacterium, Dermatophilus, Streptomyces and Mycobacterium.

Fungal Diseases- Pathogenesis and Pathology of Aspergillosis, Blastomycosis, Coccidioidomycosis, Adiaspiromycosis, Maduramycosis, Cryptococcosis, Histoplasmosis, Zygomycosis, Rhinosporidiosis, Sporotrichosis, Candidiasis, Geotrichosis, Dermatomyces, Pneumocystosis, other important fungal diseases and Mycotoxicoses.

Practical: Study of gross and histopathological changes in important viral, mycoplasmal, rickettsial, chlamydial, bacterial and fungal diseases.

VPP 607: Pathology of parasitic diseases **II** (Cr. Hrs. : 1+1)

Theory: Study of pathogenesis and pathology of important parasitic diseases - Protozoan diseases- coccidiosis, toxoplasmosis, neosporosis, sarcocystiosis, besnoitiosis, klossiellosis, cryptosporidiosis, giardiasis, trichomonosis, balantidiosis, trypanosomosis, leishmaniosis, malaria, hepatozoonosis, babesiosis, theileriosis and cytauxzoonosis - Helminthic Diseases- Effects of helminthic parasites upon the host. Host response to parasites. Pathogenesis and pathology of ascariasis, ancylostomosis, trichostrongylosis, haemonchosis, ostertagiosis, cooperiosis, oseo-phagostomosis, dirofilariosis, strongyloidosis, spirocercosis, cerebrospinal nematodosis, trichinellosis, pulmonary nematodosis, renal diroctophymosis, habronemosis, capillariosis, trichuriasis, onchocercosis, stephanofilarosis, stephanurosis, gongylonemosis, cysticercosis, echinococcosis, schistosomosis, paragonimosis and other important helminthic infections; Arthropod Diseases- myiasis, acarosis.

Practical: Study of gross and histopathological changes in diseases caused by common protozoan infections, helminths and arthropods.

VPP 608: Nutritional Pathology **II** (Cr. Hrs.: 2+0)

Theory: Pathogenesis and pathology of deficiencies and excesses of lipids, carbohydrates, proteins, water, minerals- calcium, phosphorus, magnesium, sodium chloride, potassium, fluorine, iodine, sulphur, selenium, iron, copper, cobalt, manganese, zinc, molybdenum. Vitamins- fat soluble vitamins - A, D, E, K; Water soluble vitamins - thiamine, riboflavin, niacin, pyridoxine, pantothenic acid, cobalamin, folic acid, choline, biotin and vitamin C.

VPP 609 : Toxicologic Pathology. **II** (Cr. Hrs.: 1+1)

Theory: Extraneous poisons. Mode of action of toxins- Biotransformation of toxicants. Systematic study of acute, subacute and chronic toxicity of environmental pollutants. Diseases due to extraneous poisons and classification based on their mechanisms and important lesions. Procedures for determination of the enzymes involved in Phase I (Cytochromes) and Phase II (glutathione, glutathione- S- transferases) biotransformation pathways. Methods for extraction and analysis of mycotoxins in feed and clinical samples.

Practical: Study of gross and histopathological lesions in important poisonings. Histochemical demonstration of biotransforming enzymes.

VPP 610: Immunopathology

II (Cr. Hrs. : 1+1)

Theory: General aspects- Natural immunity, Acquired immunity, Humoral immunity, Cell-mediated immunity. Immune reactions. Immunodeficiencies- Primary and Secondary Immunodeficiency disorders. Hypersensitivity reactions and diseases. Autoimmunity- Pathogenesis and pathology of various types of autoimmune diseases. Drugs and toxins induced immunopathological changes.

Practical: Gross and microscopic lesions of immunologically mediated disorders. Histochemical demonstration of T cells, B cells, eosinophils, mast cells, phagocytic cells, cytokines. Methods used in immunopathological studies. Use of fluorescent antibody and other techniques in study and diagnosis of diseases.

VPP 611*: Comparative Oncology

II (Cr. Hrs.: 1+1)

Theory: General aspects of neoplasms. Causes of neoplasia- spontaneous genetic mutations, radiation, chemicals, viruses, parasites, chronic irritation, hereditary factors. Process of carcinogenesis. Growth and spread of neoplasms. Tumor immunity. Classification and nomenclature of neoplasms. Diagnosis and chemotherapy of neoplasia. Detailed study of neoplasms affecting various tissues/organ systems in different species.

Practical: Study of gross and histopathological features of various neoplasms of different species. Techniques for diagnosis of neoplasms- Exfoliative cytology and histochemical methods.

VPP 612: Clinical Pathology

I (Cr. Hrs.: 1+1)

Theory: Importance of collection and sampling of blood, serum, plasma, urine, milk, stool, discharges and other body fluids for various clinical tests. Principles and methodology of different tests employed for haematology, blood chemistry, urine analysis, mastitis, liver and kidney function, cerebro-spinal fluid, faecal examination and biopsy specimens.

Practical: Practical procedures for sampling and conduct of various clinical laboratory tests on blood, serum, plasma, urine, milk, stool, discharges and other body fluids. Interpretation and correlation of results. Biopsy and exfoliative cytology.

VPP 613 : Avian Pathology

II (Cr. Hrs. : 2+1)

Theory: General introduction. Avian inflammation, Pathology of nutritional and metabolic diseases. Viral diseases- Pathogenesis and pathology of diseases caused by viruses of Paramyxoviridae, Orthomyxoviridae, Poxviridae, Herpesviridae, Coronaviridae, Picornaviridae, Birnaviridae, Adenoviridae, Reoviridae, Astroviridae - Avian Mycoplasmosis, Avian Chlamydiosis - Bacterial diseases- Pathogenesis and Pathology of diseases caused by Enterobacteriaceae, Pasteurella, Haemophilus, Clostridia, Staphylococcus, Streptococcus, Enterococcus, Erysipelas, Mycobacterium, Campylobacter, Listeria, Pseudomonas - Fungal diseases- Aspergillosis, Dactylariosis, Candidiasis, Favus, Mycotoxicoses - Parasitic diseases- Pathogenesis and pathology of diseases caused by Coccidia, Cryptosporidia, Histomonas, Leucocytozoon, Spirochaetes and infections/infestations caused by various Nematodes,

Cestodes, Trematodes, Ectoparasites - Diseases and syndromes of unknown etiology. Vices and miscellaneous diseases.

Practical: Necropsy examination of avian carcasses. Collection and processing of specimens from poultry for clinical pathological and histopathological examinations. Study of gross and microscopic features of various avian diseases.

VPP 614: Wild Life Pathology **I** **(Cr. Hrs. : 1+1)**

Theory: General considerations regarding diseases of wild life. Epidemiology, Pathogenesis and Pathology of Viral, Mycoplasmal, Chlamydial, Rickettsial, Bacterial and fungal diseases affecting captive and wild animals. Common parasitic diseases. Diseases due to nutritional deficiencies, metabolic disorders and common poisonings.

Practical: Study of gross and histopathological features of common diseases of captive and wild animals. Study of wild life management and practices by visiting the zoo.

VPP 615: Pathology of Laboratory animals **I** **(Cr. Hrs. : 1+1)**

Theory: Pathology and pathogenesis of viral, bacterial, chlamydial, mycoplasmal, fungal, parasitic, and nutritional diseases/ disorders affecting laboratory mice, rat, hamsters, guinea pigs, rabbits and Mongolian gerbils.

Practical: General procedures for handling of laboratory animals and collection of clinical samples. Necropsy examination of laboratory animals. Gross and histopathological examination of important diseases/lesions in laboratory animals.

