PONDICHERRY UNIVERSITY

PUDUCHERRY 605 014

M.V.Sc. DEGREE PROGRAMME

(Master of Veterinary Science)

Revised Syllabi & Regulations

2016-17 ONWARDS
M.V.Sc. Degree Programme

Revised Syllabi & Regulations

(2016-17 onwards)

1. **Short title, application and commencement:**
   
   1.1 These regulations may be called as Post-graduate Studies in M.V.Sc. Degree regulations 2016.

   1.2. They shall govern the Post-graduate studies 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 2016-17

2. **Definitions:**

   In these regulations, unless the context otherwise requires

   2.1 **Academic year:** A period consisting of two consecutive semesters including inter-semester break as announced by the College.

   2.2 **Semester:** An academic term consisting of not less than 110 instructional days excluding the days of external examinations.

   2.3 **Credit hour, Semester Credit or Credit:** One hour of lecture or three hours of laboratory or field practicals or hospital each week in a semester.

   2.4 **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.
2.5 **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.

2.6 **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.

2.7 **Credit Point of a course**: The product of grade point and credit hours in a course.

2.8 **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 completed by the student in that semester. The Non Credit and Research Credits are not to be included for the calculation of GPA. The GPA shall be corrected to second decimal place.

2.9 **Overall Grade Point Average (OGPA)**: The quotient of cumulative credit points obtained by a student in all courses completed by a student 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 overall performance of a student in all the courses taken during the period covering more than one semester. The Non Credit and Research Credits are not to be included for the calculation of OGPA. The OGPA has to be corrected to second decimal place.

3. **Academic Departments referred to in this regulations**:

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

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

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

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 in 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) Shall secure a minimum of 50% in the entrance examination (40% for SC/ST candidates of UT of Puducherry).

5.2. Selection: The Selection of candidates will be based both on marks obtained in the B.V.Sc./B.V.Sc. & A.H. examination and the entrance examination with equal weightage (50% each).

5.3. Entrance Examination: An entrance examination will be conducted by RIVER, 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.

5.4. 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 in the prescribed format on the date specified for the purpose. For specific purpose and requirement, students may get their originals from the institutions by applying through proper channel and return the documents by the specified time. 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 duration of minimum four semesters (two academic years).

6.1. Minimum Credit requirements for Master’s Degree:

i) Course work

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major subject</td>
<td>28</td>
</tr>
<tr>
<td>Minor &amp; Supporting subject(s)</td>
<td>11</td>
</tr>
<tr>
<td>(Minimum of 6 credits for Minor</td>
<td></td>
</tr>
<tr>
<td>&amp; 3 credits for supporting subjects)</td>
<td></td>
</tr>
<tr>
<td>Seminar (Major subject)</td>
<td>01</td>
</tr>
<tr>
<td>Non credit compulsory courses</td>
<td>Nil</td>
</tr>
</tbody>
</table>

ii) Research Work

<table>
<thead>
<tr>
<th>Research Work</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Total: 60 credits
Major subject: The subject (department/discipline) in which a student takes admission.

Minor subject: The subject closely related to a major subject (as per the list specified for each major subject)

Supporting subject: The subject not related to major subject. It could be any subject considered to be relevant for student’s research work or necessary for building overall competence.

Non credit compulsory courses: Four courses are of general nature under compulsory for master’s programme.

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGS-501</td>
<td>Library and information services</td>
<td>0 +1</td>
</tr>
<tr>
<td>PGS-502</td>
<td>Technical writing and communication skills</td>
<td>0 +1</td>
</tr>
<tr>
<td>PGS-503 (e-course)</td>
<td>Intellectual Property and its management in Veterinary/ Agriculture</td>
<td>1+0</td>
</tr>
<tr>
<td>PGS-506 (e-course)</td>
<td>Disaster Management</td>
<td>1+0</td>
</tr>
</tbody>
</table>

6.2. Credit load: A candidate shall be allowed to register for a maximum of 18 credits excluding non credit courses in a semester. However, to an extent of 2 credits more than the prescribed maximum can be registered in a semester with prior approval of the Dean.

6.3. Residential requirements: Minimum residential requirement for M.V.Sc. degree programme is four semesters (two academic years) and the maximum limit for completion of M.V.Sc. programme is eight semester i.e. four academic years (inclusive of duration of discontinuation, if any). If a student fails to complete his/her Master’s programme with in the maximum time limit prescribed, his/her admission shall stand cancelled.

7. Attendance: The student is required to have an attendance of at least 85% of total classes separately for theory and practical in each course. If any student falls short of the required attendance 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 and such candidates are required to re-register the course (s) in which he or she had fallen short of the required attendance.
8. **Evaluation and Examinations:**

Evaluation of a student in each course is based on Internal (50%), external (50%) for theory and practical. The weightage between theory and practical shall be as per the credits of the course.

8.1 **Internal Examinations:** It shall be the responsibility of the concerned Dean / Head of the Department to ensure proper conduct of all internal evaluations in all the courses offered by that Department. The internal marks scored by the student will be communicated by the Dean at the end of the semester to the Pondicherry University for the declaration of the result.

8.1.1. The theory internal examination consists of one midterm examination for 30 marks, seminar or assignment for 20 marks.

8.1.2. The internal practical examination shall be conducted at the end of the semester for 100 marks comprising of 70 marks for practical, 20 marks for practical assignments / record and 10 marks for viva-voce. Submission of records / assignments and attendance in viva-voce examination are compulsory.

8.1.3. 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 after the end of the semester and the external examiner will evaluate the theory papers for all the courses offered by one department including major and minor fields of study. 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 practical examination for 100 marks (80 marks for practical, 10 marks for records and 10 marks for viva-voce) will be conducted with one internal and one external examiner nominated by the Controller of Examinations, Pondicherry University.

8.3. **Comprehensive Examination:** The comprehensive examination should be conducted after the completion of 75% of the course work in major subject (proportionately covering those courses) by obtaining the question paper from an external examiner by the
Pondicherry University. The comprehensive written examination in major subject will be for 100 marks comprising subjective questions for 3-hour duration. The answer scripts will be evaluated internally and reported to the University. A student must get at least 60% of marks in the written comprehensive examination and will be graded as Satisfactory/Unsatisfactory. In case a student fails to get satisfactory result he or she may be asked to reappear for the comprehensive examination one month after the declaration of the result. It shall be the responsibility of the Head of the Department to ensure proper conduct of comprehensive examination for all the students in the concerned Department.

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. The retired experts with above criteria below the age of 65 years can also be appointed as external examiners.

9.1. **Panel of examiners**: The HOD will submit a panel of five external examiners to the University through the Dean of the college for conducting the Semester Theory and Practical External Examinations including the paper setters for the Comprehensive Examination in the concerned subject.

9.2. **Evaluation**: The Semester External Examination answer scripts will be evaluated by the External Expert. All the answer scripts of the internal examinations (including the Comprehensive Examination) will be evaluated internally. All these internal evaluations will involve HOD and the course in-charge for the individual courses / the Chairman of the Advisory Committee for the Comprehensive Examination.

10. **Minimum Marks for Pass**: If a candidate fails in any course in aggregate of theory and practical with GP of less than 6.00, he/she should reappear for all the examinations in theory and practical (internal and external) in that course conducted in the ensuing semester. The Pondicherry University will declare the results of the examinations and the results will be communicated to the college.
11. **Advisory Committee:** The HOD shall allot a major advisor / Chairman advisory committee for each student registered for M.V.Sc. programme in his/ her department in the first semester. The major advisor in consultation with the HOD will propose an advisory committee for approval by the Dean in the second semester. The committee shall consist of at least three members two from the major field of study and one from the minor field. ‘

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 field of specialization

iii. Assistant Professors who do not possess Ph.D. Degree but have eight years of Teaching/Research/Extension experience in the concerned field 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 field of specialization are also eligible to be appointed as **members of the advisory committee**.

11.1. **Changes in Advisory committee:** If the Chairman / any member of the advisory committee is not available for any reason or proceeds on long leave / resigns / retires from the present assignment, the HOD may recommend an eligible substitute for approval by the Dean. However, in such cases, if the concerned student is likely to submit his or her thesis within 90 working days, the same Chairman/ member(s) may be permitted to continue to guide the student.

12. **Research Project formulation and Supervision:**

On successful completion of 75% of the Course work in the Major Subject, the student can register eligible research credits in the subsequent semester. The Chairman in consultation with the members of the advisory committee shall identify the topic of research project and submit the Synopsis of the proposed Research Project in prescribed format to the Dean for approval. He/she will also present a seminar on the proposed work to the faculty of the college including the members of the Research Advisory Committee (RAC) of the college. Based on the recommendations of the RAC the Dean will accord the approval to the
synopsis. Subsequent change(s) if any in the synopsis need to be approved by the Dean on the recommendation of the RAC. The student will carry out the research work as per the approved synopsis under the supervision and guidance of the Advisory Committee.

12.1. Approval of the synopsis: The synopsis approval must be accomplished in the semester in which the registration of the research credits started. The time between submission of synopsis and thesis shall be at least one semester.

13. 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 three draft copies of the thesis and the approved synopsis to the Dean along with a certificate in the prescribed proforma duly signed by the advisory committee. Three copies of thesis abstract of not more than 300 words shall also be submitted along with the thesis. The student is permitted to submit his or her thesis within 30 calendar days after the closure of the semester failing which he/she has to register in the concerned semester by paying a registration fee of Rs. 5000/- with 0 credits. If he/she fails to submit the thesis in that semester too, the student has to register in the subsequent semester by paying the balance amount of the Annual fee with 0 credits.

14. 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 of the 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 the stipulated time.

14.1. 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 Vive voce examination. The student shall submit five final bound copies of the thesis after incorporating the
suggested corrections of the external examiner in consultation with the Advisory Committee 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 HOD, external examiner 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.

14.1.1. 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.

14.1.2. 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 by the same examiner.

14.1.3. 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 14.1.

14.1.4. 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.

14.2. A candidate shall not be permitted to submit his/her thesis for more than two occasions.
15. **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.

i. Minimum passing grade in a course: 6.00

ii. Minimum GPA/OGPA to appear for the comprehensive examination, registration of research credits and to obtain degree: 6.50

*If a candidate fails to get GPA/OGPA of 6.5, he/she should improve the GP by reappearing for the examination conducted during ensuing semester in not more than two courses of the major subject with the recommendation of the advisory committee.*

16. **Eligibility for Degree:**

A candidate is eligible for the award of M.V.Sc. degree after successful completion of the prescribed courses and research credits including final thesis viva voce examination with minimum OGPA of 6.50. Candidate securing an OGPA of 8.50 and above and completing the courses, Comprehensive examination and final thesis examination satisfactorily in the first attempt will be awarded degree in FIRST CLASS WITH DISTINCTION. Candidate securing an OGPA of 7.50 to 8.49 and completing the courses, Comprehensive examination 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.

17. **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 comprehensive examination with the prior approval of the Pondicherry University. Discontinuation before successful completion of comprehensive examination shall result in cancellation of admission. The discontinuation is allowed only once in the M.V.Sc. degree
programme. However, the maximum time limit prescribed for the completion of Master’s Programme shall remain unchanged. The M.V.Sc. student should not be on the active rolls of employment in Government or University or any private or public undertakings during the study period.

18. 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.

19. Removal of Difficulties:

19.1. If any difficulty arises in giving effects to provisions of these regulations, Vice-chancellor Pondicherry University may issue necessary orders which appear to the authorities to be necessary or expedient for removing the difficulty.

19.2. No order under Rule 19.1 shall be questioned on the ground that no difficulty as is referred to in the said rule existed or was required to be removed

19.3. Notwithstanding anything contained in the Regulations, Pondicherry University reserves the right to make changes, whenever necessary.
Syllabus
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the M.V.Sc. Programmes</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Veterinary Anatomy</td>
</tr>
<tr>
<td>2.</td>
<td>Veterinary Physiology</td>
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<td>Veterinary Biochemistry</td>
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<td>15.</td>
<td>Veterinary Surgery and Radiology</td>
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<td>16.</td>
<td>Veterinary and Animal Husbandry Extension Education</td>
</tr>
</tbody>
</table>
1. VETERINARY ANATOMY

Course Structure – at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAN 601</td>
<td>COMPARATIVE OSTEOLOGY AND ARTHROLOGY</td>
<td>1+2</td>
</tr>
<tr>
<td>VAN 602</td>
<td>COMPARATIVE SPLANCHNOLOGY</td>
<td>2+2</td>
</tr>
<tr>
<td>VAN 603</td>
<td>MYOLOGY, ANGIOLOGY, NEUROLOGY AND AESTHESIOLOGY OF OX</td>
<td>1+3</td>
</tr>
<tr>
<td>VAN 604</td>
<td>GROSS ANATOMICAL TECHNIQUES</td>
<td>0+2</td>
</tr>
<tr>
<td>VAN 605</td>
<td>THEORY AND PRACTICE OF HISTOLOGICAL AND HISTOCHEMICAL TECHNIQUES</td>
<td>1+2</td>
</tr>
<tr>
<td>VAN 606</td>
<td>GENERAL HISTOLOGY AND ULTRASTRUCTURE</td>
<td>3+1</td>
</tr>
<tr>
<td>VAN 607</td>
<td>SYSTEMIC HISTOLOGY AND ULTRASTRUCTURE</td>
<td>3+1</td>
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<tr>
<td>VAN 608</td>
<td>DEVELOPMENTAL ANATOMY</td>
<td>3+1</td>
</tr>
<tr>
<td>VAN 691</td>
<td>MASTER’S SEMINAR</td>
<td>1+0</td>
</tr>
<tr>
<td>VAN 699</td>
<td>MASTER’S RESEARCH</td>
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</tr>
</tbody>
</table>

Major Subject
Veterinary Anatomy and Histology

Minor Subjects*
Veterinary Pathology, Veterinary Surgery and Radiology, Veterinary Physiology, Veterinary Biochemistry

* The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the Department and Dean, Post Graduate Studies
VETERINARY ANATOMY

Course Contents

VAN 601  COMPARATIVE OSTEOLOGY AND ARTHROLOGY  1+2

Objective
To make a student well versed with the bones and joints of different domestic animals.

Theory
UNIT I
Technical terms, structure, chemical composition and classification of bones.
UNIT II
Bones of appendicular skeleton of ox as a type and their comparison with those of horse, dog, pig and poultry.
UNIT III
Bones of axial skeleton of ox as a type and their comparison with those of horse, dog, pig and poultry.
UNIT IV
Classification and detailed study of different joints of the body.
UNIT V
Study the various indices for estimating race, sex and age of different animals. Basics of biomechanics of the locomotor system. Radiography of normal and developing bones.

Practical
Demonstration of all bones and dissection of joints of buffalo/Cattle.

Suggested Readings

VAN 602  COMPARATIVE SPLANCHNOLOGY  2+2

Objective
To give a detailed overview of different systems constituting splanchnology.

Theory
UNIT I
Descriptive anatomy of various organs of digestive system and associated glands of ox and their comparison with those of horse, dog, pig and poultry. Study of formation of thoracic, abdominal and pelvic cavities; reflection of these cavities.
UNIT II
Study of various organs/structures and associated glands constituting the respiratory system of ox and their comparison with those of horse, dog, pig and poultry.
UNIT III
Detailed study of organs and associated glands comprising the urinary system of ox as a type and their comparison with those of horse, dog, pig and poultry.

UNIT IV
Complete study of various organs and associated glands of male and female genital systems.

UNIT V
Surgical sites for various operations and clinically significant areas for performing auscultation, percussion and for carrying out surgical procedures such as laryngotomy, oesophagotomy, gastrotomy, rumenotomy, cystotomy, urethrotomy, caesarian section, exploratory laparotomy, mammectomy, thoracotomy, thoracocentesis etc.

Practical
Demonstration of structure and placement of organs in body cavities of all the animals.

Suggested Readings

VAN 603 MYOLOGY, ANGIOLOGY, NEUROLOGY AND AESTHESIOLOGY OF OX

Objective
To give a thorough knowledge about the muscles, course of blood vessels and nerves of the body in addition to various organs of circulatory, nervous and sensory systems of ox as a type animal.

Theory
UNIT I
Classification of muscle fibres. Origin, insertion and relations of muscles of different body parts.

UNIT II
Topographic anatomy of the vascular system comprising of heart, arteries, veins and lymphatics.

UNIT III
Study of various components of central nervous system, peripheral nervous system and autonomic nervous system.

UNIT IV
Complete study of the gross anatomy of various sense organs.

UNIT V
Study of different nerve blocks, intravenous sites and enucleation of eye ball.

Practical
Dissection of heart, different vessels, brain, cranial nerves, brachial plexuses and lumbo-sacral plexus. Dissection of eye, ear, hoof and horn of buffalo/cattle.
Suggested Readings


VAN 604                  GROSS ANATOMICAL TECHNIQUES                  0+2

Objective
   Hands-on training for preparation of gross anatomical specimens.

Practical
   Embalming fluids, embalming of animals, maceration and preparation of skeletons. Gross staining of brain sections. Demonstration of sites of ossifications. Preparation of transparent specimens, preparation of casts of various organs, blood vessels and ducts etc.

Suggested Readings

VAN 605                  THEORY AND PRACTICE OF HISTOLOGICAL AND HISTOCHEMICAL TECHNIQUES

Objective
   To give exposure to methods of processing the tissues for research and teaching purposes.

Theory
   UNIT I
   Preparation of tissues for light microscopy using different fixatives.
   UNIT II
   Different staining methods for routine light microscopy.
   UNIT III
   Frozen sectioning techniques and staining methods for enzymes, carbohydrates, lipids, proteins, pigments etc.
   UNIT IV
   Silver staining techniques for nervous tissue.

Practical
   Study of different techniques for collection, fixation and processing of animal tissues; preparation of paraffin and frozen sections; handling and care of microtomes. Demonstration of staining of carbohydrates, lipids, proteins, nucleic acids and enzymes.

Suggested Readings

**VAN 606**  
**GENERAL HISTOLOGY AND ULTRASTRUCTURE**  
*3+1*

**Objective**  
To understand basic principles of light microscopy and ultrastructure of four basic tissues.

**Theory**  
**UNIT I**  
Light and ultrastructural details of animal cell.
**UNIT II**  
Light and ultrastructural details of epithelial tissue.
**UNIT III**  
Light and ultrastructural details of muscular tissue.
**UNIT IV**  
Light and ultrastructural details of connective tissue.
**UNIT V**  
Light and ultrastructural details of nervous tissue.

**Practical**  
Demonstration of different components of cells and intercellular substances of the above referred tissues by special staining through the use of light, phase contrast, dark field, fluorescent and electron microscopes.

**Suggested Readings**  

**VAN 607**  
**SYSTEMIC HISTOLOGY AND ULTRASTRUCTURE**  
*3+1*

**Objective**  
To understand and identify arrangement of four basic tissues in organs of different body systems.

**Theory**  
**UNIT I**  
Light and ultrastructure of different organs of digestive system of ruminants with differential features among domestic animals.
**UNIT II**  
Light and ultrastructure of different organs of respiratory, lymphoid and cardiovascular systems.
**UNIT III**  
Light and ultrastructure of different organs of urino-genital systems.
**UNIT IV**  
Light and ultrastructure of different sense organs and nervous system.
Practical
Study of histological structure of organs of digestive, respiratory, urinary, genital and cardiovascular systems of buffalo, horse and dog/cat.

Suggested Readings

VAN 608 DEVELOPMENTAL ANATOMY 3+1

Objective
To understand the developmental processes of different body systems at various stages of pregnancy.

Theory
UNIT I
Gametogenesis, fertilization, cleavage and gastrulation.
UNIT II
Development of foetal membranes and placenta in domestic animals.
UNIT III
Histogenesis of nervous system, sense organs, endocrine organs and cardiovascular system.
UNIT IV
Embryonic development of digestive, respiratory, uro-genital and musculoskeletal system.

Practical
Study of serial sections of the chick and pig embryos at different stages of development.

Suggested Readings

Suggested Broad Topics for Master’s Research

* Gross anatomical disposition of various organs of animals of local interest
* Light and ultra-structural studies of important organs and systems of animals of local importance
* Developmental studies of different body systems
## 2. VETERINARY PHYSIOLOGY

### Course Structure – at a Glance

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<th>CODE</th>
<th>COURSE TITLE</th>
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<td>PHYSIOLOGY OF DIGESTION</td>
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<td>CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY</td>
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<td>RENAL PHYSIOLOGY AND BODY FLUID DYNAMICS</td>
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<td>HAEMATOLOGY</td>
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### Major Subject

Veterinary Physiology

### Minor Subjects*

Veterinary Anatomy, Veterinary Biochemistry, Veterinary Pharmacology & Toxicology, Animal Nutrition, Veterinary Gynaecology and Obstetrics, Livestock Production and Management, Animal Genetics & Breeding

* The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the Department and Dean, Post Graduate Studies
VETERINARY PHYSIOLOGY

Course Contents

VPY 601

PHYSIOLOGY OF DIGESTION 2+1

Objective
To teach comparative physiology of digestive system of monogastric animals, ruminants and birds, and basic techniques.