VPP 680[#]: Special Assignment **II** **(Cr. Hrs.: 0+1)**

VPP 690[#]: Seminar **II** **(Cr. Hrs.: 1+0)**

VPP 700[#]: Research **(Cr. Hrs.: 0+30)**

REFERENCE BOOKS:

- 1. Mechanism of Disease: A Text book of General Pathology**, 3rd Ed. (2002) Slauson, D. O., and Cooper, B. J. (eds.). ISBN 0323002285 Mosby, St. Louis, MO
- 2. Jubb, Kennedy & Palmer's Pathology of Domestic Animals** 5th Ed. (2007) 3-Volume Set M. Maxie (ed.) Saunders Elsevier
- 3. Theory and Practice of Histotechnology** D.C. Sheehan and B. B. Hrapchak ISBN-0-8016-45735, C.V. Mosby Company, USA.
- 4. Avian Histopathology** (1987) C.Riddell American Association of Avian Pathologists ISBN: 0-915538032
- 5. Histological and Histochemical Methods: Theory & Practice**, 2nd Edn. 1990 J.A. Kiernan ISBN 0-08-036223-0, Pergamon Press, Oxford.
- 6. Tumors in Domestic Animals** 4th Ed. (2002) Donald Meuten ISBN 0-8138-2652-7, Blackwell
- 7. Diagnostic Histopathology of Tumors** 3rd Ed. (2007) Fletcher C D M ISBN: 0443074348 Elsevier

14. M.V.Sc. IN VETERINARY PHARMACOLOGY AND TOXICOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1	VPT601*	General Pharmacology	2	0	2
2.	VPT602	Drugs acting on the digestive and the Respiratory system	2	1	3
3.	VPT603*	Drugs acting on the Nervous system	2	1	3
4.	VPT604	Cardiovascular and Renal Pharmacology	2	1	3
5.	VPT605	Endocrine and Reproductive Pharmacology	2	1	3
6.	VPT606*	Toxicology	2	1	3
7.	VPT607*	Chemotherapy	2	1	3
8.	VPT608	Nutritional Pharmacology	1	0	1
9.	VPT609*	Pharmacometrics – I	1	2	3
10.	VPT610	Drugs acting on Fluid and Electrolyte Balance	1	0	1
11.	VPT611	Pharmacokinetics	1	1	2
12	VPT612	Drugs acting on ANS and peripheral Somatic Nerves	2	1	3
13	VPT613	CNS Pharmacology	2	1	3
14	VPT614	Autacoid and Immunopharmacology	2	0	2
15	VPT651	Drugs and Society	1	0	1
16.	VPT680 [#]	Special Assignment	0	1	1
17.	VPT690 [#]	Seminar	1	0	1
18.	VPT700 [#]	Research	0	30	30

* Core Courses : (14 Crédits)

[#] Compulsory

Minor Fields of study

1. Veterinary Physiology (VPY)
2. Veterinary Biochemistry (VBC)
3. Veterinary Medicine (VMD)
4. Veterinary Microbiology (VMC)
5. Veterinary Pathology (VPP)
6. Veterinary Parasitology (VPA)

VPT 601*: General Pharmacology

I (Cr. Hrs. : 2+0)

Theory: Introduction, historical development, scope of pharmacology, Principles of pharmacokinetics; administration, dosage, absorption, distribution, biotransformation, elimination, pharmacodynamics; mechanisms of drug action, drug receptors, quantification of Drug-Receptor interactions and elicited response, agonists, antagonists, application of pharmacodynamic principles in therapy.

VPT 602: Drugs Acting on the Digestive and the Respiratory System

I (Cr. Hrs. : 2+1)

Theory: Functions of the digestive system, drugs acting on the mouth, pharynx, esophagus and stomach; salivary stimulants, salivary inhibitors, modulators of gastric motility and secretion, carminatives, antacids, emetics and antiemetics, Drugs acting on the intestinal tract; laxatives and cathartics, protectants and adsorbents, intestinal astringents, antidiarrheal agents, Agents promoting digestive functions; digestants, Drugs acting on liver; cholagogues and choleric agents, hepato protectants.

Drugs acting on rumen, antibloat agents, drugs used in ruminal indigestion

Functions of the respiratory system, antitussives, expectorants and mucolytic agents, drugs used in the treatment of asthma, respiratory stimulants

Practical: Study of drugs affecting gastrointestinal motility, digestive efficiency and liver function tests. Experimental Induction of gastric ulcers using drugs and measurement of gastric acid secretion. Experimental bronchoconstriction and effects of bronchodilators.

VPT 603*: Drugs Acting on the Nervous System

II (Cr. Hrs. : 2+1)

Theory: Drugs action on the central nervous system: introduction to nervous system, historical development, neurotransmission in the central nervous system, general anaesthetics, hypnotics and sedatives, neuroleptics, analgesics, antiepileptics, central muscle relaxants.

Drugs acting on the autonomic nervous system: Anatomy and physiology of the autonomic nervous system, pharmacodynamics of cholinergic agonists and antagonists, adrenergic agonists and antagonists, ganglionic stimulants and blockers, neuromuscular blocking agents.

Practical: Demonstration of effects of drugs on spontaneous motor activity in mice/rats, amphetamine aggregation toxicity test, effect of CNS depressant drugs on amphetamine induced hyperactivity in mice, Barbiturate induced sleeping time, CAR, MAO inhibition test, supramaximal shock test, anticonvulsant activity of drugs against leptazole induced convulsions in mice, study of drug-receptors interaction, dose-response curve, drug antagonism, determination of ED₅₀, EC₅₀, pD₂ and pA₂ values.

VPT 604: Cardiovascular and Renal Pharmacology **I** (Cr. Hrs.: 2+1)

Theory: Anatomical and physiological considerations of the heart and the blood vascular system, pharmacology of cardiac glycosides, antiarrhythmic and antihypertensive drugs. Drugs used in ischaemic heart disease and antihyperlipemic drugs. Coagulants and anticoagulants

Anatomical and physiological consideration of the urinary system, diuretics, urinary acidifiers and alkalizers, urinary antiseptics

Practical: Study of the effect of cardio-active drugs on heart. Effect of drugs on blood pressure of dog, rat and birds. Effect of diuretics on GFR, volume and composition of body fluids

VPT 605: Endocrine and Reproductive Pharmacology **II** (Cr. Hrs. : 2+1)

Theory: Anatomical and physiological considerations of the endocrine system, pharmacology of adenohipophyseal hormones, thyroid and antithyroid drugs, estrogens and progestins, adrenocortical hormones, hormonal regulations of calcium and phosphorus homeostasis, androgens, Insulin, oral hypoglycemic agents. Pharmacology of drugs affecting male and female reproductive organs, ovulation, estrus, gestation, lactation, ecbolics, tocolytics

Practical: Demonstration of alloxan - induced diabetes, assay of insulin by mouse convulsion method. Effect of estrogen on intact uterus. Assessment of stages of estrous cycles by vaginal method, study of effect of drugs affecting reproductive performance. Demonstration of effects of ecbolics on uterus and estimation of hormones

VPT 606*: Toxicology **I** (Cr. Hrs. : 2+1)

Theory: Introduction, historical development and the scope of the subject; Source and classes of poisons, toxicokinetic and toxicodynamic considerations, terminology; toxicology of metals, agrochemicals, phyto and zootoxins; environmental pollution and pollutants, radiation and radioactive hazards.

Practical: Determination of LD₅₀, TD₅₀, by using different methods. Study of pharmacodynamics of prototype toxicants in experimental animals. Chemical detection of common plant, fungal, mineral and insecticidal poisons in toxicological specimen. Extraction of poisons, preservation of tissue for chemical diagnosis of poisons, calculation of cumulative toxicity factor (CFT) in cumulative toxicity study.

VPT 607*: Chemotherapy **II** (Cr. Hrs. : 2+1)

Theory: Introduction, historical development, principles of chemotherapy, drug resistance, Antimicrobial agents; Sulfonamides, quinolones, penicillin, cephalosporins, other Beta lactam antibiotics, aminoglycosides, tetracyclines, erythromycin, chloramphenicol, antimycobacterial agents, antifungal agents, antiviral agents, Chemotherapy of neoplastic diseases. Anthelmintic and antiprotozoan drugs

Practical: Study of physical and chemical properties of chemotherapeutic agents, antibiotic sensitivity test, Determination of MIC of common antibiotics, estimation of

antimicrobial agents (Sulphonamides, chloramphenicol, oxytetracycline and nitrofurantoin derivatives). Demonstration of antifungal activity and effect of drugs on parasitic motility

VPT 608: Nutritional Pharmacology **II** (Cr. Hrs. : 1+0)

Theory: Introduction to the subject, historical development, pharmacology and therapeutics of vitamins, minerals, trace elements, growth promoters.

VPT 609*: Pharmacometrics - I **II** (Cr. Hrs. : 1+2)

Theory: Introduction, Screening of drugs, multidimensional screening procedures, quantal and graded responses, calculation of ED₅₀, TD₅₀, LD₅₀ Bioassay.

Practical: Calculation of ED₅₀, TD₅₀, LD₅₀. Multidimensional screening on unknown compounds. Bioassay techniques.

VPT 610: Drugs Acting on Fluid and Electrolyte Balance **I** (Cr. Hrs. :1+0)

Theory: Physiological consideration of fluid and electrolyte balance. Principles of fluid therapy, Transfusions. Drugs affecting fluid and electrolyte balance; antidiuretic hormones, adrenal steroids

VPT 611: Pharmacokinetics **II** (Cr. Hrs. : 1 + 1)

Theory: Drug metabolism; Phase I reactions, P₄₅₀ mono-oxygenase system, other phase I reactions, Phase II reactions; renal excretion of drugs; biliary excretion of drugs and enterohepatic circulation; single compartment model, effect of repeated dosage; two compartment model, steady state kinetics.

Practical: Estimation of drugs and their metabolites in biological fluids; kinetic analysis and determination of dose and frequency.

VPT 612 : Drugs acting on ANS and peripheral Somatic Nerves **I** (Cr.Hrs. : 2+1)

Theory: Autonomic Nervous System: anatomy and physiology; effector tissues, neurochemical transmission and associated general considerations; synthesis, release, storage and actions of acetylcholine; cholinergic agonists and antagonists; inactivation of acetylcholine and anticholinesterase agents; drugs facilitating and impairing ganglionic transmission;

Synthesis , storage, release , uptake and metabolism of catecholamines; adrenoceptors; adrenergic agonists and antagonists;

Muscle relaxants and neuromuscular blocking agents; local anaesthetics.

Practical: Demonstration on effects of cholinergic and adrenergic agonists and antagonists; demonstration on neuromuscular blocking agents; demonstration on local anaesthetic; simulation experiments .

VPT 613 : CNS Pharmacology **II** (Cr.Hrs.: 2+1)

Theory: General introduction ; anatomy and physiology of nervous system; neurotransmission; general anaesthetics: inhalation and intravenous anaesthetics; dissociative

anaesthetics; preanaesthetics; neurolepanalgesics; hypnotics and sedatives: Chloralhydrate, barbiturates, propofol, propanidid, imidazole derivatives, agonists, benzidiazepines, aliphatic alcohols; anticonvulsants and antiepileptics; centrally acting muscle relaxants; analgesics; drugs for affective disorder; antipsychotic drugs; drugs and animal behaviour; tolerance and drug dependence.

Practical: Demonstration of drugs on CNS activity; barbiturate induced sleeping time, anticonvulsant activity; screening of CNS active drugs.

VPT 614 : Autacoid and Immunopharmacology **I** (Cr.Hrs.: 2+0)

Theory: General considerations, local hormones, biogenic amines, histamine, serotonin, melatonin, lipid derived autacoids, Eicosanoids and platelet activating factors, antigout and asthmatic compounds.

Immune system, inflammatory reactions, hypersensitivity reactions, immunomodulators: immunosuppressants and immunostimulants; autoimmune diseases, tissue grafting and transplantation.

VPT 651 : Drugs and Society **II** (Cr.Hrs.: 1+0)

Theory: Role of drugs in society; various categories of drugs; concepts of effects, adverse effects and side effects of drugs; medical and non-medical use of drugs; drug laws; use, misuse and abuse of drugs; habit forming and pleasure giving drugs; drug tolerance, addiction , and drug dependence; control and treatment of drug abuse; abuse of drugs such as alcohol, barbiturate, opioids, ketamine, solvents and other sedative –hypnotic.

VPT 680#: Special Assignment **II** (Cr. Hrs.: 0+1)

VPT 690#: Seminar **I** (Cr. Hrs. : 1+0)

VPT 700#: Research (Cr. Hrs.: 0+30)

REFERENCE BOOKS:

1. Hardman, J.G., Limbird, L.E., Molinoff, P.B., Ruddon, R.W. and Gilman, A.G. 1996. Goodman & Gilman's The Pharmacological Basis of Therapeutics, 9th Edition. McGraw-Hill, Health Professionals Division, New York.
2. Maddison, J. E., Page, S.W. and Church, D., 2002. Small animal Clinical Pharmacology, W.B. Saunders, London.
3. Carruthers, S.G., Hoffman, B.B., Melmon, K.L. and Nierenberg, D.W. 2000. Melmon & Morrelli's Clinical Pharmacology, 4th Edition, McGraw- Hill, Medical Publishing Division, New York.
4. Curtis D. Klaassen: Casarett and Doull's Toxicology, The Basic Science of Poisons, 5th International Ed. McGraw-Hill, Health Professional Division, New York.
5. Hayes, A.W., 1994. Principles and Methods of Toxicology, 3rd Edition, Raven

Press Ltd., New York.

6. Lorgue, G., Lecheret, J., and Riviere, J., 1996. Clinical Veterinary Toxicology, Blackwell Science Ltd., Oxford.
7. Prescott, J.F., Baggot, J.D. and Walker, R.D., 2005. Antimicrobial Therapy in Veterinary Medicine. Blackwell Scientific Publications, IOWA, USA.
8. Baggot, J. D. 1977. Principles of drug disposition in domestic animals. The basis of Veterinary Clinical Pharmacology. W. B. Saunders Co., Philadelphia.
9. Gibaldi, M. and Perrier, D., 1982. Pharmacokinetics, 2nd Edition. Marcel Decker Inc., New York.

15. M.V.Sc. IN VETERINARY PHYSIOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VPY601*	Mammalian Physiology-I	2	1	3
2.	VPY602*	Mammalian Physiology – II	2	1	3
3.	VPY603	Physiology of digestion	2	1	3
4.	VPT604	Physiology of lactation	2	1	3
5.	VPY605	Haematology	0	2	2
6.	VPY606*	Physiology of Growth	2	1	3
7.	VPY607*	Environmental Physiology	2	1	3
8.	VPY608	Physiology of Male Reproduction	2	1	3
9.	VPY609	Physiology of Female Reproduction	2	1	3
10.	VPY610	Work Physiology	1	1	2
11.	VPY611	Altitude Physiology	2	1	3
12.	VPY612	General Endocrinology	2	1	3
13.	VPY613	Endocrinology of Reproduction in Farm Animals	2	1	3
14.	VPY614	Gastrointestinal hormones	2	0	2
15.	VPY615	Water, electrolyte and acid base balance	2	1	3
16.	VPY616	Clinical Physiology	2	1	3
17.	VPY680 [#]	Special Assignment	0	1	1
18.	VPY690 [#]	Seminar	1	0	1
19.	VPY700 [#]	Research	0	30	30

*Core Courses: (12 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Biochemistry (VBC)
2. Animal Nutrition (ANN)
3. Veterinary Pharmacology and Toxicology (VPT)
4. Veterinary Gynaecology and Obstetrics (VGO)

VPY-601*: Mammalian Physiology - I

I

(Cr. Hrs. : 2+1)

Theory: Mechanism of muscular contraction at molecular level, biophysics of membrane depolarization, excitation-contraction coupling, molecular basis of neuromuscular disorders, modern concept of neural transmission, biology and chemistry of neurotransmitters, electrophysiology of nerves, brain and behaviour, memory and other higher brain functions. Biophysics of circulation, ECG and cardiac abnormalities, neural and humoral control of cardiovascular functions, immunophysiology and aberrations.

Practical: Electrophysiology of heart and nerves, interpretation and clinical implications of ECG, fluctuations and control of blood pressure, measurement of pH in blood, blood cell count.

VPY-602*: Mammalian Physiology - II

II (Cr. Hrs. : 2+1)

Theory: Mechanics of respiration, compliance of respiratory tract, surfactants, neural and humoral control of respiration, role of peripheral receptors and effectors, response of CO₂ and hypoxic stimuli, role of kidney in fluid homeostasis and acid-base regulation, counter-current mechanism of urine concentration, kidney and long-term blood pressure regulation, renal disorders, artificial kidney and haemodialysis.