Theory

UNIT I
Basic characteristics and comparative physiology of digestive system of domestic animals.

UNIT II
Gastro-intestinal motility, secretory functions of gastro-intestinal tract, their regulation and gastro-intestinal hormones.

UNIT III
Absorption, metabolism and excretion of various nutrients, appetite and control of feed intake.

UNIT IV
Development of ruminant system and rumen environment. Ruminant microbial digestion, its advantages and disadvantages. Rumino-reticular motility, its significance and control.

UNIT V
Rumen microbiology. Digestion in birds.

Practical

Suggested Readings

VPY 602

CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY 2+1

Objective
To teach function and regulation of heart, recording of ECG and respiration in different animals and basic techniques.

Theory

UNIT I
Heart muscle, heart as pump, origin and propagation of heart beat. Electrophysiology of heart, rhythmic excitation of heart, cardiac cycle, heart sound and dynamics of valvular and congenital heart defect.
UNIT II
Cardiac output and its measurements, factors affecting cardiac output.
Venous return and its regulation. Control of the heart.

UNIT III
Normal electro-cardiogram, electrocardiographic interpretation in cardiac myopathies and cardiac arrhythmias.

UNIT IV
Circulation and hemodynamics, coronary, systemic and pulmonary circulation, their regulation, energetics of circulation, pathophysiology of circulation.

UNIT V
Respiration, mechanism of ventilation, hemoglobin, oxygen and carbon-dioxide transport. Respiratory gas exchange. Respiratory adjustment at high altitude and deep swimming. Neural and chemical control of respiration, artificial respiration. Respiration in birds.

Practical

Suggested Readings

VPY 603 RENAL PHYSIOLOGY AND BODY FLUID DYNAMICS 2+1

Objective
To impart knowledge regarding excretory system of mammals and birds, maintenance of body fluid homeostasis.

Theory
UNIT I
An overview of nephron structure and function. Renal homeostatic function and renal excretory function.
UNIT II
Quantitative analysis of renal function, renal haemodynamics. Glomerular filtration- its mechanism and measurement. Permselectivity of the glomerular capillary wall, structural basis of GFR, tubular reabsorption and transport.
UNIT III
UNIT IV
Skin- general anatomy of epidermis, dermis, hypodermis, mechanical protection, permeability, actinic irradiation, sweat glands, sebaceous glands. Skin grafting. Immune properties of skin.
UNIT V
Composition of body fluids and their regulation. Excretory system in birds.
Practical
Collection and preservation of urine. Physical and chemical analysis of urine and its interpretation in health and disease condition. Demonstration of various kidney function tests, glomerular filtration rate, creatinine clearance rate, urea clearance rate and glucose tolerance test.

Suggested Readings

VPY 604  HAEMATOLOGY  2+1
Objective
To acquaint the students about haematology of different animals including hands-on training.

Theory
UNIT I
Red blood cells, anaemia, different types of anaemia, polycythemia and their effect on circulation in mammals and birds.
UNIT II
Resistance of the body to infection, leukocytes, tissue macrophage system and inflammation.
UNIT III
Immunity, immunoglobulins, immunogenetics, polymorphism in hemoglobin, transferrin etc. Changes in blood during diseases. Iatrogenic blood diseases, hemorrhagic diathesis, hemophilias.
UNIT IV

Practical
Haemograms, platelet count, erythrocyte fragility. Estimation of serum iron and iron binding capacities of plasma. Separation of variants of hemoglobin and transferrin by electrophoresis. Examination of bone marrow. Isolation of different types of blood cells by sedimentation and column chromatography.

Suggested Readings

VPY 605  VITAMINS AND MINERALS IN ANIMAL PHYSIOLOGY  2+0
Objective
To teach the importance of these nutrients in normal body functions and in disease conditions.

Theory
UNIT I
Introduction and brief history, definition, general properties and overview of functions.
UNIT II
Fat soluble vitamins, their functions and deficiency diseases.
UNIT III
Water soluble vitamins and vitamin-like compounds, their functions and deficiency diseases.

UNIT IV
Physiological functions of trace elements, their role in metabolism, toxicity, deficiency diseases.

Suggested Readings

VPY 606 PHYSIOLOGY OF ANIMAL REPRODUCTION 2+1

Objective
To impart knowledge of male and female reproductive system of different species of animals including birds.

Theory
UNIT I
Functional histomorphology of male and female reproductive system, development of male and female sex organs. Endocrine and neuroendocrine relation in male and female reproductive function in different domestic animals.

UNIT II
Sexual cycles and mating behaviours in females, oogenesis, folliculogenesis and ovulation. Secretions of female reproductive tract in different species of animals.

UNIT III
Male mating behaviour, spermatogenesis, spermiogenesis, Seminiferous, epithelial cycles. Spermatozoa- structure and composition, maturation and transportation. Secretions of male reproductive tract.

UNIT IV
Transport of male and female gametes, fertilization, implantation. Pregnancy and parturition. Post-partum recovery in different species of domestic animals.

Practical
Heat detection in different animals, palpation of reproductive organs. Physical and biochemical evaluation of semen, determination of sperm enzyme, leakage during freezing. Preservation of semen, RIA of steroid hormones.

Suggested Readings
VPY 607 CLINICAL PHYSIOLOGY 2+1 Objective

To teach physiological basis of clinical abnormalities in body functions.

Theory

UNIT I
Cardiovascular, respiratory, hepatic and renal evaluation of body functions in relation to clinical conditions.

UNIT II
Carbohydrate, fat, protein and mineral metabolism in health and disease of various species.

UNIT III
Functions and dysfunctions of liver, kidney and gastro-intestinal tract.

UNIT IV
Clinico-immunological evaluation of immune responses and clinical enzymology.

Practical


Suggested Readings


VPY 608 NEUROMUSCULAR PHYSIOLOGY 2+1

Objective

To impart knowledge of coordination of body functions and regulation of brain functions and sense organs.

Theory

UNIT I
Types and classification of muscles, comparative histopathology of muscles. Skeletal muscle fibers, membrane and action potential at myoneuronal junction. Molecular characteristics of contractile filaments, molecular mechanism of muscle contraction, relationship between actin and myosin filaments, overlap and tension developed by the contracting muscles. Contractile process of smooth muscles.

UNIT II

UNIT III
Nervous system, synapse, transmission and processing of information, receptors, brain and spinal reflexes, motor functions of brain stem, limbic system, memory, sleep, learning, autonomic nervous system.
UNIT IV
Special senses and somatic senses.

Practical
Recording of electro-myogram, fatigue, tetanus in muscles. Effect of temperature on different types of muscles, demonstration of intestinal movements, effect of drugs on all types of muscles, estimation of muscles specific enzymes.

Suggested Readings

VPY 609 CHEMICAL BIOREGULATION IN PHYSIOLOGICAL FUNCTIONS 3+0

Objective
To acquaint the students about different endocrine glands of the body and their relationship with production.

Theory
UNIT I
Methods of study bioregulation including methods of endocrine analysis. Manipulation and disruption of biorhythms in homeostatic and natural ecosystem.
UNIT II
UNIT III
Genetic and genomic approaches in endocrinology. Animal models and alternate uses of animal model. Regulation and metabolism of hypothalamic, hypophyseal, thyroid and adrenal hormones.
UNIT IV
UNIT V

Suggested Readings
Objective
Training in various techniques for application in research in Animal Physiology.

Practical

Suggested Readings

Suggested Broad Topics for Master’s Research

* Manipulation of rumen fermentation to enhance growth and productivity in ruminants.

* Normal renal functions of domestic animals.

* To study the mechanism of regulation of various hormones involved in production and reproduction in domestic animals.

* Dietary effects on growth and production in poultry.
### 3. VETERINARY BIOCHEMISTRY

**Course Structure – at a Glance**

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<td>VBC 607</td>
<td>METABOLISM-II: NUCLEIC ACIDS AND AMINO ACIDS</td>
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<td>VBC 608</td>
<td>METABOLISM-III: INTEGRATION AND REGULATION</td>
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<td>Veterinary Physiology, Veterinary Microbiology, Veterinary Medicine, Animal Biotechnology, Veterinary Pharmacology &amp; Toxicology, Animal Nutrition, Animal Genetics &amp; Breeding</td>
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VETERINARY BIOCHEMISTRY

Course Contents

VBC 601 CHEMISTRY OF ANIMAL CELL 2+0

Objective
Teaching of principles of physical chemistry as applicable to veterinary sciences.

Theory
UNIT I
Pre-biotic world, chemical evolution, cellular architecture, molecular organization and metabolic function.

UNIT II
Thermodynamics, chemical equilibrium, standard state, living cell as a steady state, open system obeying laws of thermodynamics. Minimum energy conformation, quantum mechanical calculation. \( \Delta G \) and ATP.

UNIT III
Properties of water, homeostasis, pH, osmosis, viscosity, surface forces adsorption, dialysis, diffusion rate and the sizes of organisms. The blood buffering system. Chemical basis of oral and parental fluid/electrolyte therapies, Bacterial toxigenic diarrhoeas.

Suggested Readings

VBC 602 TECHNIQUES IN BIOCHEMISTRY 0+2

Objective
To make students well versed with methodologies used in biochemistry.

Practical
Ultracentrifugation– its principle and use, preparative analytical and density gradient ultracentrifugation. Fractionation of sub-cellular components and molecular weight determination using ultracentrifuge.

Suggested Readings
VBC 603  APPLICATIONS OF GENOMICS AND PROTEOMICS IN MOLECULAR BIOLOGY

Objective
To acquaint students about molecular basis of structure and functional aspects of NA and AA.

Theory
UNIT I
Nucleotides, nucleic acids, high order structures, cohesions and condensins in chromosome structure. SMC proteins, sequencing, mutation, evolution. DNA libraries. Bacterial RNA polymerase, RNA interference. DNA replication, RNA synthesis, control of gene expression. DNA microarrays/chips.

UNIT II

UNIT III

Suggested Readings


Theory

UNIT I

UNIT II
Lipid classification, metabolism of LCFA, TAG, PL, Sphingolipids, cholesterol, lipoproteins. Regulation of lipid metabolism in fed and fasted states. Regulation of FA oxidation. FAs as regulatory molecules. Glucose production and FAs in type II diabetes. Ketone bodies as fuel.

UNIT III
Lipid bilayers, lipid motility, integral membrane proteins, lipid linked proteins, peripheral membrane proteins, fluid mosaic model, membrane skeleton, lipid asymmetry, vesicle trafficking, secretory pathway, membrane rafts, caveolae fusion, lung surfactant, structure of bacterial rhodopsin, thermodynamics of membrane transport, ionophores, porins, ion channels, aquaporins, transport proteins, P and F types (Na+ - K+ ) ATPases, Ca2+, Ion–gradient, Gap Junction, Cl--HCO3-exchanger, cardiac glycosides, abnormalities in cell membrane fluidity. Haemolytic anaemia.

Suggested Readings

VBC 605

ENZYME CATALYSIS, KINETICS, INHIBITION AND REGULATION 2+0

Objective
To give thorough knowledge of molecular basis of enzyme action in relation to diagnostic importance.

Theory

UNIT I
Mechanisms: Enzyme activation energy and reaction co-ordination, acid-base, covalent, metal ion. Proximity and orientation effects. Preferential transitional state binding.

UNIT II

UNIT III
Suggested Readings

VBC 606 METABOLISM-I: CARBOHYDRATES AND LIPIDS 2+0
Objective
To teach regulatory mechanisms of carbohydrates and lipids metabolism in health and diseases.

Theory
UNIT I
Metabolic control, analysis for enzymes limiting the flux through a pathway. Trophic strategies, universal mapping of metabolic pathways. Thermodynamic relationships. ΔG, ATP and phosphoryl group transfer, coupled reactions, thioesters, NAD+ and FAD.

UNIT II
Overview of carbohydrate and lipid cycles, control of glycolysis, glycolysis in cancer cells, control of pentose phosphate pathways, deficiency of glucose-6-phosphate dehydrogenase. Control of glycerogen metabolism, control of gluconeogenesis. GSD. Regulation of citric acid cycle, pathways that use citric acid intermediates, Sugar interconversions and nucleotide – linked sugar formation. Disorders associated with impairment of metabolism.

UNIT III
Electron transport and oxidative phosphorylation. Generation of heat by uncoupling in brown adipose tissue.

UNIT IV
Regulation of fatty acid metabolism, inhibitors of fatty acids biosynthesis, sphingolipid degradation and lipid storage disease. Regulation of cholesterol synthesis. PGs in NSAID, leukotrienes, HETEs, hypersensitivity. Influence of glucose metabolism on lipid metabolism.

Suggested Readings

VBC 607 METABOLISM–II: NUCLEIC ACIDS AND AMINO ACIDS 2+0
Objective
To understand regulatory mechanisms of amino acid and nucleic acid metabolism in health and diseases.
Theory

UNIT I
Overview of pathways of amino acid and nucleic acid metabolism. Lysosomal degradation, ubiquitin, proteosome, breakdown of amino acids, heme biosynthesis and degradation, biosynthesis of physiologically active amines. Nitric oxide, homocystein as marker of disease. Diseases of amino acid metabolism, porphyrias.

UNIT II
Nucleotide synthesis and degradation, inhibition of thymidylate synthesis in cancer therapy. Mutation in coenzyme binding sites and diseases. Forces stabilizing NA structure, restriction endonucleases, small inhibitory RNAs. Chromatin organization. Inhibitors of topoisomerases as antibiotic and anti-cancer agents, interfering with purine and pyrimidine metabolism.

UNIT III

Suggested Readings

VBC 608 METABOLISM–III: INTEGRATION AND REGULATION  2+0
Objective
To give exposure in inter-relationship of cellular metabolism of various macromolecules.

Theory
UNIT I
Regulation and integration of all metabolic pathways.

UNIT II
Organ specialization in fuel metabolism: Brain, muscle, adipose tissue, liver, kidney, inter organ metabolic pathways, hormonal control of fuel metabolism. Tracing metabolic fates, perturbing the system.

UNIT III
Signal transduction, gated ion channels, G-proteins, adenylate cyclase, receptor tyrosine kinase, protein phosphatases, cGMP, Ca^{2+}, interaction with phosphoserine/tyrosine, integrations, drugs and toxins, cell cycle and CDKs that affect cell signaling.

UNIT IV

**Suggested Readings**

**VBC 609**  
CENTRAL DOGMA AND PROTEIN FUNCTION  
2+0

**Objective**
Teaching of applied aspects of replication, transcription and translation.

**Theory**

**UNIT I**
Overview of transcription and translation in eukaryotes. Collision between DNA polymerase and RNA polymerase, inhibitors of transcription, introns, evolution and expansion of the genetic code.

**UNIT II**

**UNIT III**
Actin structure, microfilament dynamics, actin-myosin reacting cycle, tubulin dimmer, microtubules dynamics, kinensins, dyeins.

**UNIT IV**
Antigen-antibody binding, cytokines, principles of immunochemical methods: agglutination, precipitation, typing of major histo-compatibility antigens. Blood group substances in farm animals.

**UNIT V**

**Suggested Readings**

**VBC 610**  
CLINICAL BIOCHEMISTRY OF ANIMALS  
2+1

**Objective**
To make a student well versed with biochemical basis for diagnosis and prognosis of diseases in animals and poultry.
Theory

UNIT I

UNIT II
Myocardial infarction, respiratory distress syndrome. Primary renal dysfunctions and test, doping. Problems in game horses.

UNIT III

UNIT IV

Practical
Estimation of constituents (enzymes, metabolites and electrolytes) of body fluids during normal and pathological conditions. Estimation of hormones. Liver and kidney function tests. Total volatile fatty acids and the fractions in ruminants.

Suggested Readings
Jurisica I & Wigle D. 2006. Knowledge and Discovery in Proteomics. CRC.

VBC 611 BIOCHEMICAL BASIS OF DISEASES OF DOMESTIC ANIMALS

Objective
To give a detailed overview of role of biomolecules in health and diseases in animals and poultry.

Theory
UNIT I
Diabetes mellitus, hyperinsulemia, galactosemia, hypoglycaemia of baby pigs, Glycogen Storage Disease. Carbohydrate balance in ruminants. Biochemical alterations in body fluids of ruminants in hypoglycaemia, Ruminant ketosis.

UNIT II

UNIT III
Anemias of the newborn, cytosolic enzyme deficiencies and membrane abnormalities in erythrocytes. Porphyrias and porphyrias. Disorders of iron
metabolism, neutrophil function defects and its testing. Equine immuno-

deficiency.

UNIT IV


Suggested Readings


VBC 612 ENDOCRINOLOGY AND REPRODUCTIVE BIOCHEMISTRY

Objective
To give a conceptual discussion on role of biomolecules in health and diseases in animals and poultry.

Theory

UNIT I
Mechanism of hormone action, Receptor binding, biosynthetic and metabolic aspects in physio-pathology of hormones, factors, and minerals.

UNIT II
Metabolic functions of the hormones of the hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal, pineal, ovaries and testes.

Biochemistry of prostaglandins and related agents. Clinical endocrine aspects in production and reproduction status in domestic animals and poultry.

Suggested Readings


VBC 613 BIOCHEMICAL BASIS OF ANIMAL PRODUCTION 2+1

Objective
To teach about biochemistry of draft capacity, meat production and dairy chemistry.

Theory

UNIT I

UNIT II
The biochemistry controlling postmortem energy metabolism mechanisms. Application of genomic technologies to the improvement of meat quality of
farm animals. Identification of meat quality parameters by proteomics.
Application of proteomics to understand the molecular mechanisms behind
meat quality. Oxidative stability of post mortem muscles from sheep of
various ages.

UNIT III
Metabolic demands of draft animals, and biochemical aspects of work and
kinesiology.

Practical
Biochemical tests for proteins of meat, milk and egg and analysis of wool
structure.

Suggested Readings
Laboratory Manual. E & FN SPON.
Hudson BJE. 1994. *New Developing Sources of Food Proteins.* Chapman
& Hall.
CRC.

Suggested Broad Topics for Master’s Research

* Biochemical parameters in body fluids of patients in livestock and poultry
* Assay of enzymes for diagnosis of diseases in poultry and livestock.
* Endocrine studies on domestic and companion animals in relation to
  production and health status
4. VETERINARY PHARMACOLOGY AND TOXICOLOGY

Course Structure – at a Glance

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**Major Subject**
Veterinary Pharmacology and Toxicology

**Minor Subjects**
Veterinary Physiology, Veterinary Biochemistry, Veterinary Medicine, Veterinary Pathology, Animal Biotechnology

- The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
VETERINARY PHARMACOLOGY AND TOXICOLOGY

Course Contents

VPT 601 GENERAL PHARMACOLOGY 2+0

Objective
To study the scope of pharmacology and to understand the basic mechanisms of drug actions and its effects.

Theory
UNIT I
History and scope of pharmacology, Principles of drug absorption, distribution, metabolism and elimination. Drug bioavailability and routes of administration.
UNIT II
Important pharmacokinetic parameters and their clinical significance.
UNIT III
Pharmacodynamics: mechanism of action and the relationship between drug concentration and effect; signal transduction mechanism and drug receptors for physiological regulatory molecules.
UNIT IV

Suggested Readings

VPT 602 AUTONOMIC AND AUTACOID PHARMACOLOGY 2+1 Objective

To study the pharmacodynamics of autonomic drugs.

Theory
UNIT I
Anatomical and physiological considerations of autonomic nervous system (ANS).
UNIT II
Neurohumoral transmission in ANS.
UNIT III
Pharmacology of cholinergic agonists and antagonists.
UNIT IV
Pharmacology of adrenergic agonists and antagonists.
UNIT V
Ganglionic stimulants and blockers.
UNIT VI
Autacoids: Histamine, serotonin, kinins, eicosanoids and platelet activating factor.
Practical
Pharmacological experiments on intact and isolated preparations for studying the effects of various prototype drugs on vascular, intestinal, respiratory, urinary and reproductive smooth muscles, autonomic ganglia, skeletal muscles; blood pressure, ECG, heart etc.

Suggested Readings

VPT 603 CNS PHARMACOLOGY 2+1
Objective
To study the pharmacodynamics of drugs acting on CNS.
Theory
UNIT I
Anatomical and physiological considerations of central nervous system (CNS); neurohumoral transmission in CNS.
UNIT II
Historical development, theories, principles and stages of general anaesthesia.
UNIT III
Pharmacology of anaesthetics, sedatives, hypnotics, neuroleptics, antiepileptics.
UNIT IV
CNS stimulants, analeptics, opioid agonists and antagonists; non-steroidal anti-inflammatory agents, central and peripheral muscle relaxants, local anaesthetics, therapeutic gases, euthanizing agents. Doping.
Practical
Study of pharmacodynamics of prototype drugs of each group in experimental animals.