Practical: Measurement of different respiratory volumes, Demonstration of adaptive respiratory responses in hot and cold temperature, variations of urinary pH and biochemical constituents under various environmental conditions. Estimation of blood urea nitrogen, creatinine and uric acid

VPY-603: Physiology of Digestion

I (Cr. Hrs. : 2+1)

Theory: Feeding pattern in different species of domestic animals, evolution of the organs of digestion, Role of gastrointestinal hormones in digestion, neurohumoral control of digestion, principles of transport across epithelia, nutrient transport across gastrointestinal tract, methods to study nutrient transport, use of radioisotopes in nutrient transport studies, digestive disorders.

Practical: *In vitro* action of digestive enzymes, Effect of pH and temperature on digestive enzymes, contractility of gastrointestinal tissue. Collection and analysis of saliva. Estimation of postprandial serum glucose, triglyceride and total protein levels.

VPY-604: Physiology of Lactation

II (Cr. Hrs. : 2+1)

Theory: Ontogeny and phylogeny of mammary gland, basis of classification, physiological anatomy of mammary gland, growth and development of mammary gland, endocrine regulation of growth of mammary gland and milk secretion. Physiological factors affecting composition of milk, precursors and site of milk formation, milk ejection and inhibitory reflex, environmental factors affecting lactation. Involution of lactation, lactational anestrus.

Practical: Effect of galactogogues and secretagogues, physiological factors like feeding and watering affecting composition and secretion of milk.

VPY-605: Hematology

I (Cr. Hrs. : 0+2)

Practical: Enumeration of RBC, WBC and thrombocytes; packed cell volume, erythrocyte sedimentation rate; estimation of Hb, MCV, MCH, MCHC. Determination of sodium, potassium and calcium. Osmotic fragility of erythrocyte membrane. Detection of Heinz bodies, Periodic-acid-Schiff staining of leucocytes, detection of lipids in leucocytes, LE cell test. Bleeding time and clotting time, blood group antigens and blood grouping.

VPY-606*: Physiology of Growth

I (Cr. Hrs. : 2+1)

Theory: Concepts of growth. Importance of growth in animal husbandry, measures of growth and growth curves. Various factors affecting pre-natal and post-natal growth. Effect of

hormones & nutrition and environment on growth. Growth in relation to reproduction & lactation. Regulation of foetal growth. Regulation of post-natal growth. Neuroendocrine control in different species. Growth promoters - Uses and limitations and safety to consumers. Ageing in farm animals.

Practical: Measurement of growth in farm animals. Preparation of growth curves, Body weight and its surface relationship. Principles and methods of estimation of body composition.

VPY-607*: Environmental Physiology **II** (Cr. Hrs. : 2+1)

Theory: Environmental effects on animal growth, production and health. Neural control of thermo-regulation, environment in relation to endocrine function, water and electrolytes. Effect of environment on various body systems - digestive, cardiovascular, respiratory and excretory system. Morphological, anatomical, behavioural and physiological adaptation of livestock in tropics, desert and high altitude. Mechanism of adaptation.

Practical: Preparation of climograph. Measurement of physiological responses at normal and stressful environment. Concept of heat tolerance index - its measurement and dependence of modifying factors. Estimation of suspended particles from environment.

VPY-608 : Physiology of Male Reproduction **I** (Cr. Hrs. : 2+1)

Theory: Development of male gonads and accessory glands - role of endocrine glands. Mechanism of spermatogenesis. Spermatogenic wave, spermatogenic cycle, endocrine control of spermatogenesis. Molecular mechanism of capacitation and acrosome reaction. *In vitro* capacitation. Transport of male gametes in female reproductive tract-its endocrine regulation. Neuro-endocrine control of male reproductive behaviour and function. Biochemical constituents of semen and their physiological functions. Factors regulating quality of semen.

Practical: Assessment of semen quality, determination of initial pH of semen, determination of methylene blue reduction time, estimation of initial fructose and fructolysis index, cervical mucus penetration tests.

VPY-609: Physiology of Female Reproduction **II** (Cr. Hrs. : 2+1)

Theory: Development of female reproductive system - endocrine control, folliculogenesis, biochemical composition of follicular fluid, recruitment and selection of follicles, mechanism of ovulation, neurohumoral control of ovulation, estrus behaviour, neurohypophysis during estrus, seasonal effect on estrus, maintenance of pregnancy, gestagens and extra-gonadal hormones, fetomaternal interaction, placental and fetal hormones, parturition, prostaglandins.

Practical: Observation of different stages of estrus, collection of ovary and study of oocytes, estimation of biochemical constituents of follicular fluid (calcium and glucose), influence of gonadotropins and estrogen on female genitalia.

VPY-610: Work Physiology **I** (Cr. Hrs. : 1+1)

Theory: Work output, measurement and interpretation. Morphological and physiological factors affecting maximum load capacity. Speed of work and total work production. Changes in cardiovascular system during work. Changes in respiratory system including gaseous exchange during work. Metabolic and neuro-humoral changes during maximum load.

Practical: Measurement of physiological parameters. Measurement of work production - maximum pull power. Measurement of work efficiency; physiological indices to assess work efficiency- speed, work output.

VPY-611: Altitude Physiology **II** (Cr. Hrs. : 2+1)

Theory: Environmental characteristics of high altitude. Adaptive mechanisms in neural acclimatization. Hematological changes at high altitude. Cardiovascular changes during acclimatization. Respiratory regulation at high altitude. Endocrinological changes at high altitude. Acid-base balance and gas transport at high altitude. Adaptive mechanism at tissue level. Work capacity at high altitude. Immunophysiological aspects of antibody formation at high altitude. Loss of natural acclimatization and mountain sickness. Medical problems during acclimatization in high altitude.

VPY-612: General Endocrinology **I** (Cr. Hrs. : 2+1)

Theory: Organisation of endocrine system in farm animals - Anatomy, histology of endocrine glands. Hormones and Hormone like factors produced by various tissues of the body. Integration of endocrine and nervous system. Production and transport of hormones. Feed back control mechanisms, hormone and receptor interactions. Mechanism of action of steroid, protein and fatty acid and other types of hormones. Chemistry and physiological functions of releasing hormones, pituitary, thyroid, parathyroid, adrenal, pancreatic hormones. Hormones of ovary and testis. Functions of Gastrointestinal hormones. Prostaglandins in reproduction.

Practical: Demonstration of endocrine glands in rats. Histological structures of pituitary, thyroid, adrenal gland, pancreas, ovary and testis. Dissection of male and female genital tract in rats. Effect of oestrogen treatment on uterus of immature female rats. Demonstration of cyclicity in female rats by vaginal smears.

VPY-613: Endocrinology Of Reproduction In Farm Animals **II** (Cr. Hrs. : 2+1)

Theory: Role of hypothalamus and hypophysis in reproduction. Structural and functional interaction between hypothalamus and pituitary in relation to reproduction. Hypothalamus - Pituitary - Gonadal axis. Chemistry and functions of GnRH, FSH, LH, Oxytocin. Feedback mechanisms. Role of pineal gland in reproduction. Sex steroids - origin, chemistry and biological functions. Role of other hormones produced by gonads. Endocrine role of placenta during pregnancy and parturition. Other related hormones in reproduction - GH, Thyroid hormone, ACTH and prostaglandins - Principle and methodology of synchronisation of estrus and superovulation.

Practical: Grouping and handling of experimental rodents. Computation and administration of hormones. Preparation of experimental rats/mice for endocrine surgical ablation techniques (Gonadectomy). Demonstration of cyclicity in female rats by vaginal smears. Demonstration of synchronisation of oestrus, and superovulation in laboratory animals.

VPY-614: Gastrointestinal Hormones **II** (Cr. Hrs. : 2+0)

Theory: Source, chemistry and functions of various gastrointestinal hormones. Mechanism of action of important GI hormones. Interaction of GI hormones with general body functions. Manipulation of feed utilization by GI hormones.

VPY-615 : Water, Electrolyte and Acid Base Balance **I** (Cr. Hrs. : 2+1)

Theory: Body fluid compartments, estimation of various spaces of body water input and output regulation, osmotic and hydrostatic pressure, modern concepts on interstitial fluid pressure and mechanism. Oedema and hypertension, dehydration and water intoxication. Fluid exchange, fluid homeostasis in various birds and mammals. Physiology of acidosis and alkalosis, compensation by respiratory and renal mechanism. Electrolyte regulation, neural and humoral control of electrolyte and acid base balance. Physiology of electrolyte and acid-base balance and water inter relationship. Electrolyte excess and loss.

Practical: Urinary constituents, measurement of blood volume, titrable acidity of urine, abnormal constituents of urine, factors affecting diuresis, effect of diuretics on urine volume. Estimation of electrolytes and measurement of acid / base deficiency in blood.

VPY-616: Clinical Physiology **I** (Cr. Hrs. : 2+1)

Theory: Endocrine disorders - Diabetes mellitus, Diabetes insipidus, Addison's disease - Physiological basis of hypothyroidism, hyperthyroidism, endocrine basis of male climacteric and menopause; anaemia and aphagia - classification and aetiology, cystic ovaries - endocrine basis, parturient paresis - causes and prevention, free martins - theories and mechanism; effect of free radical on cell metabolism and auto immune disorders, alopecia and retarded wool growth; Kwashiorkar and marasmus.

Practical: Chemical ablation, experimental diabetes, estimation of glycosylated Hb, effect of T4 on metabolism, diagnostic techniques and interpretation of results (ECG and strip tests).

VPY-680[#]: Special Assignment **I/II** (Cr. Hrs.: 0+1)

VPY-690[#]: Seminar **I/II** (Cr. Hrs.: 1+0)

VPY-700[#] Research (Cr. Hrs.: 0+30)

REFERENCE BOOKS

1. Dukes Physiology of Domestic animals – Edited by Melvin J Swenson.
2. Text book of Medical Physiology – Arthur C. Guyton.
3. Veterinary Endocrinology & Reproduction – by Mc. Donald.
4. Reproduction in Farm Animals – by E.S.E. Hafez.
5. Review of Medical Physiology – William Ganong.
6. Adaptation in Domestic animals - E.S.E. Hafez and B. Hafez.
7. Clinical Physiology – by Campbell, Dickinson and Stafer.
8. Applied Animal Endocrinology – by E.J. Squires.
9. Ruminant Physiology: Digestion, Metabolism, Growth and Reproduction
– by P. Cronjea.
10. Endocrinology – by Williams

16. M.V.Sc. IN VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VPH601*	Environmental Hygiene and Health Hazards	2	1	3
2.	VPH602*	Food Hygiene – I	2	1	3
3.	VPH603*	Food Hygiene – II	2	1	3
4.	VPH604*	Zoonoses – I	2	1	3
5.	VPH605*	Epidemiology in Public Health	2	1	3
6.	VPH 606	Public Health administration and Health Education	2	0	2
7.	VPH607	Comparative Medicine and Biology	2	1	3
8.	VPH608	Occupational Health	1	1	2
9.	VPH609	Zoonoses – II	1	1	2
10.	VPH610	Food Borne infections and intoxications	1	1	2
11.	VPH 611	Applied Epidemiology	1	1	2
12.	VPH680 [#]	Special Assignment	0	1	1
13.	VPH690 [#]	Seminar	1	0	1
14.	VPH700 [#]	Research	0	30	30

*Core courses: (12 Credits)

[#] Compulsory

Minor Fields of study

1. Veterinary Microbiology (VMC)
2. Veterinary Pathology (VPP)
3. Livestock Products Technology (LPT)
4. Veterinary Parasitology (VPA)
5. Veterinary Biochemistry (VBC)

VPH-601*: Environmental Hygiene and Health Hazards **I** (Cr. Hrs.: 2+1)

Theory: Importance of Veterinary Public Health in modern society. Occupational Health Hazards. Water - sources, contamination, purification and water borne diseases. Man - Environment Relationship. Pollution of human environment and their control. Public health importance of rodents, insects, fleas, pest, flies etc and their control measures. Pollution of air. Pollution by noise, radiation, allergens etc. Excreta, solid and liquid waste disposal and their relation to public health. Disaster Medicine. Pollution monitoring organisations and activities at National and International level.

Practical:

- Sampling, physical, chemical and microbiological examination of water for pollutants, indicator organisms and specific pathogens. Purification of water.
- Monitoring the air pollution by evaluation of chemical and microbiological parameters.
- Visit to recycling, rendering and sewage treatment plants.
- Assessment of noise and radiation pollution.

VPH-602*: Food Hygiene - I **I** (Cr. Hrs.: 2+1)

Theory: History and Development of food hygiene. Relation between public health and food hygiene with special emphasis to milk and milk products. Preharvest food safety. Effects of microorganisms in food and their prevention and control. Principles of food preservation. Biological and other indicators of hygienic quality and spoilage of milk and milk products. Milk borne and plant food borne diseases, their prevention and control. Packaging - principles, methods and materials used. Microbiological and chemical aspect of packaging in related to health. Physical and chemical quality of milk, synthetic milk, adulterants, preservatives, residues and other pollutants. International and National food and drug laws.

Practical:

- Sampling, collection and shipment of Milk and Milk products.
- Physical and Chemical (adulterants/synthetic milk and preservatives) examination of milk.
- Examination of milk for microbiological quality, specific pathogens, antibiotics pesticides and antibodies.
- Assessment of hygienic standard of utensils by different methods. Evaluation of chemical (pesticides) and biological quality (parasitic ova) of raw and cooked foods of plant origin.

VPH-603*: Food Hygiene - II **II** (Cr. Hrs.: 2+1)

Theory: History, development, scope and principles of meat hygiene. Basic principles of meat inspection, Ante mortem and post mortem examination in relation to public health. Safety and quality of animal and marine food products. Role of processing and catering establishment in public health. Structural design of modern abattoir and processing plants. Plant sanitation, management and operation. Disease conditions of meat and aquatic food products caused by microbes and their prevention. Meat borne diseases; prevention and control. Method of food preservation, packaging, storage, transportation and marketing. Animal byproducts utilisation. Recycling of effluents, methods of disposal of rejects. Safety standards, Development of HACCP system. Inspection of game animals, eggs and food of aquatic origin.

Practical:

- Inspection of Food animals and their carcass.
- Assessment of microbial quality of meat, fish and egg.
- Quality control tests on different meat products.
- Serological method for detection of meat of different food animals.

VPH-604*: Zoonoses-I

I

(Cr. Hrs.: 2+1)

Theory: Evolution of zoonoses: Etiological and ecological factors affecting host and reservoir cycle, concept and classification of zoonoses. Natural nidi and spread of zoonoses. Role of domestic vertebrates, cold-blooded animals and primates in zoonoses. General methods of prevention and control. Problems in control and eradication of zoonotic diseases. Bacterial, viral, parasitic, protozoal, mycotic, rickettsial and prion zoonoses. Mode of transmission of diseases by vectors. Animal reservoirs of diseases, biting of venomous animals including marine and aquatic. Ecological aspect of zoonoses - sporadic, endemic, epidemic, pandemic. Inapparent, subclinical and latent carriers. Xenozoonosis

Practical :

- Collection and despatch of laboratory specimens with respect to specific zoonoses (bacterial, viral, parasitic).
- Methods for diagnosis of common zoonotic diseases (Eg. Brucellosis, Leptospirosis).
- Isolation and identification of different common agents responsible for zoonoses.

VPH-605*: Epidemiology in public health

I

(Cr. Hrs.: 2+1)

Theory : Epidemiology – History, definition, scope. Principles of investigation of outbreak. Components of epidemiology, Formulation and evaluation of hypothesis, characteristics of screening tools. Types of analytical studies: Prospective, Case Control, Longitudinal, and Cross sectional studies, Experimental studies. Biotic community, ecosystem, parasite host relation. Natural foci of diseases. Patterns and trends of disease occurrence, Disease process and its spread, Formulation of Causal hypothesis – principles of host-parasite relationship, Health statistics & demographic methods. Measurement of health and diseases, Principles of prevention, control and eradication diseases. Introduction to Biostatistics. National and International organizations concerned with epidemiology. OIE – its functions.

Practical:

- Calculation of prevalence, incidence, case fatality rate etc for different diseases.
- Evaluation of results obtained by the use of different chemotherapeutic, chemoprophylactic and vaccine studies in a given population.
- Field visits for surveillance and monitoring of specific factors related to public health. Demographic studies of zoonoses.
- Visit to Primary Health Centers and isolation ward.
- Biostatistics in relation to Epidemiology

VPH-606: Public Health administration and Health Education II (Cr. Hrs.: 2+0)

Theory: Definition of health, development of VPH, various aspect of health, spectrum of health. Ecology of health. Health determinants. Health education - principles and methods. Indicators of health, concept of disease, screening of disease, epidemiological surveillance and monitor, level of prevention, comprehensive health care delivery, organisation, administration, concepts of welfare of public health. Food and drug laws, National and International sanitary regulations. Notifiable diseases. Power of food inspection, prevention of food adulteration. Public awareness on environmental hygiene and pollutants. National and International organisations and administration of veterinary Public Health services.