Suggested Readings

VPT 604 DIGESTIVE AND RESPIRATORY PHARMACOLOGY 2+0
Objective
To study the pharmacological aspects of drugs acting on digestive and respiratory systems.
Theory
UNIT I
Pharmacology of drugs acting on gastrointestinal tract. Appetite stimulants, emetics and anti-emetics.
UNIT II
Anti-ulcer drugs, modulators of gastric and intestinal motility and secretions.

UNIT III
Gastrointestinal protectants and adsorbents, laxatives and cathartics.

UNIT IV
Agents promoting digestive functions; bile acids and pancreatic enzymes, drugs affecting liver; rumen pharmacology.

UNIT V
Pharmacology of drugs acting on respiratory system: pathogenesis of inflammatory respiratory diseases.

UNIT VI
Bronchodilators, antitussives, mucolytics, expectorants, decongestants.

UNIT VII
Drugs used in treatment of asthma.

Suggested Readings


VPT 605 CARDIOVASCULAR AND RENAL PHARMACOLOGY 2+0

Objective
To study the pharmacological aspects of drugs acting on CVS and kidneys.

Theory
UNIT I
Pharmacology of cardiac glycosides.

UNIT II
Antiarrhythmic, antihypertensive and antihyperlipidaemic drugs.

UNIT III
Drugs affecting vasomotor and cardiorespiratory reflex mechanisms and haemopoietic system.

UNIT IV
Coagulants and anticoagulants, thrombolytic agents.

UNIT V
Pharmacology of drugs affecting renal functions and fluid-electrolyte balance.

UNIT VI
Fluid and electrolyte therapy, diuretics, antidiuretics, uricosuric drugs.

Suggested Readings


VPT 606 ENDOCRINE AND REPRODUCTIVE PHARMACOLOGY 2+0

Objective

To study the pharmacology of drugs affecting endocrine functions.

Theory

UNIT I
Pharmacology of drugs affecting endocrine functions of pituitary, thyroid, adrenals and pancreas.
UNIT II
Hormonal regulation of calcium and phosphorus homeostasis.
UNIT III
Pharmacology of drugs affecting male reproductive organs, spermatogenesis.
UNIT IV
Pharmacology of drugs affecting female reproductive organs, ovulation, oestrus, conception, gestation and lactation.
UNIT V
Oxytocic and tocolytic drugs.

Suggested Readings


VPT 607 CHEMOTHERAPY 2+1

Objective

To study the recent advances of chemotherapeutic agents with relevance to pharmacological and therapeutic aspects.

Theory

UNIT I
General consideration and principles of chemotherapy, classification of chemotherapeutic agents; development of microbial resistance to antimicrobials, combination therapy.
UNIT II
Systemic and gut acting sulfonamides, diaminopyrimidines, quinolones sulfones, nitrofurans.
UNIT III
Penicillins, cephalosporins, beta-lactam antibiotics.
UNIT IV
Chloramphenicol, tetracyclines, macrolides, polymixins, polypeptides.
UNIT V
Aminoglycosides and other antibiotics.
UNIT VI
Anti-protozoans, anthelmintics, ectoparasiticides.
UNIT VII
Antituberculosis, antifungal, antiviral and antineoplastic drugs.

Practical

General methods for assay of chemotherapeutic agents, antibiotic sensitivity tests, estimation of sulfonamides, penicillins, oxytetracyclines,
trimethoprim and nitrofurans in biological fluids to study their kinetics and bioavailability.

**Suggested Readings**


**VPT 608 TOXICOLOGY OF XENOBIOTICS 2+1**

**Objective**

To study the poisonings and their antidotal therapy in animals.

**Theory**

UNIT I
Principles and scope of toxicology, sources of poisoning.

UNIT II
General modes of action of poisons, detoxification, factors affecting toxicity, general principles of diagnosis and treatment of poisonings.

UNIT III
Toxicology of metals, agrochemicals, solvents and vapors, feed additives.

UNIT IV
Toxic effects of radiations and radioactive chemicals, genetic and developmental toxicology; forensic and regulatory aspects of toxicology.

**Practical**

Extraction, separation and detection of common poisons in toxicological specimens, study of toxicity and antidotal treatment in animals, designing of animal toxicity experiments and general toxicity tests.

**Suggested Readings**


**VPT 609 TOXICOLOGY OF PLANTS AND TOXINS 2+0**

**Objective**

To impart knowledge of toxicity of poisonous plants & natural toxins.

**Theory**

UNIT I
Classification, identification and chemical constituents of poisonous plants. Plants containing cyanide, nitrate/nitrite, oxalate, lectins and cardiotoxic glycosides.

UNIT II
Plants producing lathyrism, thiamine deficiency and photosensitization.

UNIT III
Toxicology of mycotoxins: aflatoxins, rubratoxins, ochratoxins, trichotheccenes, tremorgens and ergot.
UNIT IV

Suggested Readings

VPT 610 PHARMACOLOGICAL TECHNIQUES 1+1

Objective
To impart the knowledge of various basic pharmacological techniques and screening methods of drugs.

Theory
UNIT I
Principles of drug action and bioassay. Dose response curves and their analysis.
UNIT II
Techniques for setting up isolated and intact preparations.
UNIT III
Organization of screening programme of drugs; multidimensional screening procedures and gross observational methods.

Practical
Setting up of isolated and intact preparations, recording of BP in dog/rat, recording of ECG in rat, experiments on drug potentiation, antagonism and tachyphylaxis. Construction of dose-response plots, calculation of EC50, dissociation rate constants, potency ratio, pA_x, pDx and pD’_x values.
Specific tests for evaluation of tranquillizing, hypnotic, analgesic, anti-convulsant, general and local anesthetic, muscle relaxant, anti-inflammatory, antipyretic, antiarrhythmic, antihypertensive, antihyperglycemic and anticholesterimic activities. Determination of potency ratio, median effective, toxic or lethal doses. Bioassay techniques.

Suggested Readings
VPT 611  TECHNIQUES IN TOXICOLOGY  1+1

Objective
To understand the animal toxicity tests and assessment of various toxicants using specific tests.

Theory
UNIT I
Animal models in toxicological studies.
UNIT II
Animal toxicity tests for acute, sub-acute and chronic toxicity.
UNIT III
Specific toxicity tests for neurotoxicity, immunotoxicity, developmental, behavioural, reproductive and inhalation toxicity, mutagenicity, carcinogenicity.
UNIT IV
Animal toxicological tests for the study of metabolism, synergism and antagonism.

Practical
Tests for acute, sub-acute and chronic toxicity, protocols and various specific toxicity tests. Assay for marker enzymes, analysis of toxicant residues in biological materials.

Suggested Readings

VPT 612  ETHNOPHARMACOLOGY  2+0

Objective
To impart the knowledge and importance of traditional Indian medicine.

Theory
UNIT I
Historical aspects: Traditional Indian remedies and regional folklore in disease cure.
UNIT II
Classification, identification and chemical constituents of medicinal plants. Extraction, distillation, evaporation and other processes used in purification and preparation of active constituents from medicinal plants.
UNIT III
Standardization and clinical validation of bioactive molecules from vegetable sources. Therapeutic and adverse effects of potential herbal drugs. Indigenous drugs used as carminatives, antiseptics, antimicrobials, analgesics, and anti-inflammatory agents.
UNIT IV
Alternate systems of medicine in animals.

Suggested Readings

**Suggested Broad Topics for Master’s Research**

& Neuro- and Behavioural Toxicology of Agrochemicals
& Pharmacokinetics and Pharmacodynamics of Newer Drugs
& Ethnopharmacology
& Autonomic Pharmacology of Ruminants
& Autonomic Pharmacology of Poultry
& Clinical Pharmacology
& Clinical Toxicology
## 5. VETERINARY MICROBIOLOGY

### Course Structure – at a Glance

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<tr>
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<td>BACTERIOLOGY – II</td>
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<td>GENERAL VIROLOGY</td>
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<td>VMC 608</td>
<td>DIAGNOSTICS OF INFECTIOUS DISEASES</td>
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<tr>
<td>VMC 699</td>
<td>MASTER’S RESEARCH</td>
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### Major Subject
Veterinary Microbiology

### Minor Subjects
Animal Biotechnology, Veterinary Pathology, Veterinary Public Health, Veterinary Biochemistry

*The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.*
VETERINARY MICROBIOLOGY

Course Contents

VMC 601  BACTERIOLOGY – I  3+1

Objective
To impart knowledge on general microbiology and important aerobic bacteria.

Theory
UNIT I
Introduction to historical development of cellular organization, genetic & chemical characteristics of eukaryotic and prokaryotic cells. Classification, nomenclature and identification; genetic characterization and numerical taxonomy. Bacterial cell structure, physiology and antigenic structure.

UNIT II
Determinants of pathogenicity and its molecular basis. Bacteriophages: temperate and virulent phages; lysogeny and lysogenic conversion. Bacterial genetics: bacterial variation, genetic transfer mechanisms (transformation, transduction and conjugation); plasmids, transposons and drug resistance; recombinant DNA technology.

UNIT III
Systemic study of following bacteria: Gram negative- aerobic rods and cocci, family Pseudomonadaceae, Legionellaceae, Neisseriaceae, and genus Brucella. Facultative anaerobic Gram negative rods, family Vibrionaceae, Pasteurellaceae, Enterobacteriaceae and other genera.

Practical
Morphological characterization, cell fractionation, enrichment & isolation technology, various methods used in growth measurement and bacterial preservation, gene transfer experiment. Detailed characterization (biochemical, serological, pathogenicity) of bacteria.

Suggested Readings

VMC 602  BACTERIOLOGY – II  3+1

Objective
To learn about spore forming bacteria and some important aerobes and anaerobes.

Theory
UNIT I
Systematic study of following pathogenic bacteria: Gram positive cocci, family Micrococaceae, endospore forming Gram positive rods and cocci, family Bacillaceae genus Bacillus, Sporolactobacillus and Clostridium. Spirochetes. Family Spirochetaceae and other families like Spirillaceae, coryneform bacteria, Dermatophilaceae, Streptomycetaceae.
UNIT II
*Mycobacteria* and *Nocardia*, family *Actinomycetaceae*. Atypical prokaryotes such as *Chlamydia*, *Rickettsiae*, *Mycoplasma*, *Acholeplasma*, *Spiroplasma*, *Anaeroplasma* and *Thermoplasma*.

UNIT III
Regular non-sporing Gram positive rods such as *Listeria* and *Erysipelas*. Anaerobic Gram negative straight, curved and helical rods, family *Bacteriodaceae* and genus *Bacteroides* and *Fusobacterium*.

**Practical**
Detailed and comparative study of morphology, biochemical reactions, physiology, serology and pathogenicity of various bacteria studied in theory, isolation of bacteria from field materials leading to their characterization and identification.

**Suggested Readings**

**VMC 603 VETERINARY MYCOLOGY 1+1**

**Objective**
To learn general and pathogenic mycology.

**Theory**

UNIT I
Morphology, physiology, reproduction, cultural characters, classification of fungi, immunology of pathogenic fungi.

UNIT II
Systematic study of animal mycoses such as aspergillosis, candidiasis, cryptococcosis, epizootic lymphangitis, mycetomas, sporotrichosis, histoplasmosis, blastomycosis, coccidioidomycosis, haplomycesis, rhinosporidiosis, zygomycosis, mycotic abortion, mycotic mastitis, mycotic dermatitis, dermatophytoses, mycotoxicosis etc.

**Practical**
Collection and processing of clinical material for isolation of fungi. Study of gross and microscopic characters of pathogenic fungi.

**Suggested Readings**

**VMC 604 GENERAL VIROLOGY 2+1**

**Objective**
To study general aspects of viral structure, classification, replication, interactions and immunity to viruses.
Theory

UNIT I
History of virology; origin and nature of viruses; biochemical and morphological structure of viruses; nomenclature and classification of viruses.

UNIT II
Replication of DNA and RNA viruses, viral genetics and evolution.

UNIT III
Genetic and non-genetic interactions between viruses, virus-cell interactions, viral pathogenesis, viral persistence, oncogenic viruses, epidemiology of viral infections.

UNIT IV
Immune response to viruses, viral vaccines, viral chemotherapy.

Practical
Orientation to a virology laboratory, preparation of equipment for sterilization, collection, preservation, transportation of samples and their processing, isolation and cultivation of viruses in animals/birds, embryonated chicken eggs; media and reagents for cell culture, trypsinization and maintenance of monolayer cell cultures, isolation of virus in cell cultures, titration of viruses by 50% end-point cytopathogenicity, and haemagglutination; detection of viral antibodies by serum neutralisation test, agar gel precipitation test, haemagglutination inhibition and ELISA.

Suggested Readings


VMC 605 SYSTEMATIC ANIMAL VIROLOGY 3+1

Objectives
To study viral properties, epidemiology, pathogenesis, diagnosis and control of diseases caused by animal viruses.

Theory

UNIT I
Studies on animal viruses belonging to various families, and prion agents given below with reference to antigens, cultivation, pathogenesis, epidemiology, disease status in India, diagnosis, immunity and control.
Capripoxvirus, avipoxvirus, cowpoxvirus; bovine herpes viruses, equine herpes viruses, infectious lymangeotracheitis virus, Marek’s disease virus, pseudorabies virus, malignant cattarrh fever virus; infectious canine hepatitis virus, egg drop syndrome virus, inclusion body hepatitis-hydropericardium virus, papiollomatosis, canine parvoviruses, feline panleucopenia virus.
UNIT II
Newcastle disease virus, canine distemper virus, rinderpest virus, PPR virus; infectious bursal disease virus; rotavirus, blue tongue virus, African horse sickness virus; rabies virus, ephemeral fever virus, borna virus.

UNIT III
Infectious bronchitis virus, transmissible gastroenteritis virus; equine arteritis virus, equine encephalomyelitis viruses; swine fever virus, BVDV-mucosal disease virus; foot and mouth disease virus, duck hepatitis virus; visna/maedi virus, equine infectious anemia virus, avian leukosis complex virus, bovine leukemia virus, chicken anemia virus; prions: scrapie, bovine spongiform encephalopathy.

Practical
Isolation of viruses in embryonated eggs and cell cultures; cytopathogenicity of representative animal viruses viz., cell death, syncytia formation, inclusion body etc.; diagnosis of animal viruses employing various serological tests, viz., haemagglutination and haemagglutination inhibition for Newcastle disease virus, agar gel diffusion and virus neutralization test for infectious bursal disease viruses; diagnosis of IBD virus and rotavirus by latex agglutination test, serotyping of FMD virus by ELISA, electropherotyping of rotavirus, PCR for diagnosis of viral infections.

Suggested Readings

VMC 606 PRINCIPLES OF IMMUNOLOGY 2+1

Objective
To impart knowledge about fundamental principles of immunology and its applications in the field of infectious diseases.

Theory
UNIT I
History of immunology, immunity types, cardinal features, phylogeny. Vertebrate immune system: lymphoid organs and tissues; development of B and T lymphocyte repertoires and other leukocytes, differentiation markers and other distinguishing characters of leukocytes; lymphoid cells trafficking.

UNIT II
UNIT III

UNIT IV
Immunity against veterinary infectious agents, immunological surveillance and cancer immunity, immunological tolerance, its breakdown and autoimmunity, immuno-deficiencies: types and examples, hypersensitivity: classification, mechanisms of induction and examples.

Practical
Preparation of antigens for laboratory animals immunization; production, collection and preservation of antisera; quantitation of immunoglobulins in antisera by zinc sulphate turbidity and single radial immunodiffusion; examination of lymphoid organs of animals; tests for in vivo and in vitro phagocytosis; separation and counting of peripheral blood lymphocytes; separation and concentration of immunoglobulin by ammonium sulphate precipitation and dialysis; demonstration of antigen-antibody interactions in serological tests such as agar gel precipitation, immunoelectrophoresis, bacterial agglutination, direct and passive hemagglutination, latex agglutination, complement fixation, enzyme-linked immunosorbent assay, immunoblotting.

Suggested Readings

VMC 607 VACCINOLOGY 2+0
Objective
To understand science and practice of vaccines for prevention of bacterial and viral diseases.

Theory
UNIT I

UNIT II
UNIT III
Modern vaccines: nucleic acids, vectored vaccines, recombinant expressed immunogens, synthetic peptides, marker vaccines, etc. Combination/multivalent vaccines. Novel immunomodulators and delivery systems. Modern methods of vaccine construction: methods based on synthetic chemistry and rDNA technology.

UNIT IV

Suggested Readings

VMC 608 DIAGNOSTICS OF INFECTIOUS DISEASES 1+2

Objective
To provide training in essential immunological and molecular diagnostic techniques.

Theory
UNIT I
Diagnosis of infectious diseases: an overview. Principles of serodiagnostic: agglutination-reaction based tests, precipitation-reaction based tests, complement fixation test and enzyme immunoassays.
UNIT II

Practical
Serodiagnostic tests for infectious diseases: bacterial slide and microtitre plate agglutination, agar gel immunodiffusion test, passive hemagglutination, hemagglutination inhibition and latex agglutination tests, complement fixation test, enzyme linked immunosorbent immunoassays, dot-ELISA, fluorescent antibody technique, immuno-electron microscopy, virus neutralization test, etc.
Molecular diagnostic techniques: protein profiling of infectious agents by SDS-polyacrylamide gel electrophoresis, antigen profiling of infectious agents by immunoblotting, nucleic acids isolation from infectious agents, detection of infectious agent nucleic acids by various formats of polymerase chain reaction and reverse transcription-PCR, dot-blot technique, etc.

Suggested Readings
Objective
To learn various important techniques of bacteriology, virology and immunology.

Practical
Preparation of different media used in bacteriology and mycology; isolation and identification of bacteria and fungi; antibiotic sensitivity of microorganisms from clinical specimens. Plasmid profiling, pathogenicity test in cell culture or laboratory animals, maintenance and preservation of bacteria and fungi.

Cryopreservation and reconstitution of preserved cell lines; Concentration and purification of animal viruses by chemical agents, differential centrifugation, density gradient centrifugation, and ultra filtration, etc. Storage of animal viruses by freeze drying and ultra freezing. Biophysical and biochemical characterization of animal viruses; Molecular characterization of viral protein and nucleic acid.

Immunoglobulin purification by salt precipitation and chromatographic techniques, anti-species antibody production, enzyme-linked immunosorbent assays for antigen and antibody detection, neutrophils and peritoneal macrophage isolation and demonstration of phagocytic activity, lymphocyte separation, lymphocyte proliferation assay, tuberculin-type delayed type hypersensitivity reaction.

Suggested Readings

Suggested Broad Topics for Master’s Research

* Isolation, identification and characterization of pathogenic bacteria for developing diagnostics and vaccines
* Development of genetically modified bacteria for improved vaccine and genetically modified signatured bacteria for developing vaccine candidate that can differentiate vaccinated from infected animals
* Development of molecular tools for studying evolution, quick diagnosis and molecular epidemiology of microbes
* Molecular characterization and antigenic relationship of field isolates of important viruses of animals and poultry.
* Isolation and characterization of field isolates of important viruses of livestock and poultry with the aim of development of diagnostics and candidate vaccines
* Studies on immune responses and immunity to animal and poultry viruses
* Investigation of the roles of proinflammatory cytokines in ovarian activity of buffaloes
* Production of phage display libraries of bovine scFv for diagnostic and therapeutic uses
* Development of novel delivery systems for developing mucosal veterinary vaccines
6. VETERINARY PARASITOLOGY

Course Structure – at a Glance

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<td>VETERINARY PROTOZOOLOGY</td>
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<td>Veterinary Microbiology, Veterinary Pharmacology &amp; Toxicology, Animal Biotechnology, Veterinary Pathology, Veterinary Biochemistry</td>
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*The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies*
VETERINARY PARASITOLOGY

Course Contents

VPA 601  VETERINARY HELMINTHOLOGY - I  2+1

Objective
To learn about various aspects of trematode and cestode parasites of veterinary importance.

Theory

UNIT I
Introduction, history, classification, general account and economic importance of platyhelminths.

UNIT II
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Dicrocoeliidae, Opisthorchiidae, Strigeidae and Fasciolidae.

UNIT III
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Echinostomatidae, Heterophyidae, Plagiorchiidae, Troglotremaematidae, Prosthogonimidae, Nanophyetidae and Paragonimidae.

UNIT IV
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of trematodes belonging to families: Notocotylidae, Brachylemidae, Cyclocoelidae, Paramphistomatidae and Schistosomatidae.

UNIT V
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of cestodes belonging to families: Mesocestoididae, Anoplocephalidae, Thysanosomidae, Dipyldiiidae and Dilepididae.

UNIT VI
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of cestodes belonging to families: Davaineidai, Hymenolepididae, Taeniidae and Diphyllobothriidae.

Practical
Identification of trematode and cestode parasites; their eggs and intermediate hosts. Observation on parasitic stages in host tissues and associated pathological lesions.

Suggested Readings
Dalton JP. 1999. Fasciolosis. CABI.
Khalil LF, Jones A & Bray RA. 1994. Keys to the Cestode Parasites of Vertebrates. CABI.