VPH-607: Comparative Medicine and Biology II (Cr. Hrs.: 2+1)

Theory: Comparative pathology of different important zoonotic diseases (Eg. Rabies, TB, Anthrax, JE etc.) and disorders (Eg. Metabolic disorder, cerebrovascular diseases, chronic heart diseases, Neoplastic condition. Gnotobiology. Diseases of zoonotic importance in laboratory animals and their diagnosis. Regulations and laws regarding experimental animal.

Classification of foods, proteins, carbohydrates, fats minerals, vitamins and their functions, daily nutritional requirement, sources, deficiency (Eg. PEM, Thyroidism, Vit. A etc.), prevention and control. Balanced diet, Nutritional requirements of special groups. Nutritional diseases. Aflatoxins, Epidemic dropsy, scurvy etc. Social aspects of Nutrition. Assessment of ecological factors. Health significance of genetically modified foods.

Practical:

- Comparative study of animal & human histopathology - normal and important zoonotic disease conditions.
- Handling of laboratory animals
- Different methods and routes of inoculation of lab animals.
- Collection of different samples from different laboratory animals.
- Nutritional assessment, clinical examination, anthropometric measures. Height, weight arm circumference, skinfold thickness etc.
- Biochemical tests for total serum protein, serum albumin, urinary ascorbic acid, haemoglobin etc.

VPH-608: Occupational Health II (Cr. Hrs.: 1+1)

Theory: Occupational environment, occupational hazards, occupational diseases due to physical agents, heat, cold, light, pressure, radiation, mechanical etc. Chemical-- gases, dusts, organic dusts, metal etc. Biological - Brucellosis, leptospirosis, anthrax, hydatidosis, psittacosis, tetanus, encephalitis, fungal infections and viral infections. Occupational cancers - Neoplasms of skin, lungs, bladder etc. Occupational dermatosis Toxic hazards--lead, mercury, arsenic etc. poisoning. Respiratory diseases. Measurement of health protection of workers, prevention and control of occupational diseases.

Practical:

- Diagnosis of occupational diseases by different methods.

- Field survey among different work groups.
- Isolation and identification of different causative organisms, serological methods of diagnosis, evaluation of data available.

VPH-609: Zoonoses - II **II** (Cr. Hrs.: 1+1)

Theory: Systematic study of bacteria and fungi in relation to public health significance; eg. - Corynebacterium, Campylobacter, Yersinia, Pseudomonas, Shigella, Aspergillus, Fusarium, Penicillium, Trichophyton etc. Description of important RNA and DNA virus of public health significance; eg. Enteroviruses, Influenza group of virus, Pox virus, Herpes virus etc. Parasites like Malaria, Leishmania, Giardia, Entamoeba, hook worm, round worm etc.

Practical:

- Different methods for isolation and identification of zoonotic bacteria, virus, fungi, protozoa etc. of zoonotic importance from host, vehicle and environment.

VPH-610: Food Borne infections and intoxications **I** (Cr. Hrs.: 1+1)

Theory: Epidemiology of food borne diseases. Important food borne infections and Intoxications: Botulism, Staphylococcal enterotoxin intoxication of Cl. perfringens, salmonella, Vibrio parahaemolyticus, B. cereus, Pseudomonas aeruginosa, Aeromonas hydrophilus, E. coli, Klebsiella, Mycotoxins, parasites and viruses, Toxic sea foods, Methyl Mercurial and other chemical poisonings. Toxic plant foods, Food poisoning by microbes chemicals, additives, preservatives, pesticides, herbicides, rodenticides and plant origin toxins. Canned food hygiene, various type of canned foods, their physical and chemical characters, spoilage, storage and handling of canned food. Fish Hygiene, inspection, preservation, storing of fish & fish products.

Practical :

- Examination of foods for food poisoning microbes, parasites and chemicals.
- Methods of investigation into food poisoning outbreaks.
- Methods for screening the food for different toxins of bacterial and fungal origin.

VPH-611: Applied Epidemiology **I** (Cr. Hrs.: 1+1)

Theory: Introduction to applied epidemiology, Influence of disease on animal and human population, Methods of disease transmission, Analytical- Observational study of etiology, Ecologic studies Disease control strategies, Integrated planning, Monitoring disease, Disease outbreak investigation, International monitory, Concept of field trials, Disease modeling.

Practical: Field investigations, Surveys, Sampling methods, Preparation of Questionnaire, Evaluation of epidemiological reports, Computerized recording techniques, Data management, Introduction to epidemiological software.

VPH-680[#]: Special Assignment **II** (Cr. Hrs. : 0+1)

VPH -690[#]: Seminar **II** (Cr. Hrs.: 1+0)

VPY-700[#]: Research **(Cr. Hrs.: 0+30)**

REFERENCE BOOKS:

1. Text book of Preventive and Social Medicine* - K.Park
2. Dairy Microbiology* - Anandakrishnan C.P., Singh R.B and Padmanabhan P.N
3. Fundamentals of Dairy Microbiology* - Prajapathy, J B
4. The technology of food preservation- Norman W. D., and James N.D
5. Environmental Pollution: Impact of technology on Quality of life- Ray,M.
6. Environmental Hazards and Human Health- Richard B.Philp
7. Wilsons' Practical Meat Inspection- Wilson W.G
8. Food Microbiology* - Frazier V. and Westhoff D.C.,
9. Food safety and Quality Assurance-Foods of Animal Origin- Hubbert W.T
10. Food safety-Contaminants and Toxins- D'Mello J.P.F
11. Methods of Analysis and Analysis- James P.L. and Je.
12. Review of Parasitic Zoonosis- Parija S.C
13. Industrial Hygiene Evaluation Methods- Bisese S and James P.K.
14. Health and health care in Third world- Phillips D.R
15. Infectious Waste Management-A practical guide.-Garvin M. L.
16. Hand book of Biomedical Instrumentation- Khandpur
17. Veterinary Preventive Medicine- White E.C. and Jordan FTW
18. A textbook of Preventive Medicine- Chakrabarti.A
19. Meat Hygiene* - Gracy, Collins and Huey
20. Meat Hygiene* - Joshi.B.P
21. A colour Atlas of Meat Inspection- Durao.G
22. Manual on simple methods of Meat preservation- FAO Manual No. 79
23. Poultry Meat Hygiene and Inspection - Bremner.A and Jhonston M
24. Diseases of Animals Transmissible to Man- Thapliyal D.C.
25. Zoonoses* - Mahendra Pal
26. Fundamentals of Parasitic Zoonoses- Pathak K.M.L
27. Zoonoses: Recognition Control and Prevention- Martin.E., Jones.E.H., Hubbart,W.T and Hagstard H.V
28. Zoonoses: Infectious diseases Transmitted from Animals to Human Being
Krauss H
29. Dogs Zoonoses and Public Health- Calum N.L., Macpharson, Fracois,X., Moslin and Wandeler,A.
30. CRC handbook series in Zoonoses- Steele J.L.
31. Zoonoses* - Palmer, Soulsby and Simpson
32. Applied Dairy Microbiology- Marth.E.H. and Steele J.L.
33. Modern Food Microbiology- Jay. M.J
34. Handbook of milk Microbiology- Srivatava.M.L.
35. Basic Food Microbiology- Banwart.G.J.
36. Industrial Microbiology- Prescott and Ponn
37. Urban Health Research in Developing Countries- Atkigson.S., Sangsore,J and Werns,E.
38. Safety Evaluation of Environmental Chemicals- Dikshith, T.S.S.
39. Influence and Removal of Organics in Drinking Water- Mallevilla,Suffet and Chan
40. Manual of Aquatic Sediment Sampling.- Murdoch,A Asane J.M.
41. Text book of Medical Parasitology- Parija S.C.
42. Worms and Human Disease- Muller
43. Food Borne Pathogens* - Varnem and Evans

44. Gradwohls' Clinical Lab Methods and Diagnosis- Sonnenwirth and Jarett
 45. Fish Disease and Disorders – Viral Bacterial and Fungal Infections.
Wro and Bruno
 46. Epidemiology, Diagnosis and Management of Zoonoses* - Narayan K.G.
 47. Outline of Dairy Technology- Sukumar De
 48. Textbook of Human Nutrition- Bamji.M.S., Rao,N.P and Reddy V
 49. Principles and Practice of Animal Health and Hygiene- Prasad. J., and Neeraj
 50. Veterinary Epidemiology- Thrushfield. M.
 51. Fundamentals of Animal Hygiene and Epidemiology* - Thapliyal D.C.
 52. Communicable disease Epidemiology and Control- Webber,R.
 53. Veterinary Epidemiology-Principles and Methods* - Willeberg,M.
 54. Medical Parasitology- Parija S.C.
 55. Veterinary Medicine- Radostits,O.M, Gay C.C, Douglas,C, Blood.C and Kenneth W.H.
 56. Practical Medical Microbiology* - Mackie and Mc.Cartney
 57. Helminthes, Arthropods and Protozoa of Domesticated Animals- Soulsby.J.L.
- (* indicates books which can be used for under graduate reference)

17. M.V.Sc. IN VETERINARY SURGERY AND RADIOLOGY

Sl. No.	Course No.	Course Title	Credits		Total
			T	P	
1.	VSR601*	Anaesthesiology	2	1	3
2.	VSR602*	Small Animal Surgery	2	1	3
3.	VSR603*	Large Animal Surgery and Lameness	2	1	3
4.	VSR604*	Radiology, Imaging Techniques and Physiotherapy	2	1	3
5.	VSR605	Operation Theatre Techniques and Bio-Instrumentation	1	1	2
6.	VSR606	Plastic, Reconstructive surgery and Veterinary Dentistry	2	1	3
7.	VSR607	Thoracic and Abdominal Surgery	2	1	3
8.	VSR608	Urogenital Surgery	2	1	3
9.	VSR609	Neurosurgery	2	1	3
10.	VSR610	Orthopaedic Surgery	2	1	3
11.	VSR611	Ophthalmic Surgery	1	1	2
12.	VSR612	Experimental Surgery	1	0	1
13.	VSR613*	Clinical Surgery – I	0	1	1
14.	VSR614*	Clinical Surgery – II	0	1	1
15.	VSR680 [#]	Special Assignment	0	1	1
16.	VSR690 [#]	Seminar	1	0	1
17.	VSR700 [#]	Research	0	30	30

*Core courses: (14 Credits)

[#] Compulsory

Minor Fields of Study

1. Veterinary Anatomy (VAN)
2. Veterinary Pathology (VPP)
3. Veterinary Pharmacology and Toxicology (VPT)
4. Veterinary Medicine (VMD)
5. Veterinary Gynaecology & Obstetrics (VGO)

VSR 601*: Anaesthesiology

I

(Cr. Hrs.: 2+1)

Theory: General considerations - Anaesthetics and pre anaesthetics - Local & regional anaesthesia - Tranquilizers - Basal narcosis - General anaesthesia - Administration in farm and pet animals and birds - Evaluation and monitoring of patient during anaesthesia - Anaesthetic emergencies and management.

Practical: Acquaintance of various equipments and instruments used in anaesthesia in large and small animals – preanaesthetic evaluation- practice of local, regional and general anaesthesia- parameters employed-monitoring anaesthetised patients.

VSR 602*: Small Animal Surgery

I

(Cr. Hrs.: 2+1)

Theory: General considerations in small animal surgery - congenital anomalies and surgical affections of skull, jaws, teeth, tongue, tonsils, salivary glands, pharynx, larynx, ear, eye, trachea and oesophagus - principles of thoracic surgery - surgical diseases of thoracic wall, bronchi, mediastinum and lung - hypertrophic pulmonary osteoarthropathy - management of congenital and acquired heart diseases - diaphragmatic hernia - affections of abdominal wall- surgical diseases of gastrointestinal tract, spleen, liver, pancreas, urogenital system – cosmetic surgeries.

Practical: Surgical procedures for diseases of eye, aural haematoma, draining of external and middle ear, exodontia, dental scaling, oesophagotomy, end to end anastomosis of oesophagus, thoracotomy, pericardiotomy, vascular anastomosis, gastrotomy and partial gastrectomy, pyloromyotomy, splenectomy, enterotomy, enteroanastomosis; Surgical procedures for urogenital system- cosmetic surgeries.

VSR 603*: Large Animal Surgery and Lameness

II

(Cr. Hrs.: 2+1)

Theory: General considerations in large animal surgery - Congenital anomalies and surgical affections of skull, sinuses, horn, jaws, eye, ear, teeth, tongue, salivary gland, pharynx, larynx, guttural pouch, nasal cavity, trachea and oesophagus - management of gall and torticollis – surgical affections of thoracic wall, pleura, lungs, mediastinum -traumatic reticulopericarditis - peritonitis- diaphragmatic hernia-surgical affections and congenital abnormalities of gastrointestinal tract, spleen, liver, pancreas - urogenital system - hernia - classification and management. Diagnosis of lameness - specific joint diseases in large animals - Fore limb and hind limb affections - affection of hoof and corrective shoeing.

Practical: Trephining and draining of sinuses - cannulation salivary duct - surgical procedures for empyema of guttural pouch, ventriculectomy, oesophagotomy, end to end anastomosis of oesophagus, tracheotomy and tracheostomy, resection of tracheal rings and end to end anastomosis of trachea- Fifth rib resection - rumenotomy - abomasotomy - correction of abomasal displacement - enterotomy and enteroanastomosis - surgical procedures for urogenital system and other abdominal organs - Conformation of body in large animals surgical correction for fore limb and hind limb lameness - corrective shoeing methods.

VSR 604*: Radiology, Imaging Techniques And Physiotherapy II (Cr. Hrs.: 2+1)

Theory: Radiation physics, X ray tube, X ray film, qualities of X ray Radiographic techniques and interpretation of skiagrams. Soft tissue radiography and contrast radiography techniques of esophagus - Thorax - Abdomen - alimentary tract, Urinary system- myelography - bronchography - angiography and other miscellaneous techniques - Fluoroscopy - Physics and physiological effects of heat, Infrared, laser and ultraviolet therapy, electrotherapy, medical diathermy, ultrasound therapy.

Practical: Handling of X ray machine, positioning of animals for radiography- processing of X ray film – Special radiographic techniques in small and large animals - Contrast radiography - Barium contrast- IVP, Cystography - Myelography - Angiography - Venography - Double contract techniques - Laser and other physiotherapy practices.

VSR 605: Operation Theatre Techniques and Bio-Instrumentation I (Cr. Hrs.: 1+1)

Theory: Designing of operation theatre - maintenance - Acquaintance of equipments at operation theatre - intensive care handling - Maintenance of cardio - Pulmonary support - ECG, EEG and other monitoring techniques - fluid and electrolyte balance therapy in surgical cases - Principles and use of heartlung machine, cryosurgical instrument, operating microscope, laparoscopy, endoscopy, arthroscopy, cystoscopy, hemodialyser.

Practical: Acquaintance of various bio-instruments and equipments used in operation theatre - Monitoring surgical procedures - operation of life supporting systems - familiarisation of various latest bio-medical instruments and equipments.

VSR 606: Plastic, Reconstructive Surgery and Veterinary Dentistry II (Cr. Hrs.: 2+1)

Theory: Principles of plastic and reconstructive surgery - Congenital abnormalities and their corrective surgery- Biomaterials and implants in veterinary practice - Principles of transplantation and grafting techniques - Grafting techniques of skin, tendons, blood vessels - Use of various prosthetic materials - fate of transplanted tissues - Veterinary dentistry - common dental pathology - common surgical procedures related to tooth - Complications - Periodontal diseases - Orthodontics - Endodontics - Root canal therapy - use of dental prosthesis.

Practical: Reconstructive surgical practices for congenital abnormalities - Use of Biomaterials and implants for various clinical conditions - Development of new biomaterials - clinical study on the efficacy of various prosthetic materials in various types of hernia including diaphragmatic hernia - use of various prosthetic materials in clinical conditions affecting esophagus and trachea – Veterinary orthodontics procedures and practices.