**VPA 602 VETERINARY HELMINTHOLOGY - II 2+1**

**Objective**
To learn about various aspects of nematodes, thorny-headed worms and leeches of veterinary importance.

**Theory**

**UNIT I**
Introduction, history, classification, general account and economic importance of nematodes and thorny-headed worms

**UNIT II**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Ascarididae, Anisakidae, Oxyuridae, Heterakidae and Subuluridae.

**UNIT III**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Rhabditidae, Strongyloidae and Strongylidae.

**UNIT IV**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Trichonematidae, Amidostomidae, Stephanuridae, Syngamidae and Ancylostomatidae.

**UNIT V**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Metastrongylidae, Protostrongylidae, Filaroididae, Trichostrongylidae, Ollulanidae, Crenosomatidae and Dictyocaulidae.

**UNIT VI**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Spiruridae, Thelaziidae, Acuariidae, Tetrameridae, Physalopteridae, Gnathostomatidae, Filariiidae, Setariidae, Onchocercidae and Dracunculidae.

**UNIT VII**
Morphology, epidemiology, life cycle, pathogenesis, clinical signs, diagnosis and control measures of nematodes belonging to families: Trichinellidae, Trichuridae, Capillariidae, Dioctophymatidae, Polymorphidae, Oligacanthorhynchidae and Gnathobdellidae.

**Practical**
Identification of nematode parasites; their eggs and intermediate hosts, differentiation, study of their stages in the tissues and associated pathological lesions.
Suggested Readings


VPA 603 VETERINARY ENTOMOLOGY AND ACAROLOGY 2+1 Objective

To learn various aspects of arthropods of veterinary importance.

Theory

UNIT I
Introduction, history, classification and economic importance.

UNIT II
Distribution, life cycle, seasonal pattern, pathogenesis, economic significance and control of arthropods belonging to the families: Culicidae, Ceratopogonidae, Simuliidae and Psychodidae.

UNIT III
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Tabanidae, Gasterophilidae, Muscidae, and Glossinidae.

UNIT IV
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Oestridae, Sarcophagidae, Calliphoridae and Hippoboscidae.

UNIT V
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Pediculidae, Haematopinidae, Linognathidae, Menoponidae, Philopteridae and Trichodectidae.

UNIT VI
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Siphonapteridae, Cimicidae and Reduviidae.

UNIT VII
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Dermanyssidae, Argasidae and Ixodidae.

UNIT VIII
Distribution, life cycle, seasonal pattern, pathogenesis, diagnosis, economic significance and control of arthropods belonging to the families: Sarcoptidae, Psoroptidae, Demodicidae, Trombiculidae, Cytoditidae and Linguatulidae.
UNIT IX
Strategic control measures of arthropods with special emphasis on improved versions of chemical, biological and immunological control and integrated pest management.

Practical
Collection, preservation, identification and differentiation of various arthropods and their developmental stages; associated pathological changes and lesions; skin scraping examination.

Suggested Readings
Kettle DS. 1995. Medical and Veterinary Entomology. CABI.
Mullen G & Durben L. 2002 Medical and Veterinary Entomology. Academic Press

VPA 604 VETERINARY PROTOZOOLOGY 2+1

Objective
To project the importance and to impart detailed knowledge on various aspects of protozoan parasites.

Theory
UNIT I
Introduction, history, classification, general account, economic importance of protozoan parasites.
UNIT II
Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Trypanosomatidae, Monocercomonadidae, Trichomonadidae, Hexamitidae and Endamoebidae.
UNIT III
Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Eimeriidae, Cryptosporidiiidae and Sarcocystidae.
UNIT IV
Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of protozoan parasites belonging to the families: Plasmodiidae, Babesiidae, Theileriidae, Haemogregarinidae and Balantidiidae.
UNIT V
Morphology, epidemiology, pathogenesis, clinical signs, diagnosis and control measures of Rickettsiales like Anaplasma, Ehrlichia and Haemobartonell.a

Practical
Identification of protozoan parasites and observation on parasite stages in host tissues and the attendant pathological lesions. Diagnosis of protozoan parasites of veterinary importance.
VPA 605 **PARASITOLOGICAL TECHNIQUES** 0+2

**Objective**
To impart practical knowledge on various techniques used in veterinary parasitology.

**Practical**
- Microscopy, micrometry, camera lucida drawings, micro- and digital photography.
- Collection, processing and examination of faecal and blood samples; lymph node biopsies, skin scrapings and nasal washings from animals for parasitological findings. Quantitative faecal examination.
- Evaluation of the efficacy and resistance of drugs against parasites.
- Maintenance of tick and fly colonies in laboratory for experimental purposes and testing of drugs; tick dissection for vector potential. Collection of aquatic snails from field and their examination for the presence of different parasitic stages.
- Collection, fixation, staining, whole mounts and identification of parasites. Cryopreservation of parasites, culturing techniques for important parasites and pasture larval count, worm count and assessment of worm burden.
- Remote sensing (RS) and geographic information system (GIS) as tools for mapping parasitic diseases.

**Suggested Readings**
VPA 606 CLINICAL PARASITOLOGY 1+1 Objective

Collection and examination of clinical material for parasitological investigations and study of clinical cases.

Theory
UNIT I
History, clinical signs, gross and microscopic examination of secretions and excretions of clinical cases.
UNIT II
Collection and dispatch of material to laboratory for diagnosis.
UNIT III
Animal sub-inoculation tests; blood and biopsy smear examination; histopathology of affected organs.

Practical
Identification, observation of parasitic stages in host tissues, excretions, secretions and associated pathological lesions.

Suggested Readings

VPA 607 TRENDS IN CONTROL OF LIVESTOCK AND POULTRY PARASITES

Objective
To learn about integrated approach for the control of helminths, arthropods and protozoan parasites of veterinary importance.

Theory
UNIT I
Conventional and novel methods of control of helminth – anthelmintics, their mode of action, characteristic of an ideal anthelmintic, anthelmintic resistance, spectrum of activity, delivery devices, integrated control method and immunological control Formulation of deworming schedule. Snail and other intermediate host control.
UNIT II
Conventional and novel methods of control of protozoan parasites – antiprotozoan drugs, their mode of action, integrated control method and immunological control.
UNIT III
Conventional and novel methods of control of insects – Insecticides / acaricides - methods of application, their mode of action, insecticide resistance , integrated control method and immunological control.

Practical
In vivo and in vitro detection of efficacy of and resistance to parasiticidal agents.

Suggested Readings
**VPA 608 IMMUNOPARASITOLOGY 2+1**

**Objective**
To impart knowledge about the immunology, immunodiagnosis and immunoprophylaxis of ecto- and endoparasites of veterinary importance.

**Theory**

**UNIT I**
Introduction, types of parasitic antigens and their characterization.

**UNIT II**
Types of immunity in parasitic infections. Cellular and humoral immunity to parasites, hypersensitivity, regulation of the immune response.

**UNIT III**
Evasion of immunity, immunomodulations and their uses.

**UNIT IV**
Immune responses in helminths, arthropods and protozoa of veterinary importance.

**UNIT V**
Immunodiagnostic tests and their techniques; application of biotechnological tools in the diagnosis and control of parasitic diseases.

**UNIT VI**
Vaccines and vaccination against parasitic infections.

**UNIT VII**
Genetic control of parasites.

**Practical**
Preparation of various antigens (somatic, secretory and excretory) and their fractionation and characterization; raising of antisera and demonstration of various immunodiagnostic methods for the diagnosis of parasitic infections.

**Suggested Readings**

**VPA 609 PARASITIC ZOONOSES 2+0**

**Objective**
To provide the students with an in-depth knowledge of occurrence and importance of parasitic zoonoses and how these parasites are diagnosed and controlled.

**Theory**

**UNIT I**
Introduction to the concept of zoonotic infections, definitions, various classifications of zoonoses, host-parasite relationships, modes of infections, factors influencing prevalence of zoonoses.
UNIT II
A detailed study of transmission, epidemiology, diagnosis and control of major protozoa of zoonotic importance.

UNIT III
A detailed study of transmission, epidemiology, diagnosis and control of major helminths of zoonotic importance.

UNIT IV
A detailed study of transmission, epidemiology, diagnosis and control of major arthropods of zoonotic importance.

Suggested Readings

VPA 610  PARASITES OF ZOO AND WILD ANIMALS  2+1

Objective
To learn about biological and control aspects of parasitic diseases of zoo and wild animals.

Theory
UNIT I
A detailed study of major protozoa of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

UNIT II
A detailed study of major arthropod parasites of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

UNIT III
A detailed study of major helminth parasites of zoo and wild animals with particular emphasis on morphological features, geographical distribution, epidemiology, diagnosis and management.

Practical

Suggested Readings
NBII Wildlife Diseases Information Node can be reached at: http://wildlifediseases.nbii.gov
Objective
To learn about the details of various snails involved in diseases transmission.

Theory
UNIT I
Characters and classification of Mollusca.
UNIT II
Occurrence, distribution, ecology, life history, morphology and control of vector snails belonging to families, Planorbidae, Lymnaeidae, Thiridae, Amnicolidae, Helicidae, Succineidae and Zonitidae.
UNIT III
Examination of vector molluscs for parasitic infections.
UNIT IV
Haematology, internal defense mechanisms, parasite-induced pathology and molluscan tissue culture.

Practical
Collection and identification of vector molluscs, study of their shells and internal organs. Breeding, rearing and maintenance of vector molluscs in the laboratory. Examination of molluscs for various developmental stages of parasites.

Suggested Readings

Suggested Broad Topics for Master’s Research
* Detection and management of antiparasitic drug resistance
* Studies on the efficacy of medicinal plants/herbal preparations against various parasites affecting domestic animals and poultry and the effect of these plants on pathogenicity and immunology of parasites
* Development of immunoprophylactic measures and immunodiagnostic techniques using modern molecular and biotechnological based tools for important parasitic diseases prevalent in the state
* Application of remote sensing and GIS for the management of parasitic diseases.
* Studies on application of host’s resistance as a part of integrated parasite management programme.
# 7. VETERINARY PATHOLOGY

## Course Structure – at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
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<tbody>
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<td>VPP 601</td>
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<tr>
<td>VPP 602</td>
<td>TECHNIQUES IN PATHOLOGY</td>
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<tr>
<td>VPP 603</td>
<td>ANIMAL ONCOLOGY</td>
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<td>CLINICAL PATHOLOGY</td>
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<td>NECROPSY PROCEDURES AND INTERPRETATIONS –I</td>
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<td>NECROPSY PROCEDURES AND INTERPRETATIONS –II</td>
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<td>VPP 608</td>
<td>PATHOLOGY OF INFECTIOUS DISEASES OF DOMESTIC ANIMALS</td>
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<td>VPP 609</td>
<td>TOXICOPATHOLOGY</td>
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<td>AVIAN PATHOLOGY</td>
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<td>VPP 611</td>
<td>PATHOLOGY OF LABORATORY ANIMALS, FISH AND WILD ANIMALS</td>
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<th>Major Subject</th>
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<tr>
<td>Veterinary Pathology</td>
<td>Veterinary Microbiology, Veterinary Anatomy, Veterinary Medicine, Veterinary Parasitology, Veterinary Pharmacology &amp; Toxicology, Animal Nutrition</td>
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*The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies*
VETERINARY PATHOLOGY
Course Contents

VPP 601 GENERAL PATHOLOGY 2+1

Objective
To acquaint students with different types of degenerations, cell injuries caused by different types of irritants and inflammation.

Theory
UNIT I
Introduction and history of pathology, principles of pathology including etiology, course and termination of disease.
UNIT II
Advanced study of various degenerations, infiltrations, necrosis, endogenous and exogenous pigmentations.
UNIT III
Circulatory and growth disturbances. Reversible and irreversible cell injury.

UNIT IV
Inflammation including vascular and cellular alterations with emphasis on chemical mediators. Hypersentivity and immune mediated mechanisms, Mechanism of healing and fever.

Practical
To study the gross and microscopic changes in degenerations, infiltrations, pigmentations, circulatory and growth disturbances and different types of necrosis in different tissues of domestic animals. Study of gross and histopathological features of different types of inflammation.

Suggested Readings

VPP 602 TECHNIQUES IN PATHOLOGY 1+1

Objective
To acquaint students with different techniques used frequently in Veterinary Pathology.

Theory
UNIT I
Basic histopathological techniques, collection of tissues, fixation, processing and section cutting, staining by routine and special methods.
UNIT II
Principles of dark ground, phase contrast and fluorescent microscopy and micrometry.
UNIT III
Histochemical techniques for demonstration of fat, glycogen and fibrous connective tissue, mucopolysaccharides and common enzymes.
**Practical**

Collection of tissues for histopathological, histochemical, toxic, bacterial and viral examination. Use of different fixatives for preservation of museum specimens. Application of different techniques- histopathological, cryosectioning, micrometry, routine and special staining. Demonstration of different inclusions, bacteria and fungi in tissues. Histochemical techniques to demonstrate different tissue constituents.

**Suggested Readings**


**VPP 603 ANIMAL ONCOLOGY 1+1**

**Objective**

To acquaint students with different types of neoplasms of domestic animals, their nature, cause, pathology and diagnosis.

**Theory**

UNIT I
Study of different neoplasms of animals including their identification, and epidemiology.

UNIT II
Etiology, histogenesis and experimental production.

UNIT III
Tumour immunology, cell cultures, transplantation and biological behaviour.

**Practical**

To study the gross and microscopic changes in different types of neoplasms.

**Suggested Readings**


**VPP 604 CLINICAL PATHOLOGY 1+2**

**Objective**

To acquaint students with clinical alterations in blood, urine, CSF and other body fluids due to different diseases.

**Theory**

UNIT I
Study of changes in blood, urine, faeces, cerebrospinal fluid and biopsy specimens and their interpretation.

UNIT II
Exfoliative cytology, organ function tests and their interpretation.

UNIT III
Biochemical profile of blood/plasma/serum and its correlation with disease conditions in domestic animals.

**Practical**

Evaluation of laboratory investigations on blood, urine, faeces and biopsy specimens from natural and experimentally produced disease conditions.

**Suggested Readings**

VPP 605  NECROPSY PROCEDURES AND INTERPRETATIONS-1  0+1

Objective
To acquaint students with different Post-mortem procedures in large animals and study of PM lesions in different diseases.

Practical
Detailed necropsy examination of various species of farm animals, laboratory animals and wildlife. Necropsy case presentation and report writing/protocol preparation. Collection of specimens for diagnosis of viral, bacterial, protozoan, parasitic diseases, toxic/ poisoning and for histochemistry/histopathology. Systemic examination of brain, lungs, heart, endocrine glands, lymph nodes, liver, Gastro Intestinal tract, urinary and genital systems for gross pathological and histopathological studies and correlation of the observations to diagnose the disease conditions.

Suggested Readings

VPP 606  NECROPSY PROCEDURES AND INTERPRETATIONS-II 0+1

Objective
To acquaint students with different Post-mortem procedures in small animals and poultry and study of PM lesions in different diseases.

Practical
Detailed necropsy examination of various species of small animals, poultry, laboratory animals and wildlife. Necropsy case presentation and report writing/protocol preparation. Collection of specimens for diagnosis of viral, bacterial, protozoan, parasitic diseases, toxic/ poisoning and for histochemistry/histopathology. Systemic examination of brain, lungs, heart, endocrine glands, lymph nodes, liver, Gastro Intestinal tract, urinary and genital systems for gross pathological and histopathological studies and correlation of the observations to diagnose the disease conditions.

Suggested Readings

VPP 607  SYSTEMIC PATHOLOGY  2+1

Objective
To teach the students about the different disease conditions of haemopoietic, circulatory, respiratory, digestive, urinary and genital systems, nervous, musculoskeletal, endocrine, glands and special senses.

Theory
UNIT I
An advanced study of pathological conditions affecting different organs of haemopoietic (bone marrow, blood, spleen, lymph node), circulatory (heart, blood vessels and lymph vessels). Respiratory (nasal cavity, larynx, trachea, bronchi, lung and pleura) systems. Study of etiology, pathology and pathogenesis of specific infectious and non-infectious diseases of domestic animals related to the above mentioned systems

UNIT II
Advanced study of pathological conditions affecting different organs of digestive (buccal cavity, pharynx, oesophagus, stomach and intestines)
UNIT III
Advanced study of pathological conditions affecting different organs of nervous (brain and spinal cord), endocrine (pituitary, thyroid, parathyroid, pancreas), musculo-skeletal systems (muscles and bones), and organs of special senses (eye, ear), skin and its appendages (hoof, tail). Study of etiology, pathology and pathogenesis of specific infectious and non-infectious diseases of domestic animals related to the above mentioned systems/organisms.

Practical
To study the gross and histopathological changes in important conditions affecting various systems. Study of gross and microscopic lesions in specific diseases pertaining to above said systems.

Suggested Readings

VPP 608
PATHOLOGY OF INFECTIOUS DISEASES OF DOMESTIC ANIMALS

Objective
To teach the students about the important infectious disease conditions of domestic animals

Theory
UNIT I
Pathology of various viral diseases of domestic animals.
UNIT II
Pathology of various bacterial and fungal diseases of domestic animals.
UNIT III
Pathology of various rickettsial and parasitic diseases of domestic animals.

Practical
To study the slides, museum specimens including autopsy specimens concerned with specific diseases.

Suggested Readings

VPP 609
TOXICOPATHOLOGY

Objective
To teach students about toxicity in livestock due to plants and extraneous poisons.

Theory
UNIT I
Introduction, mode of action, diagnosis and treatment of different poisons and their classification.
UNIT II
Pathogenesis, gross and microscopic pathology of diseases caused by toxic plants, organic and inorganic poisons commonly taken or administered maliciously to different species of domestic animals.

Practical
To study gross and histopathological alterations as a result of ingestion of toxic plants and extraneous poisons in domestic animals.

Suggested Readings

VPP 610 AVIAN PATHOLOGY 2+1

Objective
To teach the students about the different disease conditions of poultry including pathology and diagnosis.

Theory
UNIT I
Pathology of infectious diseases of chickens, turkeys, ducks and other birds.
UNIT II
Pathology of non-infectious diseases of chickens, turkeys, ducks and other birds.

Practical
Necropsy examination of the different species of poultry; study of gross and histopathological lesions in naturally occurring and artificially produced diseases of birds.

Suggested Readings

VPP 611 PATHOLOGY OF LABORATORY ANIMALS, FISH AND WILD ANIMALS 2+1

Objective
To teach the pathology and diagnosis of different disease conditions of laboratory animals, fish and wild animals.

Theory
UNIT I
Introduction, disease transmission and inter-phase.
UNIT II
Pathology of important infectious diseases (viz. bacterial, viral, fungal and parasitic) of fish, laboratory and wild/zoo animals.
UNIT III
Pathology of non-infectious diseases of fish, lab/ wild/zoo animals.

Practical
Post-mortem examination of wild animals including wild birds. Study of gross and microscopic lesions of important infectious and non - infectious diseases of fish and laboratory animals.

Suggested Readings

**VPP 612**  
**VETEROLEGAL PATHOLOGY**  
1+0

**Objective**  
To educate the students about common veterolegal problems and legal writing of PM report.

**Theory**

**UNIT I**  
General knowledge about the laws relating to veterinary practice, professional discipline and professional etiquettes.

**UNIT II**  
Regulations dealing with diseases of animals in India regarding epidemiology, quarantine certificate, issue of soundness certificate etc.

**UNIT III**  
Common causes of violent death, criminal assault, cruelty to animals, malicious poisoning, snake bite, electrocution, gun shot wounds, automobile accidents, doping etc.

**Suggested Readings**


**Suggested Broad Topics for Master’s Research**

* Effect of probiotics on pathogenesis and pathology of bacterial diseases
* Effect of antioxidants on pathogenesis and pathology of bacterial diseases
* Pathology of mixed infections in domestic animals
* Role of stress in pathogenesis and pathology of animal diseases
8. VETERINARY PUBLIC HEALTH

Course Structure- at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
<th>CREDITS</th>
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<tr>
<td>VPH 601</td>
<td>ELEMENTS OF VETERINARY PUBLIC HEALTH</td>
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<tr>
<td>VPH 602</td>
<td>BACTERIAL AND RICKETTSIAL AGENTS OF PUBLIC HEALTH SIGNIFICANCE</td>
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<tr>
<td>VPH 603</td>
<td>VIRAL, FUNGAL AND PARASITIC AGENTS OF PUBLIC HEALTH SIGNIFICANCE</td>
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<td>VPH 604</td>
<td>ZOOONES, EPIDEMIOLOGY AND PUBLIC HEALTH</td>
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<td>VPH 605</td>
<td>PRINCIPLES OF FOOD HYGIENE AND SAFETY</td>
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<tr>
<td>VPH 606</td>
<td>FOOD-BORNE INFECTIONS AND INTOXICATIONS</td>
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<td>VPH 607</td>
<td>MEAT AND MILK HYGIENE</td>
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<td>VPH 608</td>
<td>ENVIRONMENTAL POLLUTION AND SAFETY</td>
<td>3+1</td>
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<td>VPH 609</td>
<td>FISH, FISH PRODUCTS AND SEAFOOD HYGIENE</td>
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<td>VPH 610</td>
<td>BIOTERRORISM AND DISASTER MANAGEMENT</td>
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Major Subject | Minor Subjects
---|---
Veterinary Public Health | Veterinary Microbiology, Veterinary Pathology, Animal Biotechnology, Veterinary Pharmacology & Toxicology, Veterinary Parasitology, Livestock Product Technology

• The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies
VETERINARY PUBLIC HEALTH
Course Contents

VPH 601 ELEMENTS OF VETERINARY PUBLIC HEALTH 1+1 Objective

To acquaint students with basics of veterinary public health.