VSR 607: Thoracic and Abdominal Surgery I (Cr. Hrs.: 2+1)

Theory: Principles of thoracic surgery - Surgical affections of thoracic wall, pleura, lungs, mediastinum, thoracic esophagus and their surgical management - principles of abdominal surgery - Surgical affections of abdominal wall, peritoneum, peritoneal cavity, ventral hernia, surgical conditions of abdominal organ and their management.

Practical: Clinical diagnosis and treatment of cardio-thoracic disorders in small and large animals - treatment for traumatic pericarditis in large animals – Trans thoracic esophagotomy techniques - repair of diaphragmatic and ventral hernia in clinical cases - Correction of surgical disorders of abdominal organs.

VSR 608: Urogenital Surgery

II (Cr. Hrs.: 2+1)

Theory: Surgical diseases of urinary system - Pathophysiology and management of urinary tract disorders - Diagnostic procedures- urolithiasis - nephrectomy - cystotomy - urethrotomy - urinary diversion techniques - Uroperitonium and its management - Principles of genital tract surgery - Surgical approach to male and female genital system - surgical affection of ovary, oviduct, uterus, cervix, vagina and vulva - Surgical affection of prostate, seminal vesicles, testes, epididymis , scrotum, penis and prepuce - castration and spaying - Surgical intervention on gravid uterus - Post operative management.

Practical: Clinical approach for various surgical disorders of urinary system - Prosthetic materials for reconstructive surgery in cases of bladder and urethral rupture - surgical management of urolithiasis - surgical management of genital tract affections - various techniques for castration and spaying - Surgical management of uterine affections and post operative care.

VSR 609: Neurosurgery

II (Cr. Hrs.: 2+1)

Theory: Surgical anatomy of nervous system. Cerebrospinal fluid and its collection, analysis - Electroencephalography, electromyography, electrodiagnostic testing - principles of brain surgery, craniotomy and craniectomy. Congenital and acquired lesions of vertebral column - spinal fusion - intervertebral disc disorders, fenestration of vertebral discs, laminectomy, hemilaminectomy , effects of atlanto- axial subluxation. Congenital abnormalities of nervous system. General consideration in peripheral nerve surgery - Surgical affections of peripheral nerves and their management, peripheral nerve anastomosis and different techniques of nerve repair - paraplegia and its management.

Practical: Methods of neurological examination, special ancillary investigation, EEG, EMG, CSF collection and evaluation. Surgical approaches of brain and spinal cord - Removal of space occupying lesions from cranial cavity - intervertebral disc prolapse correction and their surgical management - surgical approach for the treatment of vertebral fractures and dislocations - Reconstructive surgery of peripheral nerves, anastomosis -Surgical management of various paralytic conditions.

VSR 610: Orthopaedic Surgery

II (Cr. Hrs.: 2+1)

Theory: Development of bone, cartilage, tendon, bone healing, factors influencing bone healing – Fractures and dislocation - classification - diagnosis - treatment. Principles of AO/ASIF methods of internal fixation of fractures of long bones in small and large animals - Methods of fracture fixation for various type of fractures - Principles of external fixation techniques - Indications and use of external fixators for different kinds of fractures - Surgical anatomy of joints - Congenital malformation of the joints - hip dysplasia, arthritis and its treatments, diseases of muscle, tendon and ligaments - Arthroscopy principles and examination - Bone grafting principles and indications - Total hip prosthesis - Indications and procedure

Practical: Orthopaedic instruments and their usage - Surgical approach for various types of fractures in small and large animals - Fracture immobilization methods by AO/ASIF principles - External fixation methods - Applications and use - Repair of tendon and ligaments - Bone grafting - various methods in large small animals - Clinical use.

VSR 611: Ophthalmic Surgery **II** (Cr. Hrs.: 1+1)

Theory: Ocular anatomy - Ophthalmic examination and diagnostic procedures - Conjunctivitis - Keratitis - Diseases of lacrimal and nasolacrimal systems - Glaucoma, Disease of Lens - Cataract - Diseases of Retina –ocular manifestations of systemic disease - Ocular neoplasms.

Practical: Direct and indirect ophthalmoscopy - use of Tonometer - Keratoplasty, Anterior Chamber paracentesis – Gonioscopy - Nasolacrimal flush - Vitreous paracentesis – Cataract surgery - Lendectomy - techniques - Ocular prosthesis - Surgical management of various ocular disorders.

VSR 612: Experimental Surgery **I** (Cr. Hrs.: 1+0)

Theory: Planning experimental surgical techniques - special surgical procedures for experimentation on organs such as stomach, intestine, liver, kidney, bladder, pancreas and adrenal and their effects on the body- cannulation of different blood vessels and lymphatics and fistulation technique - foetal surgery - Bypass techniques - tissue transplantation and rejection phenomenon - animal models - biopsy techniques.

VSR 613*: Clinical Surgery - I **I** (Cr. Hrs.: 0+2)

Clinical surgery in Small animals and postoperative care.

VSR 614*: Clinical Surgery - II **II** (Cr. Hrs.: 0+2)

Clinical surgery in large animals and postoperative care

VSR 680#: Special Assignment **II** (Cr. Hrs.: 0+1)

VSR 690#: Seminar **II** (Cr. Hrs.: 1+0)

VSR 700#: Research (Cr. Hrs.: 0+30)

REFERENCE BOOKS

1. McIwraith's turners equine surgery – advance technique by C.W. McIwraith, J.T. Robertson
2. Lumb & Johns Veterinary anesthesia by J.C. Thurmon, N.J. Tranguith, G.J. Benson
3. Strumbeck's small animal gastro enterology by W.G. Guilford, S.A. Center, DR. Strombeck, D.A. Wilham's, D.J. Meyer.
4. Complications in small animal surgery by H.A. Lipowitz, D.D. Caywood, C.D. Newton, A.Schwartz.
5. Equine surgery by J.A. Auer, J.A. Stick.

6. Veterinary ophthalmology by Kirk N. Gelat.
7. Equine Lameness by Geraint Wynaitone, Blackwell Scientific Publication
8. Small Animal Endoscopy 2nd Edition by Todd.R.Tams Mostry
9. Small Animal Spinal disorders diagnosis surgery by Simon J. Wheeler, Nicholas, J.H. Sharp Mastry – Wolfe Publications.
10. Atlas of small animal reconstructive surgery 2nd edition by Michael. M. Pavlete W.B. Saunders Co. Publication.
11. Clinical Veterinary surgery Vol.I by A.C. Shuttleworth, R.H. Sruythe, Green World Publishers
12. Clinical Veterinary Surgery Vol.II by A.C. Shuttleworth, R.H. Sruythe, Green World Publishers.
13. Small Animal Radiology and ultrasonography a diagnostic atlas and Text 2nd edition by Ronald L. Burk, Norman Ackerman W.B. Saunders Co. Publishers.
14. An Atlas of surgical approaches to the bones and joints of the dog and cat 3rd edition by Donald, L. Piermattei W.B. Saunders Co.
15. Handbook of small animal orthopedics and fracture repair 3rd edition by Donald L. Piermattei Gretchen L. Flo W.B. Saunders Co.
16. Color atlas of Veterinary ophthalmology by Kirk N. Gelatt Lippincott. Williams & Wilkins.
17. Small animal Clinical oncology by Stephen J. Withro, E.Gregory MacEwen W.B. Saunders. Co.
18. Veterinary dental techniques to small animal practitioner 2nd edition by Steven E. Holmstronm Patricia Frost, Edward R. Eisner W.B. Saunders Co.
19. Large animal anesthesia principles and technique 2nd edition by Reibold et al. T.W. Eriebold, D.R. Geiser, D. O. Goble Iowa State University.
20. Textbook of veterinary diagnostic radiology by Thrall, Donald 2nd Edition
21. Ear disease of the dog and cat by Richard G. Hawery, Joseph Harain Agnes, J. Deauche manson Publishign The Veterinary Press.
22. Adam's lameness in horses by Stashak, ted. S.



POST-GRADUATE STUDIES SYLLABUS
(Approved by PG Board of Studies)
2010-11 onwards



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**M.V.SC. DEGREE PROGRAMME
(Master of Veterinary Science)**

Syllabus & Regulations

2010-11 ONWARDS

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