Theory

UNIT I
The purposes and scope of veterinary public health; veterinary interests in public health, principal functions and fields of activity of public health veterinarians.

UNIT II
Definition of veterinary public health administration; organisation, administration and implementation of veterinary public health services and programmes.

UNIT III
Public health team, administration and functions; place of veterinarian in the public health team; veterinary public health agencies and institutions in India and abroad.

Practical
Collection of information about set up of veterinary public health in different countries.

Suggested Readings

VPH 602 BACTERIAL AND RICKETTSIAL AGENTS OF PUBLIC HEALTH SIGNIFICANCE 2+1

Objective
To impart knowledge about importance and characteristic features of bacterial and rickettsial pathogens of public health significance.

Theory

UNIT I
Importance of microbes in relation to veterinary public health; cultural, biochemical and other identification characters; ecology, transmission and survivability of bacteria in nature.

UNIT II
Description of Bacillus, Listeria, Mycobacterium, Clostridium, Staphylococcus, Enterococcus, Brucella and Leptospira

UNIT III
Description of Vibrio, Salmonella, Escherichia, Campylobacter, Yersinia, Lactobacillus, Pseudomonas and Micrococcus.

UNIT IV
Description of Coxiella, Rickettsia and Chlamydia.

Practical
Isolation and identification methods for important bacterial and rickettsial agents of public health significance from host, vehicle and environment.
Suggested Readings

**VPH 603**  
**VIRAL, FUNGAL AND PARASITIC AGENTS OF PUBLIC HEALTH SIGNIFICANCE**

**Objective**
To impart knowledge about importance and characteristic features of viral, fungal and parasitic pathogens of public health significance.

**Theory**

**UNIT I**
Systematic study of viral agents of Japanese encephalitis, encephalomyelitis, rabies, influenza, KFD, Rift valley fever, and enteroviruses; their morphological and other characters, ecology, transmission and survivability in nature.

**UNIT II**
Description of fungal agents of public health importance belonging to genera: *Aspergillus*, *Penicillium*, *Fusarium*, *Mucor*, *Histoplasma*, *Microsporum*, *Trichophyton* and *Sporotrichum*.

**UNIT III**
Description of parasites of public health importance: *Taenia*, *Echinococcus*, *Trichinella*, *Toxoplasma*, *Diphyllobothrium*, *Fasciola*, and *Cryptosporidium*.

**Practical**
Isolation and identification methods for important fungal, viral and parasitic agents of public health significance from host, vehicle and environment.

**Suggested Readings**

**VPH 604**  
**ZOONOSES, EPIDEMIOLOGY AND PUBLIC HEALTH**

**Objective**
To impart knowledge of epidemiology, prevention and control of important zoonotic diseases.

**Theory**

**UNIT I**

**UNIT II**
Bacterial diseases: anthrax, brucellosis, tuberculosis, salmonellosis, yersiniosis, leptospirosis, listeriosis, plague, tularaemia, glanders, malidiosis, staphylococcosis, streptococcosis, tetanus, botulism, infections due to *Clostridium perfringens*, *E. coli*, *Aeromonas hydrophilla*, *Bacillus cereus*, *Vibrio parahaemolyticus*, cat scratch disease, chlamydiosis, Lyme disease, borreliosis (relapsing fever).

**UNIT III**
Detailed description of viral zoonoses: food-borne viruses viz. rota, tick-borne encephalitis, FMD, hepatitis A & E, Norwalk, entero, parvo, adeno,
cytomegalovirus, astrocytoma, calci and corona viruses, influenza, rabies, vector-borne viruses viz. Japanese encephalitis, Kyasanur forest disease, chickengunya, Crimean-Congo haemorrhagic fever, dengue fever, West-Nile viruses, yellow fever, rift valley fever, equine encephalitis, loping ill, and some rare and potential zoonotic viruses such as Newcastle and pox viruses.

UNIT IV
Q fever and other rickettsiosis, fungal infections viz. dermatophytosis, blastomycosis, coccidiodomycosis, cryptococcosis, histoplasmosis, aspergillosis, candidiasis, rhinosporidiosis and sporotrichosis. Attributes and impact of parasitic zoonoses; description, etiology, host range, epidemiology, diagnosis and disease management of echinococcosis, taeniasis and cysticercosis, toxoplasmosis, trichinellosis, cryptosporidiosis, dracunculosis, fasciolopsiosis, sarcozystosis, liver fluke diseases, cutaneous and visceral larva migrans, schistosomiasis, leishmaniasis, trypomosomiasis.

Practical
Isolation and identification of zoonotic agents, diagnostic procedures of zoonotic diseases, Calculation of different rates and ratios in epidemiology, Evaluation of medicine and vaccine in a population, Field visit and demographic studies.

Suggested Readings

VPH 605 PRINCIPLES OF FOOD HYGIENE AND SAFETY 2+1

Objective
To acquaint the students about principles of food hygiene and quality improvement practices.

Theory
UNIT I
Relation between veterinary public health and food hygiene; concept of food hygiene, impact of environmental sanitation and other factors on food quality.
UNIT II
Food spoilage, safety and preservation methods.
UNIT III
Microbiological standards and quality control (biological and other indicators of hygienic quality and spoilage) of foods to prevent food-borne infections.
UNIT IV
General principles of prevention of food-borne illnesses, GMP, HACCP, risk analysis.

Practical
Procedures of evaluation of hygienic/microbiological quality of raw and processed foods especially of animal origin by detection of biological and other indicators.

Suggested Readings
Jay JM. 1996. Modern Food Microbiology. CBS.

VPH 606 FOOD-BORNE INFECTIONS AND INTOXICATIONS 2+1 Objective
To impart knowledge about major illnesses due to foods.
Theory
UNIT I
Food-borne bacterial infection and intoxications due to *Salmonella*, *Campylobacter*, *Clostridium*, *Staphylococcus*, *Listeria*, *Vibrio*, *E. coli*, *Bacillus cereus*, bacterial toxins.

UNIT II
Food-borne viral infections: infectious hepatitis, poliomyelitis, gastroenteritis etc, natural toxic substances in foods.

UNIT III
Health problems due to food additives, biocides, bacterial toxins.

UNIT IV
Heavy metals, antibiotics, hormones etc. in food.

Practical
Detection and quantitation of food-borne pathogens, toxins, antibiotics, pesticides and additives in foods.

Suggested Readings

VPH 607 MEAT AND MILK HYGIENE 2+1
Objective
To educate regarding general methods of food hygiene.

Theory
UNIT I
Principles of food hygiene with special reference to foods of animal origin, human health and economics, nature and problem of food supply in India.

UNIT II
Meat hygiene and public health, abattoir hygiene.

UNIT III
Milk hygiene and public health, in place cleaning.

UNIT IV
Egg, food legislation, meat and milk adulteration.

Practical
Milk and meat inspection, quality control tests of meat, milk and fish.

Suggested Readings

VPH 608 ENVIRONMENTAL POLLUTION AND SAFETY 3+1
Objective
To impart education about pollutants in the environment and control.

Theory
UNIT I
Introduction to environmental hygiene, environment and health, microbial aspects of pollution.

UNIT II
Soil pollution, air pollution, water pollution and health.
UNIT III.
Genetic risk from environmental agents, health problems from nuclear energy and radiation pollution, environmental estrogens and pesticides-pollution.

UNIT IV
Dissemination of excreted pathogens, animal-waste and human risk, principles of safe disposal of waste.

UNIT V
Heavy metals, pesticides, veterinary drug residues and human health.

Practical
Determination of potability of drinking water, estimation and detection of pathogenic microbes in water, air, soil, animal products, sewage, and animal waste, inspection of sewage and waste disposal plants/sites.

Suggested Readings

VPH 609  
**FISH, FISH PRODUCTS AND SEAFOOD HYGIENE**  1+1

**Objective**
To impart knowledge regarding fish hygiene and fish borne diseases

**Theory**

UNIT I
Fisheries and resources, fish preservation, hygienic quality control

UNIT II
Hygienic disposal and utilization of byproducts of fish, hygienic handling, transportation and marketing of fish.

UNIT III
Fish borne diseases in relation to human health.

Practical
Study of physical and biological indicators of wholesome fish to determine hygienic status of raw and processed fish. Residue analysis in fish.

Suggested Readings

VPH 610  
**BIOTERRORISM AND DISASTER MANAGEMENT**  1+1

**Objective**
To update knowledge of disaster, biological weapons, biological hazards and remedial measures bioterrorism and biomedical hazards and their prevention

**Theory**

UNIT I:
Natural and man made disaster, impact analysis and classification of disaster scale, essential preparations to manage disaster, role and sequence of emergency medical services by veterinarians.

UNIT II
Effect of natural disasters like floods, prolonged draughts, forest fires, earthquakes, sunami and tidal damages, storms etc. on animal population both domestic and wild, post-disaster disease susceptibility, emergency control and remedial measures.
UNIT III
Biomedical hazards and biosafety, occupational health risk management. Major agents and their characteristics which have been used in the past and those which can be used in future as biological weapons.

UNIT IV
Biological weapons, hazard analysis and combating bioterrorism. Bioethics and social ethics, advisory role of veterinarians.

Practical
Detection of biohazards during disaster, detection and characterization of various organisms used as biological agents, use of disinfectants for their destruction.

Suggested Readings

Suggested Broad Topics for Masters Research
* Prevention and control of emerging and re-emerging food-borne infections and intoxications
* Prevention and control of major zoonotic diseases of local importance
* Environmental pollution and health problems
* Food safety, risk analysis
* Shelf life
* Food adulteration and food safety
9. ANIMAL GENETICS AND BREEDING

Course Structure – at a Glance

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<td>AGB 602</td>
<td>MOLECULAR GENETICS IN ANIMAL BREEDING</td>
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<td>AGB 603</td>
<td>POPULATION AND QUANTITATIVE GENETICS IN ANIMAL BREEDING</td>
<td>2+1</td>
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<td>AGB 604</td>
<td>SELECTION METHODS AND BREEDING SYSTEMS</td>
<td>3+1</td>
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<td>AGB 605</td>
<td>BIOMETRICAL TECHNIQUES IN ANIMAL BREEDING</td>
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<tr>
<td>AGB 606</td>
<td>CONSERVATION OF ANIMAL GENETIC RESOURCES</td>
<td>2+0</td>
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<td>AGB 607</td>
<td>CATTLE AND BUFFALO BREEDING</td>
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<td>AGB 608</td>
<td>SMALL FARM ANIMAL BREEDING (SHEEP, GOAT, SWINE AND RABBIT)</td>
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<td>AGB 609</td>
<td>POULTRY BREEDING</td>
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<td>AGB 610</td>
<td>LABORATORY ANIMAL BREEDING</td>
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<td>MASTER’S SEMINAR</td>
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<td>MASTER’S RESEARCH</td>
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<th>Major Subjects</th>
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Note: The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
ANIMAL GENETICS AND BREEDING
Course Contents

AGB 601 ANIMAL CYTOGENETICS AND IMMUNOGENETICS
2+1

Objective
To educate about basic principles of cytogenetics and immunogenetics and their applications in improving farm animals.

Theory
UNIT I
Development in animal cytogenetics and immunogenetics of farm animals. Immunoglobulins and their types: antigen-antibody interactions, Immune response, ELISA.
UNIT II
Major histocompatibility complex; genetics of biochemical variants and their applications; Ir-genes and concepts of disease resistance including major genes; hybridoma and its significance; concept of immuno-fertility, BoLA, BuLA, TLRs, Interleukins.
UNIT III
Chromatin structure of eukaryotes; chromosome number and morphology in farm animals banding and karyotyping; chromosomal and genetic syndromes; DNA packing in chromosomes, Z+B DNA, FISH chromosome painting and PRINS. RH Panel Mapping.
UNIT IV
Mutation and assays of mutagenesis; sister chromatid exchanges; recombinant DNA technique and its application in animal improvement programme.

Practical
Polymorphism of haemoglobulins, transferrins, enzymes/proteins; preparation of monovalent blood reagent isoimmunization, titre testing and absorption of polyvalent serum; identification of bar bodies; in vitro and in vivo preparation of somatic metaphase chromosomes; screening of chromosomal abnormalities; microphotography and karyotyping; banding procedures for comparing the chromosomal complement, FISH and PRINS.

Suggested Readings
Hare WCD & Elizabeth L Singh 1999. Cytogenetics in Animal Reproduction. CABI.

AGB 602 MOLECULAR GENETICS IN ANIMAL BREEDING
2+1

Objective
To educate about molecular techniques to identify molecular markers as an aid to selection.
Theory

UNIT I
Basic concept: Genesis and importance of molecular techniques; Genome organization – physical and genetic map, current status of genome maps of livestock

UNIT II
Molecular markers and their application; RFLP, RAPD, Microsatellite/Minisatellite markers, SNP marker, DNA fingerprinting

UNIT III
DNA sequencing, Genome sequencing, Genomic Library, Polymerase Chain Reaction (PCR), its types (PCR-RFLP, AS-PCR etc.) and applications; Transgenesis and methods of gene transfer

UNIT IV
Statistical techniques for analyzing molecular genetic data, Quantitative Trait Loci (QTL) mapping and its application in animal breeding, Genome scan, Candidate gene approach, Genomic selection, Marker Assisted Selection - basic concept

Practical
Extraction and purification of genomic DNA, Gel electrophoresis, Restriction enzyme digestion of DNA and analysis, PCR, PCR-RFLP, PCR-SSCP, Bioinformatics tool for DNA sequence analysis, Design of primer, Isolation of RNA, cDNA synthesis, Statistical methods for analyzing molecular genetic data.

Suggested Readings

AGB 603 POPULATION AND QUANTITATIVE GENETICS 2+1 IN ANIMAL BREEDING

Objective
To study genetic structure of animal population and importance of genetic variation and covariation among traits.

Theory
UNIT I
Individual verses population. Genetic Structure of population. Factors affecting changes in gene and genotypic frequencies and their effect on genetic structure of animal populations. Approach to equilibrium under different situations: Viz: Single autosomal locus with two alleles, single sex-linked locus, two pairs of autosomal linked and unlinked loci;

UNIT II
Small population: random genetic drift, effective population size, pedigreed populations, regular and irregular inbreeding systems.

UNIT III
Quantitative genetics-gene effects, population mean and variance and its partitioning, biometric relations between relatives.
UNIT IV
Genetic and phenotypic parameters-their methods of estimation, uses, possible biases and precision. Scale effects and threshold traits.

Practical

Suggested Readings

AGB 604 SELECTION METHODS AND BREEDING SYSTEMS 3+1

Objective
To explain the methodology of selection and breeding systems for genetic improvement of livestock and poultry.

Theory
UNIT I
Type of selection and their genetic consequences. Response to selection and its prediction and improvement of response to selection.
UNIT II
UNIT III
Selection of several traits. Evaluation of short term and long term selection experiments viz: bidirectional selection and asymmetry of response, selection plateux and limit.
UNIT IV

Practical
Estimation of breeding values from different sources of information. Prediction of direct and correlated response to different bases of selection. Computation of breeding values using different sources of information for female and male

**Suggested Readings**


**AGB 605 BIOMETRICAL TECHNIQUES IN ANIMAL BREEDING 3+1**

**Objective**

To educate about the various biometrical techniques for data analysis and their applications in animal breeding research.

**Theory**

**UNIT I**

Review of basic concepts in statistical inference and balanced experimental designs. Nature of structure of animal breeding data and sources of variation.

**UNIT II**

Introduction to matrix algebra, types of matrices and matrix operations. Determinants and their properties, methods of finding inverse of a matrix and their application.

**UNIT III**

ANOVA, Regression and Correlations, Henderson’s methods for estimation of variance components, Basic concepts of linear models, Least-squares analysis, maximum likelihood; Method of estimation; Generalized LS and weighted LS. Fisher’s discriminant function and its application, D2 - Statistics in divergent analysis.

**UNIT IV**

Linear models in animal breeding, Methods of analysis of unbalanced animal breeding data. Adjustment of data. Data base management and use of software packages in animal breeding.

**Practical**

Matrix applications, determinant and inverse of matrices; Building of models for various types of data; Estimation of variance components; Least squares method for analysis of research data; Collection, compilation, coding, transformation and analysis of animal breeding data by using above biometrical techniques with computer application.

**Suggested Readings**


AGB 606  CONSERVATION OF ANIMAL GENETIC RESOURCES  2+0

Objective
To educate about the concept of conservation of Animal Genetic Resources and their sustainable utilization.

Theory
UNIT I
Domestic Animal Diversity in India, its origin, history and utilization. Present status and flow of Animal Genetic Resources and its contribution to livelihood security. Methodology for genotypic characterization of livestock and poultry breeds through systematic surveys. Fodder availability; management of breed; physical, biochemical and performance traits and uniqueness of animals of a breed; social, cultural and economic aspects of their owners/communities rearing the breed.

UNIT II

UNIT III
Status, opportunities and challenges in conservation of AnGR. IPR issues pertaining to animal genetic resources/animal products or by-products. Registration of livestock breeds and protection of livestock owner’s rights in India.

Suggested Readings
Lasley JF. 1987. Genetics of Livestock Improvement. 3rd Ed. IBH.
UNIT II
Sire evaluation methods using single trait and multiple traits: construction of Sire indices, Sire evaluation under animal model, sire mode; and matrenal grand sire model. Open nucleus breeding systems with MOET.

UNIT III

UNIT IV
Considerations in the import of exotic germplasm for breeding cattle in the tropics. Appraisal of buffalo and cattle breeding programme. Role of breed associations in dairy improvement.

Practical

Suggested Readings
Lasley JF. 1987. *Genetics of Livestock Improvement*. 3rd Ed. IBH.

AGB 608 SMALL FARM ANIMAL BREEDING 2+0
(Sheep, Goat, Swine and Rabbit)

Objective
To educate about the small farm animal breeding concepts.

Theory
UNIT I
Breeds–Economic traits–Prolificacy-Breeding records and standardization.

UNIT II
Genetic parameters – Selection of males and females – Breeding systems. Development of new breeds.

UNIT III
Breeding policy – Breeding research – Conservation of breeds.

UNIT IV
Culling and replacement – EADR.

Suggested Readings
Objective
To educate about the advances in poultry breeding practices.

Theory
UNIT I
Origin and history of poultry species: Chicken, turkey, duck and quail – Important qualitative traits in poultry including lethals – Economic traits of egg-type chicken and their standardization – Selection criteria – Aids to selection: Index selection and Osborne index – Restricted selection index – Economic traits of meat-type chicken and their standardization.

UNIT II

UNIT III
Industrial breeding – Artificial insemination in chicken – Autosexing – Random Sample Test.

UNIT IV
Biochemical variants and immunogenetics of poultry – Use of molecular genetics in poultry breeding – Quantitative trait loci and marker-assisted selection – Conservation of poultry genetic resources

Practical
Inheritance of qualitative traits – Economic traits of egg-type and meat-type chicken – Procedures of standardization – Estimations of heritability, correlation between various production traits, inbreeding co-efficient and heterosis – Selection of sires and dams – Osborne index – Restricted selection index – Collection and evaluation of semen and insemination – Diallel cross.

Suggested Readings

Objective
To educate about the laboratory animal breeding principles.

Theory
UNIT I
Introduction to laboratory animal genetics – Breeding colonies of mice, rats, hamsters, guinea pigs and rabbits.

UNIT II
Selection and Mating methods/systems – monogamous, polygamous and others.
UNIT III
Development of genetically controlled laboratory animals – Rules for nomenclature, inbred strains, outbred stocks, mutant stocks, recombinant inbred strains, transgenic strains, gene targeting and production of ‘gene knock-out’ animals.

UNIT IV
Genetic control and monitoring – Record keeping – Ethics of laboratory animal use.

Suggested Readings

Suggested Broad Topics for Masters Research
- Animal Genetic Resources characterization and evaluation using field survey and molecular markers
- Animal Genetic Resource enhancement through selection/crossbreeding/reproductive biotechnology/molecular biology
- Identification of molecular markers for economic traits
- Genetic basis for improvement in quantitative traits
- Breeding tools for Sire evaluation
- Appropriate models for evaluating animal breeding values
- Transgenesis and gene transfer
- Genetics of Disease Resistance
## 10. ANIMAL NUTRITION
Course Structure – at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>ANN 601</td>
<td>ANIMAL NUTRITION – ENERGY AND PROTEIN</td>
<td>3+0</td>
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<tr>
<td>ANN 602</td>
<td>ANIMAL NUTRITION – MINERALS, VITAMINS AND FEED ADDITIVES</td>
<td>3+1</td>
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<tr>
<td>ANN 603</td>
<td>FEED TECHNOLOGY</td>
<td>1+1</td>
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<tr>
<td>ANN 604</td>
<td>FEED CONSERVATION ,STORAGE AND QUALITY CONTROL</td>
<td>2+2</td>
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<tr>
<td>ANN 605</td>
<td>RUMINANT NUTRITION</td>
<td>2+1</td>
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<tr>
<td>ANN 606</td>
<td>NON-RUMINANT NUTRITION</td>
<td>1+1</td>
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<tr>
<td>ANN 607</td>
<td>NUTRITION OF COMPANION/LABORATORY, WILD AND ZOO ANIMALS</td>
<td>2+1</td>
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<td>ANN 608</td>
<td>RESEARCH TECHNIQUES IN ANIMAL NUTRITION</td>
<td>1+3</td>
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<tr>
<td>ANN 609</td>
<td>NON CONVENTIONAL FEED STUFF AND TOXIC CONSTITUENTS/ANTIMETABOLITES IN ANIMAL FEEDSTUFF</td>
<td>2+1</td>
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<td>ANN 691</td>
<td>MASTER’S SEMINAR</td>
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<tr>
<td>ANN 699</td>
<td>MASTER’S RESEARCH</td>
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**Major Subjects**

Animal Nutrition

**Minor Subjects**

Veterinary Bio-chemistry, Veterinary Physiology, Livestock Stock Production and Management, Animal Biotechnology, Livestock Product Technology

**Note:** The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
ANIMAL NUTRITION

Course Contents

ANN 601 ANIMAL NUTRITION – ENERGY AND PROTEIN 3+0

Objective

Familiarization with fundamental concepts of energy and proteins, metabolism of carbohydrate, fat and protein and their efficiency of utilization. Requirement of carbohydrates, fat and proteins for various physiological functions.

Theory

UNIT I
Basic terminology and classification of carbohydrates, fats and proteins. Fundamental concepts of Digestion and metabolism of Carbohydrate Fat and Protein in different species of animals. Gluconeogenesis, Recent advances in glucogenic precursors on acetate utilization. NPN metabolism, urea fermentation potential and metabolizable protein. Amino acids imbalance, antagonism and toxicity.

UNIT II

UNIT III
Rumen degradable Protein (RDP), and rumen undegradable protein (UDN) and Kinetics. Energetics of protein synthesis and turn over. Quantification of microbial protein synthesis. Protein quality determination in monogastrics and utility.

UNIT IV

Suggested Readings

Objective

Theory
UNIT I

UNIT II

UNIT III
Relationship of vitamins with other nutrients. Critical vitamins for ruminants and non-ruminants. Feed additives including probiotics Prebiotics, Symbiotics and feed enzymes. Research techniques in nutrition.

Practical

Suggested Readings
Objective
Introduction to the subject, formula feed manufacturing and different operations involved. Layout, designing, operation and management of feed mill.

Theory
UNIT I
Importance of feed technology in relation to animal productivity. The integrated biological, chemical and physical basis for evaluating the inherent nutritional quality of feed ingredients and feeds.
Familiarization of various feed mill equipments, layout and operations.
Problems of feed manufacturing units and control measures. Quarantine measures.
UNIT II
Introduction to the formula feed manufacturing including principles of material handling, grinding, mixing, pelleting and other major processing operations.
Crumbling, Flaking, Popping, Extrusion.
Principles of instrumentation and analysis, with emphasis on application to quality control and research in the feed industry.
UNIT III
The formulation of concentrate mixtures, premixes and rations using computer.
Automated feed mill. Personal management in feed plants, laws and regulation of feed manufacturing industry.
Codex alimentarius, HACCP.
Organizational charts for small, medium and large feed plants, labour standard, planning and production programme, handling of plant equipment. Merits and demerits of automated feed plant

Practical
Identification of feed ingredients and their specifications, as well as compound feed for different categories of livestock and poultry. Feed microscopy.
Formulating premixes. Introduction to Pulverisers, pelletisers, complete feed blocks equipments Plant layout and design of different capacity of feed mills, problems related to feasibility, records keeping in different sections of feed mill. Experiential learning at the feed plant for preparing feed, urea molasses mineral blocks, mineral mixture.

Suggested Readings
Gohl BO. 1985. Tropical Feeds. FAO.
ANN 604  FEED CONSERVATION, STORAGE AND QUALITY CONTROL  2+2

Objective
To acquaint with inherent nutritional quality of feed ingredients and feeds. Evaluation of feeds and fodders and feed preservation techniques. Procurement and storage of feed ingredients. Losses during storage and its control.

Theory

UNIT I
Principles of feed and fodder processing and preservation techniques, their merits and demerits. Procurement, planning and purchase procedures; traditional and modern farm level storage structures. Feed storage and godown management, estimation of storage capacity and stack plan.

UNIT II
Evaluation of processed and preserved feeds and forages. Role of moisture, temperature and relative humidity during storage of feedstuffs and their effect on biotic factors. Handling and storage of liquid feed ingredients. Physical and chemical changes in feeds during storage; storage losses; insect pests and rodents in feed stores and their control; Role of fungi, tolerance limits and measures to check them in stored products.

UNIT III
Factors affecting the quality of feed and feedstuffs on preservation. Microbiological evaluation of processed and preserved feeds, Effect of preservation on nutritional value of feed. Properties and mode of action of pesticides and fumigants; principles of good sanitation and hygiene of godowns.

UNIT IV

Practical
Laboratory evaluation of preserved and processed feed and forages. Physical properties of feeds and feedstuffs; identification of insect-pests and fungi in stored products; techniques for detection of hidden infestation in grains; quality control and inspection of stored feed materials; moisture equilibrium determination and estimation of chemical changes including alcoholic acidity, rancidity and uric acid in feeds during storage. Weende proximate analysis, Van Soest fibre fractionation, Enzymatic evaluation, Pro rata deduction (Feed laws), urea, FFA, peroxide value, adulterants, and heavy metal.
Suggested Readings


ANN 605 RUMINANT NUTRITION 2+1

Objective

Requirement of nutrients for different physiological functions in various ruminant species. Latest concepts of feeding the nutrients for maximising production.

Theory

UNIT I

Nutrients and their metabolism with special reference to milk, meat and wool production.

UNIT II

Feeding standards, their history, comparative appraisal and limitations. Classification of feedstuffs. Nutrient requirements for calves, heifers, dry, pregnant and lactating cows, buffaloes, sheep and goat.

UNIT III

Introduction to rumen microflora and fauna. Development of rumen. Role of milk replacers and calf starters

UNIT IV

Feed formulation of large and small ruminants for different physiological stages. Concept of complete feed. Limiting nutrients and strategic feeding of high yielding ruminants. Concept of by-pass nutrients and their impact on production, reproduction and immune status. Importance of CLA, omega fatty acids, Scope for value addition in milk, Different systems of feeding buffalo for beef production.. Feeding during natural calamities, feeding in various agro-climatic zones of India.

Practical

Design and planning of feeding experiments. Identification of feed and fodder on the basis of its composition. Artificial rumen technique, Methods for evaluation of feedstuffs - in vitro gas, in sacco digestion kinetics. Determination of nutritive value of feeds and fodders by metabolism trial in dairy cattle, determination of nutritive value of pastures by the use of range techniques, study of rumen metabolic profile. Preparation of Bypass Nutrients Identification of rumen microbes and rumen studies.
Suggested Readings

ANN 606 NON-RUMINANT NUTRITION 1+1 Objective

Requirement of nutrients and feeding of various non-ruminants species for efficient quality production.

Theory
UNIT I
Nutrients, their metabolism and requirements for poultry and swine during different stages of growth and production. Limiting iminoacids-lysine and methionine.
UNIT II
Feeding systems and feed additives, feed formulations for different purposes including least cost rations.
UNIT III
UNIT IV
Nutritional factors affecting quality of the products. Hind gut fermentation and its importance, Nutrient requirements of rabbits and equines, Nutritional manipulation for producing value added egg, meat / pork

Practical
Design and planning for poultry and swine feeding experiments, formulation and compounding of general and least cost rations, determination of nutritive value of poultry and swine feeds by balance experiments, evaluation of protein quality, Visit to poultry and piggery units, feed and fodder stores, Use of software in least cost feed formulations. Basic principles governing the least cost formulation software’s.

Suggested Readings

ANN 607 NUTRITION OF COMPANION, LABORATORY, WILD 2+1 AND ZOO ANIMALS

Objective
Preparation, storage and evaluation of feeds and feeding standards of companion/ laboratory /wild and zoo animals

Theory
UNIT I
Feed Habbits, food Patterns, digestive structure and functions companion,
laboratory, wild and zoo animals. Natural dietary habits. Nutritional requirements of various species of animals.

UNIT II
Feeding standards and feeding habits of companion / laboratory animals. Importance of colostrum and feeding of neonates and growing animals. Feeding and care of nursing mothers. Feeding of sick and old animals. Post Surgical nutrition.

UNIT III
Ration formulation for captive animals. Artificial feeding and feeding during emergency. Nutritive characteristics of forages for wild animals. Adequacy of forage plants for wild and zoo animals. Diets used in captivity. Raising orphans. Nutritional melodies. Nutrition of semi wild and semi domestic animals like mithun and yak under special topography

UNIT IV
Composition, presentation, sterilization, palatability, assessment and storage of companion/laboratory animal diets. companion food tables and their nutritional assessment. Mistakes and misleading information on companion food labels and labeling.

UNIT V
Nutraceuticals in companion / laboratory foods and animal foods. Nutritional deficiency diseases. Geriatric nutrition – corrective measures

Practical
Formulation and preparation of hygienic, balanced diets and feeding for companion/laboratory animals. Characteristics of ration formulation and feeding schedules wild and zoo animals. Feeding schedules for sick and orphan wild / zoo animals. Artificial and emerging feeding. General feeding habits and different feed constituents of wild and captive animals. Research methodology of companion/laboratory animals. Processing and storage of companion/laboratory diets. Visit to Zoological parks and wildlife sanctuary.

Suggested Readings
Givens DI, Owel E, Aford REF & Omed HM. 2000. Forage Evaluation in Ruminant Nutrition. CABI.

ANN 608 RESEARCH TECHNIQUES IN ANIMAL NUTRITION 1+3
Objective
Planning and designing of experiments, use of various techniques in estimating chemical and bio-chemical constituents in feeds, fodders, blood, milk, rumen liquor, meat, wool etc.
Theory

UNIT I
Principles of animal experimentation. Specialized feed compounding. Introduction and principle of GLC, HPLC, AAS, tracer technique, flame photometer, NIR, SF6, amino acid analyzer.

UNIT II
Importance and principle of various techniques in estimating chemical and biochemical constituents and toxic principles in feeds, fodders. Importance, principles and procedures for estimating chemical and biochemical constituents in blood, milk, rumen liquor, meat, wool etc.

Practical

Suggested Readings

ANN 609 NON CONVENTIONAL FEEDSTUFFS AND TOXIC CONSTITUENTS / ANTIMETABOLITES IN ANIMAL FEEDSTUFF

Objective
To understand the importance of alternate feeds and their use in augmenting profit in livestock farm. Different toxins present in feed stuffs, their properties and detoxification techniques.

Theory
UNIT I
Present and future feed requirements and current availability for livestock and poultry. Use of non-traditional feeds – By-products of agricultural, industrial, food processing units and forest by-products. Evaluation by chemical and biological methods. Formulation of economical rations. Level of inclusion of various non conventional feeds in livestock ration

UNIT II
Classification of toxic principles in animal feedstuffs. Chemico-physical properties of various toxins. Effect of toxins on biological system and nutrients utilization in different species of livestock. Detoxification of toxin principles
by various physical, chemical and biological techniques. Insecticide and pesticide residue detection.

**Practical**

Estimation of various protease inhibitors; tannins; and mycotoxins in various feeds and feedstuffs. Nitrates, HCN, oxalates, insecticide and pesticide residues, saponins, Gossypol, mimosine, heavy metals..

**Suggested Readings**


**Suggested Broad Topics for Masters Research**

* Utilization of non conventional feed/ fodder resources
* Evolving / Assessing feed additives / supplements
* Manipulation of rumen fermentation to enhance productivity
* Feed processing for efficient utilization
* Improving palatability, digestibility of companion food
* Preservation and storage of feed / fodder
* Developing functional foods though dietary manipulation
* Neonatal growth stimulants
* Developing sick diet / Geriatric diet to companion/ domestic/ Wild animals
* Problem solving approach like formulating area specific mineral mixture
* Developing residue free animal produce through dietary management
* Addressing global issues /pollutants through feeding manipulation
# 11. LIVESTOCK PRODUCTION AND MANAGEMENT

## Course Structure - at a Glance

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<td>SHEEP AND GOAT PRODUCTION AND MANAGEMENT</td>
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<td>SWINE PRODUCTION AND MANAGEMENT</td>
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<td>LABORATORY ANIMAL PRODUCTION AND MANAGEMENT</td>
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<td>LPM 605</td>
<td>SHELTER MANAGEMENT</td>
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<td>PRINCIPLES OF ENVIRONMENTAL HYGIENE AND WASTE</td>
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<td>CLIMATOLOGY AND ANIMAL PRODUCTION</td>
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<td>LPM 608</td>
<td>POULTRY FARM AND HATCHERY MANAGEMENT</td>
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<td>FARM ANIMAL BEHAVIOR</td>
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<td>LPM 610</td>
<td>INTEGRATED LIVESTOCK FARMING SYSTEM</td>
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<td>EQUINE PRODUCTION AND MANAGEMENT</td>
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<td>LPM 612</td>
<td>WILD LIFE MANAGEMENT AND CONSERVATION</td>
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<td>LPM 613</td>
<td>LIVESTOCK BUSINESS MANAGEMENT</td>
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<td>LPM 699</td>
<td>MASTER’S RESEARCH</td>
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### Major Subjects
- Livestock Production and Management

### Minor Subjects
- Animal Nutrition, Animal Genetics & Breeding,
- Livestock Products Technology, Veterinary and Animal Husbandry Extension Education

**Note:** The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
LIVESTOCK PRODUCTION AND MANAGEMENT

Course Contents

LPM 601  CATTLE AND BUFFALO PRODUCTION AND MANAGEMENT  2+1

Objective
To acquaint students on basic aspects of dairying in India compared with developed countries, problems and prospectus of dairying, detailed aspects of care and management of different classes of dairy cattle and buffaloes.

Theory
UNIT I
Introduction – Development of Dairy Industry in India and world - Present status and future prospects of livestock development in India

UNIT II
Important breeds of cattle and buffalo, traits of economic importance and their inter-relationships - Selection of high quality animals - Role of management in improving the reproduction efficiency in farm animals. - Housing and rearing systems.

UNIT III
Breeding Management: System of breeding Economic traits. Methods of Breeding - Prenatal and postnatal care and management of cattle and buffalo - Care of neonate and young calves - Management strategies for reducing mortality in calves, age at first calving and calving interval in cattle and buffaloes.

UNIT IV
Management of labour, Milking management, Machine milking and hand milking, Different laws governing the livestock sectors to produce quality products on par with international standards - Technique of harvesting clean and hygienic livestock products, transportation of animals, health management. Wallowing in buffaloes- Management of draught animals and summer management

UNIT V
Feed and fodder resources used for feeding of cattle and buffaloes – Scientific technique of feeding, watering – Computation of practical and economical ration, supply of green fodder around the year and enrichment of poor quality roughages.

Practical
Visits to cattle farms and critical analysis of various types of managerial practices - Study of breeding management in the farm- Analysis of practical feeding management- Disease control- Housing – milking - calf, heifer and adult management- Dairy Cattle and Buffalo judging - Project preparation for external funding and commercial farms and enterprises for dairy products – marketing strategies for milk and milk products and meat.

Suggested Readings
Objective
To acquaint students on status of sheep and goat farming in India, importance of record keeping, principles of housing and feeding, breeding management to improve the reproductive efficiency and detailed account on care and management of different classes of sheep and goat.

Theory
UNIT I
Introduction - Population structure and importance- Advantages and disadvantages of sheep farming under different systems of management – type of housing and equipments- Important sheep and goat breeds- Advantages and disadvantages of sheep and goat farming.

UNIT II
Breeding Management: Breeding seasons - fitness of purchase for first breeding - methods of detection of heat - Natural Service and artificial insemination - Care of the pregnant Animals - Breeding stock - Use of teaser
* Culling.

UNIT III
Feeding Management: Feeding methods - Principles to be followed in feeding and watering- feeder space, waterer space, Designing feeders and waterers. - Range management - Stocking rate and pasture improvement and utilization; management under stall fed conditions, Transportation of sheep and goat.

UNIT IV
Disease Management: Role of management in the prevention and control of diseases. Special Management: Deworming - Dipping and spraying- shearing - Avoidance of goatry odour in milk, Tupping

UNIT V
Wool: Importance of wool - Fiber structure- Fleece characters - Goat fibers - Characters of mohair and pashmina, fur and Angora - Marketing of goat fibers / wool.- Planning of sheep and goat farm of various sizes - Economics of sheep and goat farming.

Practical
Visit to sheep and goat farms and critical analysis of various managerial practices under different conditions. Study of practical housing management - Analysis of practical diseases control management - Shearing management - Record keeping. - Preparation of project for commercial farming - Characterization of sheep and goats; handling of sheep and goat; daily and periodical operations for sheep and goats - Methods of identification of sheep and goat. Cost of rearing sheep and goat for mutton and wool - Housing plans for various age and categories of sheep and goat - Dipping; Vaccination of sheep and goat - Shearing of wool.
Suggested Readings

LPM 603   SWINE PRODUCTION AND MANAGEMENT   1+1

Objective
To impart knowledge on various aspects of swine farming in India, principles of housing, breeding, feeding and health care of pigs, management practices at different stages of growth and economic pig production systems.

Theory
UNIT I

UNIT II
Breeds of pigs - Selection of breeding stock - Breeding seasons - Age and weight at first services - Methods for detection of heat – Natural service and artificial insemination - Care of pregnant sows, piglets and growers - Care of breeding boar.

UNIT III
Housing, sanitation and hygiene, disease prevention measures - Housing and equipment –Wallowing - Sanitation and hygiene - Role of management in the prevention and the control of diseases.

UNIT IV
Feeding and management of new born, weaner and finishers, dry, pregnant and farrowing sows - Feeding principles to be followed - Methods of watering – Feeder space – Water space, etc - Marketing: Methods of marketing in swine production - Record keeping.

Practical
Visits to piggeries and critical Analysis of various types of managerial practices - Analysis of the trend and structures of pig population - Analysis of practical breeding management methods, practical disease control management - special management methods - Ageing and identification – Judging - Constraints and remedial measures in pig farming - Economics of production - Project preparation for research and commercial farms.

Suggested Readings
LPM 604  LABORATORY ANIMAL PRODUCTION AND MANAGEMENT  1+1

Objective
To educate the students become familiarize with various aspects of rabbit farming, problems and prospectus, principles of housing, breeding, feeding and health care of rabbits, rats, mice and guinea pigs, measures to reduce the mortality in young ones at different seasons.

Theory
UNIT I
Introduction - Importance of rabbit for meat and fur production, rats, mice and guinea pigs, - Common breeds and strains.
UNIT II
System of housing – Common diseases and their control measure. Management of specific pathogen free and gnotobiotic animals, concepts to related to welfare of laboratory animals
UNIT III
Breeding - Age at maturity, litter size - Weaning – Feeding of growers – Selection of replacement stock, transportation of rabbit.
UNIT IV
Transportation of Laboratory animals – marketing of meat and fur.

Practical
Handling and restraining of laboratory animals - Visits to small animal farms and critical analysis of various types of managerial practices- Analysis of the trend and structures of Laboratory animals population - Analysis of practical breeding management methods - practical disease control management and special management methods - Ageing and identification – Judging - Economics of production.

Suggested Readings

LPM 605  SHELTER MANAGEMENT  1+1

Objective
To familiarize students with type of houses suited for different livestock under varying climatic conditions.

Theory
UNIT I
General principles in planning animal houses- farmstead and animal houses - Selection of site and planning; layouts for livestock farm of different sizes in different climatic zones in India - Farm structures - General principles of construction of enclosures, floor and road.
UNIT II
Housing requirements of different classes of Livestock - Preparation of layouts, plans, arrangement of alleys- Fitting and facilities in the houses for
horses, dairy cattle, calves, bulls, work cattle, dogs, pigs, sheep, goats, and poultry.

**UNIT III**
Improvement of existing buildings; water supply; feed and fodder delivery systems - Economics of Livestock housing.

**UNIT IV**
Housing - Disease control measures and sanitation of all classes of livestock

**Practical**
Score card for animal houses - Time and motion study in Animal houses - Preparation of plans for Animal houses for horses, cattle, sheep, pigs, goats, and other livestock - Dogs and other pet animals - Economics of livestock housing - Preparation of plan for animal houses of different sizes and climatic zones of India.

**Suggested Readings**


**LPM 606 PRINCIPLES OF ENVIRONMENTAL HYGIENE AND WASTE MANAGEMENT**

**Objective**
To familiarize students on principles of air and water hygiene with reference to impurities and inclusions of water, collection and disposal of waste from the animal house, modern techniques in manure disposal and biosecurity measures to be adapted for hygienic production of livestock products.

**Theory**

**UNIT I**
Animal air hygiene: Definition - Composition of air - Air pollution - Factors affecting outdoor and indoor pollution - Assessment of these factors on animal health and production - Methods to control these factors.

**UNIT II**
Water Hygiene: Importance of water - Impurities and inclusions - Sterilization - Examination of water and water supplies - Collection of samples - Topographical physical, chemical, bacteriological and microscopic examination of water - Hygienic requirements and standards for drinking water - Quantity of water required by domestic animals - Methods of watering.

**UNIT III**
Manure - Quantity of manure voided by domestic animals - Animal excreta a factor in spread of disease - Hygienic and economic disposal of farm waste - Modern techniques used in automation / semi-automation in disposal of farm waste.

**UNIT IV**
Environmental protection act, Air (Prevention and control of pollution) act and water (Prevention and control of pollution) act - Biosecurity measures to be adapted for efficient and healthy production.
UNIT V
Effect of environmental pollution on livestock and its products directly and indirectly - Controlling environmental pollution - Different factors affecting the quality of livestock and its products meant for human consumption

Suggested Readings

LPM 607 CLIMATOLOGY AND ANIMAL PRODUCTION 1+0

Objective
To familiarize students on climate, weather, various climatic factors and their role in production and health of animals in both temperate and tropics, micro and macroclimatic conditions of animal house and assessing the heat tolerance of bovines.

Theory
UNIT I
Definition of climate - Classification of climatic regions - Climatic factors - Assessment of climate - Study of climatic factors in relation to animal production.
UNIT II
Light, natural and artificial light - mechanism of light action - photo period and light responses – Applications - Importance of light in production of animals and birds.
UNIT III
Introduction of breeds into different climatic regions - Agro meteorology and weather forecasting for Animal Husbandry activities - Micro climate modification in animal houses.
UNIT IV
Estimation of microclimatic conditions in Animal house - Measurement of Temperature, Relative humidity, Air Velocity and Mean temperature of the surrounding, measurement of intensity of light in animal houses - Construction of climographs and hythergraphs - Estimation of cooling power of atmosphere - heat tolerance test in bovines.

Suggested Readings
Siddhartha K & Roger B. 1996. Atmosphere, Weather and Climate. ELBS.

LPM 608 POULTRY FARM AND HATCHERY MANAGEMENT 2+1

Objective
To acquaint students on basic aspects of housing, feeding, breeding and health care of poultry and comparing the performance under cage and floor system of
management of poultry, biosecurity measures to be followed to reduce mortality and efficient hatchery management to produce healthy young ones.

Theory

UNIT I
Poultry housing systems Cage Vs floor system, litter management and lights for poultry, rearing turkey, duck and quails.

UNIT II
Management of chicks, growing, layering and breeding flocks, broiler production, selection and culling of laying flocks.

UNIT III
Procuring, care and pre-incubation storage of hatching eggs - Method of incubation, sanitation disinfection and management of hatchery.

UNIT IV
Embryonic development and factors effecting fertility and hatchability of eggs.

UNIT V
Chick sexing, packing and hatchery business - Transporting management of farm and hatchery waste.

Practical
Poultry Farm management - Brooding of chicks; selection of laying flocks - Disease preventive measures - Selection and care of hatching eggs; incubator operation, fumigation and candling setting and hatching, packaging of chicks - Waste management - Marketing of products.

Suggested Readings

LPM 609 FARM ANIMAL BEHAVIOR 1+0

Objective
To make acquainted students on principles of farm animal behaviour with regard to environmental influence, group formation, social behaviour and and behavioural adaptations under domestication.

Theory
UNIT I
Introduction to Animal behaviour - Importance of animal behaviour studies - Patterns of behaviour - Daily and seasonal cycles of behaviour - Physiological basis of behaviour.

UNIT II
Environmental modification of behaviour - Developmental changes in behaviour - Genetic differences in behaviour - Behavioural disorders.

UNIT III
Group formation - Social relationship, process of socialisation locality and behaviour - Practical application - Behavioural character for management
practices - Favourable and unfavourable behaviour for domestication - Behavioural adaptations under domestication.

UNIT IV

Suggested Readings

LPM 610 INTEGRATED LIVESTOCK FARMING SYSTEM 2+1

Objective
To familiarize on various aspects viz., scope and limitations of integrated livestock farming system, recent approach and economic feasibility of different integration models for sustainable production.

Theory
UNIT I
Scope and limitation of integrated farming systems - Sustainability of integrated Livestock Farming Systems and their economic importance.

UNIT II
Integration of fish, arable farming and different livestock enterprises vis-à-vis gobar gas plant, FYM, solar and wind energy utilization, cattle, buffalo sheep, goat, pig, poultry, rabbit, silk worm, bee keeping etc.

UNIT III
New approach for changing farming systems in present energy crises.

UNIT IV
Project formulation and evaluation of various livestock enterprises.

Practical
Various livestock farming units and their economic analysis - Evaluation of different farming systems and their economic importance - Preparing feasibility report for various farming projects.

Suggested Readings
Objective
To educate the students become familiarize with principles of housing, breeding, feeding and health care of different classes of horse, stable routines and measures to reduce the mortality in young ones at different seasons.

Theory
UNIT I
Equine population in India - Breeds of native and exotic horses - Types and classes of light and work horses
UNIT II
Housing and routine management practices –Hygiene and maintenance of stable. Color and markings, Dentition and ageing selecting and judging horses- unsoundness and stable vices
UNIT III
Feeding and breeding of horses donkey and Mules, foaling, care of foal
UNIT IV
Foot care and shoeing care, Stud farms - Race clubs - Race horses and their care - Horse behaviour and training - Exercising - Basic Horsemanship
UNIT V
Health management & diseases control. Control of internal and external parasites of horse- Colic and its prevention
UNIT VI
Mode of transport - Facilities requirement - Cleaning, disinfection and preparation of vehicles Transport stress - Management during transport - Regulatory acts of states and centre in animal disease control and welfare. Precautions and requirements before, during and after transport - Laws governing the import and export of livestock and its products- - Horse passport and trading

Practical
Control of horse for examination, passing of stomach tube, dentition and ageing, saddling, exercising of horse, hoof care.

Suggested Readings
Pilliner S. 1994. Care of the competition Horse. BT Batsford.
Theory

UNIT I
Zoo and captive wild animals - Principles and concepts – Ecology of wild life sanctuaries and National parks- wild life legislation in India - Status of forest in India - Biological and ecological basis of management of wild life.

UNIT II
Voluntary organization on wild life - Rules and regulations of zoo authority of India -Wild life protection act - Zoological classification of wild animals - Funding agencies for wild life research and preparation of project. - Conservation of wild animals.

UNIT III
Wild life health control - Reproduction in zoos - Population analysis - Population manipulation - Habit analysis and design - The resources and its management - Distribution of important Indian animals - Zoo animals and birds - Breeding characteristics – Movements - Cover requirements - Food - Population density – Mortality - Nesting losses caused by predators, predator and prey relationship - Human interference - Refuge rehabilitation

UNIT IV
Restraints - Maps - Survey and plans of management systems - Principles, protective measures - Development and conservation of water supply- puberty - Breeding seasons - pregnancy - Parturition - Lactation postnatal survival of the young - Social factors among various species - Miscellaneous management procedures.

Suggested Readings

LPM 613 LIVESTOCK BUSINESS MANAGEMENT 1+1

Objective
To acquaint students with knowledge in principles, planning, technical approach and preparing financial statement in Livestock Business Management and preparing projects for financing.

Theory
UNIT I
Management principles - Planning - Techniques, strategic planning, organization structure, co-ordination and controlling techniques - Approaches to management.
UNIT II
SWOT analysis, financial accounting - Accounting records - Balance sheet, fund flow statement - Cost and analysis for managerial decisions - Budgeting and control.

UNIT III

UNIT IV
Marketing - Objectives, strategies - Selecting and managing marketing channels - Pricing strategies - Sales promotion - Legislation relating licensing - Company law.

Practical
Preparation of financial statements, depreciation accounting methods, trend and variance analysis, cost-volume profit analysis - Financial planning and forecasting - Estimation of working capital requirement - Break even analysis - Visit to livestock business firms and banks - Preparing projects for financing.

Suggested Readings

Suggested Broad Topics for Master’s Research

Dairy cattle and buffalo Production
* Pre and postpartum management of dairy animals
* Reducing age at first calving
* Reducing calf mortality
* Reducing calving intervals
* Increasing reproductive efficiency
* Farming system research / extension approach
* System approach to livestock development
* Housing management of animals in semi arid region

Poultry Production
* Poultry housing system
* Stocking density in poultry
* Environmental effects on poultry
* Feeding management of poultry
* Methods of processing poultry manure
* System of approach for poultry development
Small ruminant production

* Sheep and goat housing system
* Impact study on scientific management of sheep and goat
* Environmental effects on sheep and goat
* Feeding management of sheep and goat

Rabbit production

& Rabbit housing system
& Feeding management of rabbit
& Productive and reproductive performance of rabbit under tropical climate

Swine production

* Swine housing system
* Feeding management of swine
* Productive and reproductive performance of pigs under tropical climate
## 12. LIVESTOCK PRODUCTS TECHNOLOGY

### Course Structure - at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
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<tbody>
<tr>
<td>LPT 601</td>
<td>FRESH MEAT TECHNOLOGY</td>
<td>1+1</td>
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<tr>
<td>LPT 602</td>
<td>MEAT PROCESSING, PACKAGING, QUALITY CONTROL AND MARKETING</td>
<td>2+1</td>
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<tr>
<td>LPT 603</td>
<td>POULTRY AND FISH PRODUCTS TECHNOLOGY</td>
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<tr>
<td>LPT 605</td>
<td>ABATTOIR AND POULTRY PROCESSING PLANT PRACTICES</td>
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<td>SLAUGHTER HOUSE BYPRODUCTS TECHNOLOGY</td>
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<td>LPT 607</td>
<td>PROCESSING AND MARKETING OF WOOL</td>
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<tr>
<td>LPT 608*</td>
<td>MARKET MILK PROCESSING AND DAIRY PLANT PRACTICES</td>
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<tr>
<td>LPT 609</td>
<td>QUALITY CONTROL OF MILK AND MILK PRODUCTS</td>
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<td>TECHNOLOGY OF MILK PRODUCTS</td>
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<tr>
<td>LPT 611</td>
<td>BIOTECHNOLOGY OF FOODS OF ANIMAL ORIGIN</td>
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<tr>
<td>LPT 612*</td>
<td>IN-PLANT TRAINING (NON CREDIT)</td>
<td>0+2</td>
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<tr>
<td>LPT 691</td>
<td>MASTER’S SEMINAR</td>
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<tr>
<td>LPT 699</td>
<td>MASTER’S RESEARCH</td>
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### Major Subjects

- Livestock Products and Technology

### Minor Subjects

- Veterinary Biochemistry, Veterinary Microbiology, Veterinary Public Health, Livestock Production and Management

**Note:** The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
LIVESTOCK PRODUCTS TECHNOLOGY

Course Contents

LPT 601  FRESH MEAT TECHNOLOGY  1+1

Objective
To impart knowledge about history, current status of meat industry, muscle composition, functions and sensory quality of meat. To educate on factors influencing quality of meat and nutritive value.

Theory
UNIT I
History and development of meat science and meat industry, current trends and prospects of meat industry-Structure and chemistry of animal tissues, muscle functions and postmortem changes- Rigor mortis – Effect of transport on meat quality – its veterinary and clinical importance – PSE and DFD in meat quality – Conversion of muscle to meat.

UNIT II

Practical

Suggested Readings

LPT 602  MEAT PROCESSING, PACKAGING, QUALITY  2+1

CONTROL AND MARKETING

Objective
To impart knowledge on preservations, methods, product development, quality control and packaging practices in meat.
Theory

UNIT I
Factors affecting fresh meat quality, ageing, basic principles of preservation, chilling, freezing, thermal processing, dehydration, irradiation and use of chemicals and antibiotics; meat curing and smoking.

UNIT II
Comminuted meat; preparation of various kinds of fresh and cooked meat products-Canning – Heat processing – Sausages – Ham, Bacon, Tandoori- Barbecuing of Poultry. Senses of taste and olfaction- factors influencing sensory measurements, physical and chemical properties related to sensory evaluation, types of sensory panels, discriminate and descriptive testing.

UNIT III
Meat adulteration and substitution – Different techniques for meat speciation – Agar gel immuno diffusion techniques – Démonstration of CIE, IEF, ELISA, PCR

UNIT IV
Principles of packaging- Product characteristics affecting packaging requirements; packaging material and their characteristics - different methods of packaging meat – Vacuum packaging – MAP – Retort pouch processing.

UNIT V
Marketing of meat, setting up of a meat retailing unit and other meat merchandising practices. MFPO, BIS Standards for meat products. National and international specifications and standards.

Practical
Proximate composition of meat, tyrosine value, nitrite content, TBARS value, peroxide value, Formulation of different meat products, emulsion stability, shear force value, cooking determinants, subjectice and objective method of sensory evaluations.

Suggested Readings

LPT 603  POULTRY AND FISH PRODUCTS TECHNOLOGY  2+1

Objective
To impart knowledge on structure, functional quality, microbiology, processing and preservation of poultry meat, eggs and fish.

Theory
UNIT I
History and development of poultry meat and egg processing industry. Different species of poultry and their production potentials- commonly occurring anti nutrients, and antibiotics in poultry feed ingredients and its
effect on egg and meat nutrition - Quality identification, quality maintenance, chemical, nutritional and microbiological quality of poultry meat. Preservation and packing techniques of shelled and liquid eggs. Quality identification of shell eggs and factors influencing the quality

UNIT II
Pre-slaughter care, transportation, resting, fasting, ante-mortem examination, methods of slaughter and slaughtering procedure-postmortem inspection-reasons for condemnation of carcass-yield and grading of dressed chicken,cut-up parts and de boned meat.

UNIT III
Structure, nutritive value, compositional chemistry, microbiology and functional properties of eggs. Low cholesterol eggs, GMP, HACCP procedures for food safety – Codex regulation for food products safety – WTO/GOI regulations for import and export of poultry products. National and international regulations, standards, quality control and marketing of fish and fish products, utilization of fish processing waste.

UNIT IV
Fishery resources, marine and fresh water fishes, transportation, processing, preservation, grading, standards. Quality control, labeling and marketing of fish and fish products, utilization of fish processing waste.

UNIT V
Post processing value added meat for export- Integration, poultry and fish processing and marketing-Storage, packaging and chilling, freezing, dehydration, canning, irradiation, curing, smoking, barbecuing, cooking and preparation of further processed poultry and fish products.

Practical
Organization, sanitation and maintenance of poultry processing plants. Slaughtering, ante-mortem and postmortem inspection, meat cutting, grading, production of ready to eat, smoked and cured poultry meatCommimitted and other poultry based convenient items. Visit to poultry processing plant/egg processing plant. Postmortem inspection, carcass yield and grading. Meat bone ratio, quality maintenance, tenderization water holding capascitiy. TBA values and preparation of further processed and freeze dried poultry products. Whole egg powder, shell meal processing plant waste meal-HACCP-egg powder processing plant. Grading of shelled eggs, liquid eggs, egg powder foaming property, pasteurization of liquid egg, testing microbial load in different foams of egg, visit of egg powder plant/egg processing plant poultry and fish products and its Proximate analysis, microbiological and sensory evaluation and poultry meat and fish.

Suggested Readings
Mountney GJ. Poultry Products Technology. 2nd Ed. AVI Publ.
LPT 604       EGG AND EGG PRODUCTS TECHNOLOGY       1+1

Objective
To impart knowledge about composition and marketing of eggs and nutritive value of eggs, preservation methods – quality maintenance, functional and value added egg product development, packaging and standards

Theory
UNIT I
Preservation and maintenance of quality of eggs- spoilage of egg and its prevention.-Preparation of fast foods.
UNIT II
UNIT III
Principles involved in preparation of egg powder and other egg products- Development of convenient egg based products- packaging of egg and egg products.
UNIT IV
Specifications, standards and marketing of egg and egg products-Quality control of egg products.

Practical
Evaluation of physical, chemical, functional and microbial quality of egg and egg products. Preservation of eggs- Preparation of dehydrated and convenient egg products- Visit to egg processing plant.

Suggested Readings

LPT 605 ABATTOIR AND POULTRY PROCESSING PLANT PRACTICES 1+1

Objective
Teaching about abattoir design, sanitation and basic slaughterhouse practices, effluent treatment and proper disposal of wastes.

Theory
UNIT I
Layout, designing – operation and maintenance of slaughter houses and processing plants-disposal of slaughter house effluents and different designs of effluent treatment plants - equipments, organization and Slaughter house, maintenance, record keeping and operation-sanitation of slaughterhouse-Sanitary practices in meat plant and its benefits; quality control.
UNIT II
Pre-slaughter judging, inspection, grading, pre-slaughter care, slaughter of meat animals; Humane slaughter – Principles and methods of stunning – Ritual slaughter of food animals and poultry – Machineries for slaughter and dressing- processing of different kinds of meat animals- Ante-mortem inspection and Post-mortem examination of animals. Disposal and
condemnation of unfit materials.

UNIT III
Carcass quality appraisal, judgement and their grading, meat cutting, measuring yields. Application of HACCP, GMP, ISO 9000, ISO 14000, ISO 22000, BIS Standards and any recent standards for meat and processing industries

Practical
Visit to slaughterhouse- Plan and outlay of modern abattoir- Procedure for slaughter of food animals and poultry - Ante- mortem and postmortem inspection, slaughtering, grading and meat cutting, carcass yield, meat bone ratio measurement of effluent characteristics: pH, BOD, COD, suspended solids etc.

Suggested Readings

LPT 606 SLAUGHTER HOUSE BYPRODUCTS TECHNOLOGY 2+1

Objective
To Impart knowledge on animal by-products, processing and industrial utilization.

Theory
UNIT I
Slaughterhouse byproducts industry in India and abroad – Importance of utilizing slaughterhouse offals – Rendering- Planning a by-product plant - Utilization of blood, bones, hooves, glands, intestines, feathers, glandular by-products and other minor by-products for industrial exploitation.

UNIT II
Meat fat characteristics - Preservation and Processing of ruminal contents – Ensiling of ruminal contents – Value products preparation from slaughterhouse by-products, processing of animal byproducts for pet foods.

UNIT III
Flaying - Classification and factors affecting quality of hides and skin-Physical and chemical characteristics of hide and skin- Processing of hide and skin for manufacture of leather- Preparation and quality control of gelatin and glue. Microscopic, physical and chemical characteristics of leather; testing and marketing of leather- Preservation and packaging practices of various kinds of hides and skin.

UNIT IV

Practical
Identification of quality defects in leather- preparation of sausage casing-blood meal, feather meal and meat meal. Demonstration of carcass meal – Meat meal – Bone meal - Preparation of animal casings – Grading of casings and wool – Preparation of slime meal – Collection and preservation of
glandular products – Preparation of pet foods - Visit to local by-products, processing units. Quality evaluation of rendered animal fat.

**Suggested Readings**

**LPT 607 PROCESSING AND MARKETING OF WOOL 2+1**

**Objective**
To impart knowledge on grading, manufacturing process, marketing and specifications of wool and specialty fibers- growth and structure of wool and fiber, their use.

**Theory**
- **UNIT I**
  Status and prospects of wool - Grading of wool. Faults and impurities in wool and their removal.
- **UNIT II**
  Wool types and their uses. Growth and molecular structure of wool fibre; physical and chemical properties of wool. Characteristics of hair fibres and their use, factors influencing quality of wool and hair fibres - Principles and steps involved in manufacturing processes of wool- specialty hair fibres.
- **UNIT III**
  Physical and chemical testing of wool. Proclaimed wool and secondary raw material - Marketing of wool, specification and regulation for quality control.

**Practical**
Visit to wool industry and acquaintance with various steps of manufacturing wool and its quality control, physical and chemical testing of wool. Characterization of wool, grading of wool.

**Suggested Readings**

**LPT 608 MARKET MILK PROCESSING AND DAIRY PLANT PRACTICES 2+1**

**Objective**
To impart knowledge about milk composition, legislation, milk processing techniques, cleaning and sanitation of dairy equipments.

**Theory**
- **UNIT I**
  Milk standards and legislation and related agencies.
- **UNIT II**
  Composition of milk, major and minor constituents of milk, physico-chemical, microbial and nutritional properties of milk and preservation of raw milk.
UNIT III

UNIT IV
Membrane processing and related techniques; application of ultrafiltration, reverse osmosis; nanofiltration and microfiltration in the dairy industry.

UNIT V
Current trends in cleaning and sanitization of dairy equipment, biological detergents, ultrasonic techniques in cleaning; biodetergents. Disposal of dairy effluents.

Practical

Suggested Readings

LPT 609 QUALITY CONTROL OF MILK AND MILK PRODUCTS 1+1
Objective
To impart knowledge about quality control, TQM, HACCP, SPS, CAC and legal standards.

Theory
UNIT I
Importance of quality control in dairy industry. PFA Act, BIS standards, AgMark standards and ISO standards of milk products.

UNIT II
Total quality management in processing of milk products – HACCP and SPS.

UNIT III
Types of microorganisms associated with milk and milk products-Milk borne diseases.

UNIT IV
Physico-chemical and microbial changes during procurement, processing and storage of milk and milk products.
UNIT V
Fundamental rules for sensory evaluation, Hedonic scale, score cards and their use for grading of milk and milk products.

Practical

Suggested Readings

LPT 610	TECHNOLOGY OF MILK PRODUCTS	2+1

Objective
To impart knowledge about techniques for preparation of different milk products.

Theory
UNIT I
Drying of milk and milk products; freeze dehydration, water activity; sorption behaviour of foods- dried ice cream mix – cream and butter powder.
UNIT II
Hurdle technology and its application in development of dairy products.
UNIT III
UNIT IV
Manufacturing of casein - caseinate- co-precipitates- Whey protein concentrate (WPC) - lactose- dairy whiteners; functional properties of whey proteins-casein- co-precipitates- Ultra Filtration retentate and their modifications.
UNIT V

Practical
Preparation of butter- paneer- channa- ghee- ice cream- cheese-cheddar-Mozzarella and cottage cheese- khoa- dahi- yoghurt- casein- caseinate-coprecipitate- determination of degree of browning chemical/physical methods; measurement of different functional properties of different milk products.

Suggested Readings
LPT 611 BIOTECHNOLOGY OF FOODS OF ANIMAL ORIGIN 1+1

Objective
To impart knowledge about new techniques of biotechnology for improving food value.

Theory
Role of Biotechnology in productivity of livestock, Meat Speciation and quality control. Use of Biotechnology in production of food additive. Use of biotechnological tools for the processing and preservation and foods of animal origin, use of biotechnology improved enzymes in food processing industry, consumer concerns about risks and values, biotechnology and food safety. Future of food biotechnology in India.

Practical
Introduction of basic biotechnological techniques such as western blotting, enzyme isolation and identification, DNA extraction, amplification, different types of PCR, Acquaintance with RT-PCR, Multiplex PCR, gene identification and characterization.

Suggested Readings
Selected articles from journals.

LPT 612 IN-PLANT TRAINING 0+2
(Non Credit: Satisfactory/Unsatisfactory)

Objective
To impart industrial exposure to post graduate students in meat, milk, poultry and fish industry.

Practical
APT students will undergo in-plant training in any one of the specialized area of Animal Products Technology for a period of three weeks in an institute in private/public sector industry. After completion of the training, the student will submit a training report. Evaluation will be based on viva-voce examination and a report submitted by student-Preparation of Project report.

Suggested Readings
Selected articles from journals.

Suggested Broad Topics for Master’s Research

- Development of shelf stable meat products
- Development of intermediate moisture meat products
- Application of active packaging for improving shelf life
- Development of low sodium meat products
- Development of low fat meat products
- Enrichment of meat with fiber
- Enrichment of meat with calcium
- Utilization of edible byproducts
- Utilization inedible byproducts
- Prevention of oxidative rancidity in meat products
- Development in processing of poultry meat.
- Recent advances in processing of egg and egg products.
- Recent advances in preservation and quality control of egg and egg products.
Development in packaging, regulations and standards of poultry meat.
Development in preservation and quality control of poultry meat.
Development of functional casinates for food industry
Development of phytoformula
Development of geriatric biofoods
Development of hydrolysed lactose milk drinks to lactose intolerants
Membrane utilization in indigenous dairy products
### 13. VETERINARY GYNAECOLOGY & OBSTETRICS

**Course Structure – at a Glance**

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
<th>CREDITS</th>
</tr>
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<tbody>
<tr>
<td>VGO 601</td>
<td>GENERAL GYNAECOLOGY</td>
<td>3+1</td>
</tr>
<tr>
<td>VGO 602</td>
<td>FEMALE INFERTILITY</td>
<td>3+1</td>
</tr>
<tr>
<td>VGO 603</td>
<td>VETERINARY OBSTETRICS</td>
<td>2+2</td>
</tr>
<tr>
<td>VGO 604</td>
<td>ANDROLOGY &amp; MALE INFERTILITY</td>
<td>3+1</td>
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<tr>
<td>VGO 605</td>
<td>SEMEN PRESERVATION AND ARTIFICIAL INSEMINATION</td>
<td>2+1</td>
</tr>
<tr>
<td>VGO 606</td>
<td>REPRODUCTIVE BIOTECHNOLOGY</td>
<td>2+1</td>
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<tr>
<td>VGO 607</td>
<td>CLINICAL PRACTICE I</td>
<td>0+3</td>
</tr>
<tr>
<td>VGO 608</td>
<td>CLINICAL PRACTICE II</td>
<td>0+3</td>
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<tr>
<td>VGO 691</td>
<td>MASTER’S SEMINAR</td>
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<tr>
<td>VGO 699</td>
<td>MASTER’S RESEARCH</td>
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<table>
<thead>
<tr>
<th>Major Subject</th>
<th>Minor Subjects*</th>
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<tbody>
<tr>
<td>Veterinary Gynaecology and Obstetrics</td>
<td>Veterinary Surgery &amp; Radiology, Veterinary Physiology, Veterinary Biochemistry, Veterinary Medicine, Animal Biotechnology, Veterinary Pharmacology &amp; Toxicology, Animal Nutrition</td>
</tr>
</tbody>
</table>

*The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
VETERINARY GYNAECOLOGY & OBSTETRICS

Course Contents

VGO 601 GENERAL GYNAECOLOGY  3+1

Objective

To understand hormonal regulation of female reproduction and therapeutic management of infertility.

Theory

UNIT I
Puberty and sexual maturity, role of hypothalamic-pituitary-gonadal axis in attainment of puberty and sexual maturity, onset of postpartum ovarian activity, Endocrine regulation of estrous cycle.

UNIT II
Folliculogenesis, oogenesis and ovulation and associated endocrine pattern, manipulation of follicular waves, synchronization of estrus and ovulation and induction of ovarian activity.

UNIT III
Gamete transport, fertilization, implantation and maternal recognition of pregnancy.

UNIT IV
Embryonic and fetal development, placentation, fetal circulation and gestation, position of fetus in the uterus, age characteristics of fetus.

UNIT V

UNIT VI
Factors affecting reproduction – seasonality, nutrition, stress, environment, management, suckling and diseases.

UNIT VII
Lactation and artificial induction of lactation.

Practical


Suggested Readings

Objective
To impart knowledge and training in diagnosis and treatment of infertility in female domestic animals.

Theory

UNIT I
Introduction to infertility, classification, economic impact. Anatomical causes of infertility, congenital and hereditary causes and acquired defects.

UNIT II
Nutritional causes of infertility. Importance of body condition score.

UNIT III
Managamental and environmental causes of infertility. Out of season breeding.

UNIT IV
Infectious causes of female infertility, specific and non-specific infections.

UNIT V
Ovarian dysfunction: anoestrus, cystic ovarian degeneration, anovulation, delayed ovulation and luteal insufficiency.

UNIT VI
Repeat breeding: its causes, diagnosis and treatment.

UNIT VII
Early embryonic death (EED): causes, diagnosis and therapeutic management.

UNIT VIII
Abortion: infectious and non-infectious causes, diagnosis and prevention of abortion.

UNIT IX
Interactions in Immunological mechanisms and infertility.

Practical

Suggested Readings


Objective
To impart knowledge and training on problems of pregnancy and parturition and their management in domestic animals.
Theory

UNIT I
Parturition: stages of parturition, mechanism of initiation of parturition, hormonal profiles associated with parturition.

UNIT II
Principles of handling of dystocia, obstetrical procedures: mutations, fetotomy, caesarean section. Obstetrical anesthesia and analgesia, epidural anesthesia.

UNIT III
Fetal and maternal dystocia: causes, diagnosis and management.

UNIT IV
Uterine torsion: causes, diagnosis and its correction.

UNIT V
Diseases and accidents during gestation and around parturition.

UNIT VI
Etiology, diagnosis and treatment of ante-partum and post-partum uterine and vaginal prolapse.

UNIT VII
Induction of parturition and elective termination of pregnancy.

UNIT VIII
Involution of uterus following normal and abnormal parturition.

UNIT IX
Care of dam and the newborn.

Practical

Suggested Readings


VGO 604 ANDROLOGY AND MALE INFERTILITY 3+1

Objective
To impart knowledge and training about male reproduction and treatment of male infertility in domestic animals.

Theory

UNIT I
Structure and function of reproductive tract of male.

UNIT II
Sexual behavior and examination of bulls for breeding soundness.

UNIT III
Spermatogenesis, (formation, migration, maturation and ejaculation of semen), fine structure of spermatozoa, semen and its composition.
UNIT IV
Diseases transmitted through semen.

UNIT V
Factors affecting semen quality, semen culture, tests for assessment of sperm motility, sperm survival and fertilizing capacity of spermatozoa.

UNIT VI

UNIT VII
Impotentia cocundi and impotentia generandi. Testicular hypoplasia and degeneration: causes and affect on semen and fertility.

UNIT VIII
Coital injuries and vices of male animals.

Practical

Suggested Readings

VGO 605 SEMEN PRESERVATION AND ARTIFICIAL INSEMINATION 2+1

Objective
To impart knowledge and training about collection, evaluation and preservation of semen and artificial insemination (AI) in domestic animals.

Theory
UNIT I
History of artificial insemination.
UNIT II
Methods of semen collection.
UNIT III
Semen evaluation: macroscopic, microscopic, biochemical and microbiological tests, Computer assisted semen analysis (CASA).
UNIT IV
Semen preservation. Extenders for preservation of semen at different temperatures. Semen additives for enhancement of motility and fertilizing capacity of spermatozoa.
UNIT V
Cryopreservation of semen. Effects of cryopreservation on spermatozoa, semen quality and fertility.

UNIT VI
Thawing protocols of frozen semen. Factors affecting post-thaw semen quality.

UNIT VII
Ideal protocol for AI in different species of animals. Factors affecting success of AI.

Practical

Suggested Readings

VGO 606 REPRODUCTIVE BIOTECHNOLOGY 2+1

Objective
To impart knowledge and training on biotechniques in animal reproduction.

Theory
UNIT I
Embryo transfer technology: selection of donors and recipients.

UNIT II
Synchronization, super-ovulation, surgical and non-surgical collection of embryos and evaluation of embryos.

UNIT III
Cryopreservation of embryos, transfer of embryos to donors.

UNIT IV

UNIT V
Sexing of sperm and embryos.

UNIT VI
Transgenic animals. Chimeras.

UNIT VII
Stem cell biotechnology

UNIT VIII
Immuno-neutralization of hormones. Immunomodulation of fertility.

Practical

Suggested Readings
VGO 607    CLINICAL PRACTICE - I    0+3
Objective
Hands-on training on diagnosis and treatment of reproductive disorders in animals in TVCSC.

Practical
Clinical examination of animals affected with reproductive disorders, use of diagnostic techniques for diagnosis and institution of required therapy. Maintenance of case records. Presentation on selected /assigned cases.

Suggested Readings

VGO 608    CLINICAL PRACTICE – II    0+3
Objective
Hands-on training on diagnosis and treatment of reproductive disorders in animals in TVCSC.

Practical
Clinical examination of animals affected with reproductive disorders, use of diagnostic techniques for diagnosis and institution of required therapy. Maintenance of case records. Presentation on selected /assigned cases.

Suggested Readings

Suggested Broad Topics for Master’s Research
* Anoestrus: Endocrinological investigations
* Reproductive biotechnology
* Investigations into andrological problems
* Management of obstetrical problems
### 14. VETERINARY MEDICINE

**Course Structure – at a Glance**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>VMD 601</td>
<td>Ruminant Clinical Medicine – I</td>
<td>2 + 1 = 3</td>
</tr>
<tr>
<td>2.</td>
<td>VMD 602</td>
<td>Canine and Feline Clinical Medicine</td>
<td>2 + 0 = 2</td>
</tr>
<tr>
<td>3.</td>
<td>VMD 603</td>
<td>Production and Deficiency Diseases of Livestock and Pet Animals</td>
<td>2 + 0 = 2</td>
</tr>
<tr>
<td>4.</td>
<td>VMD 604</td>
<td>Diseases of Domestic Animals caused by Toxicants</td>
<td>1 + 0 = 1</td>
</tr>
<tr>
<td>5.</td>
<td>VMD 605</td>
<td>Veterinary Emergency and Critical Care</td>
<td>1 + 1 = 2</td>
</tr>
<tr>
<td>6.</td>
<td>VMD 606</td>
<td>Infectious Diseases of Ruminants - I</td>
<td>2 + 1 = 3</td>
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<tr>
<td>7.</td>
<td>VMD 607</td>
<td>Infectious Diseases of Ruminants - II</td>
<td>2 + 1 = 3</td>
</tr>
<tr>
<td>8.</td>
<td>VMD 608</td>
<td>Canine Dermatology</td>
<td>2 + 0 = 2</td>
</tr>
<tr>
<td>9.</td>
<td>VMD 609</td>
<td>Avian Diseases</td>
<td>1 + 1 = 2</td>
</tr>
<tr>
<td>10.</td>
<td>VMD 610</td>
<td>Advances in Prevention and Control of Diseases in Pet Animals</td>
<td>1 + 1 = 2</td>
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<tr>
<td>11.</td>
<td>VMD 611</td>
<td>Clinical Practice – I</td>
<td>0 + 3 = 3</td>
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<tr>
<td>13.</td>
<td>VMD 612</td>
<td>Clinical Practice – II</td>
<td>0 + 3 = 3</td>
</tr>
<tr>
<td>14.</td>
<td>VMD 691</td>
<td>Masters’ Seminar</td>
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<tr>
<td>15.</td>
<td>VMD 699</td>
<td>Masters’ Research</td>
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#### List of Minor Subjects

<table>
<thead>
<tr>
<th>MAJOR SUBJECT</th>
<th>MINOR SUBJECTS</th>
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<tbody>
<tr>
<td>Veterinary Medicine</td>
<td>Veterinary Surgery and Radiology,</td>
</tr>
<tr>
<td></td>
<td>Veterinary Microbiology,</td>
</tr>
<tr>
<td></td>
<td>Veterinary Parasitology,</td>
</tr>
<tr>
<td></td>
<td>Veterinary Pathology,</td>
</tr>
<tr>
<td></td>
<td>Veterinary Pharmacology &amp; Toxicology</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>VMD 601</td>
<td><strong>Ruminant Clinical Medicine - I</strong></td>
</tr>
<tr>
<td>Theory:</td>
<td>Etio-pathogenesis, clinical manifestations, diagnosis, differential diagnosis, treatment and prevention of diseases of alimentary system, liver, respiratory system and cardiovascular system of farm animals.</td>
</tr>
<tr>
<td>Practicals:</td>
<td>General clinical examination of various organ systems of the body, physical methods of diagnosis - Palpation, percussion and auscultation of various body systems. Liver biopsy and other liver function tests, ECG and its interpretation, endoscopy, ultrasonography and echocardiography. Collection and laboratory examination of rumen liquor. Examination of various secretions and excretions for laboratory diagnosis and clinical case records.</td>
</tr>
<tr>
<td>VMD 602</td>
<td><strong>Canine and Feline Clinical Medicine</strong></td>
</tr>
<tr>
<td>Theory:</td>
<td>Diseases of digestive system, liver and pancreas, respiratory system, cardiovascular system, blood and blood-forming organs, diseases of the urinary and nervous systems.</td>
</tr>
<tr>
<td>VMD 603</td>
<td><strong>Production and Deficiency Diseases of Livestock and Pet animals</strong></td>
</tr>
<tr>
<td>Theory:</td>
<td>Metabolic profile testing in farm animals, etio-pathogenesis, clinical manifestations, diagnosis, differential diagnosis, treatment and prevention of parturient paresis, lactation tetany of mares, eclampsia of bitches, Downner’s cow, hypomagnesemic tetany, post-parturient haemoglobinuria, ketosis, fat cow syndrome, pregnancy toxaemia, osteodystrophia fibrosa, azoturia of equines, rheumatism-like syndrome in buffaloes, hypothyroidism, diabetes mellitus in dogs. Deficiency diseases caused by calcium, phosphorus, magnesium, iron, copper, cobalt, zinc, manganese, iodine, fat and water soluble vitamins.</td>
</tr>
<tr>
<td>VMD 604</td>
<td><strong>Diseases of Domestic Animals Caused by Toxicants</strong></td>
</tr>
<tr>
<td>Theory:</td>
<td>Management of diseases caused by various toxicants in domestic animals - physical agents and poisoning caused by farm chemicals, phytotoxins, mycotoxins and zootoxins. Management of diseases caused by poisonous plants, poisonous snakes and insect bites.</td>
</tr>
</tbody>
</table>
VMD 605  Veterinary Emergency and Critical care  1 + 1 = 2
Theory: Principles and techniques used in critical care patient - patient evaluation, diagnosis, emergency and critical care intervention. Detailed study on triage, fluid therapy, oxygen therapy and blood transfusion. Diagnosis and therapeutic management of various emergencies of cardiovascular, respiratory, gastrointestinal, urinary and nervous system and

VMD 606  Infectious Diseases of Ruminants - I  2 + 1 = 3
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.
Practicals: Collection, preservation and dispatch of clinical samples, (blood, urine faeces, biopsy or other body fluids etc) from diseased and healthy farm animal population for laboratory examination for bacteria, rickettsia and fungi. Various diagnostic tests and preventive measures against bacterial, rickettsial and fungal diseases of farm animals.

VMD 607  Infectious Diseases of Ruminants II  2 + 1 = 3
Theory: Incidence, etiology, epidemiology, pathogenesis transmission, clinical findings, clinical pathology, diagnosis, treatment, prevention and control of diseases caused by virus, protozoa including hemoprotezoan parasites and endoparasites in cattle, sheep and goats.
Practicals: Application of latest diagnostic and serological tests for establishing disease diagnosis, designing preventive and control measures against major diseases of Veterinary importance caused by viruses, helminth parasites and blood protozoa.
VMD 608  Canine Dermatology  2 + 0 = 2
Theory:  Structure and function of canine skin, fundamentals of dermatologic diagnosis, dermato-pharmacology, principles of treatment of dermatologic diseases, allergic diseases, parasitic, bacterial, fungal and rickettsial diseases, endocrinopathies (hypothyroidism, hyperadrenocorticism, growth hormone dependent syndromes), cutaneous neoplastic, cystic diseases and nutritional disorders.

VMD 609  Avian Diseases  1 + 1 = 2
Theory:  Incidence, etiology, epidemiology, pathogenesis transmission, clinical findings, clinical pathology, post-mortem lesions, treatment, prevention and control of important infectious diseases of poultry caused by bacteria, virus, rickettsia, protozoa, endoparasites, ectoparasites and fungi.

Practicals:  Visit to various poultry farms in and around Puducherry, vaccines and vaccination in poultry, diagnostic and screening tests, post-mortem examination of poultry, collection of material for isolation, antibiotic sensitivity assay, histopathology and demonstration of other routine diagnostic tests, sero-monitoring for important diseases.

VMD 610  Advances in Prevention and Control of Diseases in Pet animals  1 +1 = 2
Theory:  Bacterial, viral, fungal, blood protozoan, rickettsial and parasitic diseases of importance in pet animals.

Practicals:  Latest diagnostic and serological tests for establishing disease diagnosis, designing preventive and control measures against major diseases of pet animals caused by bacteria, viruses, fungi, rickettsiae, parasites and protozoa.

VMD 611  Clinical Practice – I  0 + 3 = 3
Application of the theoretical concepts in practice, Diagnostic procedures in Veterinary practice, therapeutic protocol application, specimen collection, examination and management of sick farm and companion animals. Note: This course shall be conducted at TVCC (College Clinics), where students shall participate in diagnosis and treatment of diseased animals.
VMD 612  Clinical Practice – II  \[0 + 3 = 3\]
Application of the theoretical concepts in practice. Diagnostic procedures in Veterinary practice, and therapeutic protocol application, specimen collection, examination and management of sick farm and companion animals. Note: This course shall be conducted in TVCC (College Clinics), where students shall participate in diagnosis and treatment of diseased animals.

VMD 691  Masters’ Seminar \[1 + 0 = 1\]

VMD 699  Research  \[20\text{ credits}\]

REFERENCES


***************
## 15. VETERINARY SURGERY AND RADIOLOGY

### Course Structure – at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
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<tbody>
<tr>
<td>VSR 601</td>
<td>PRINCIPLES OF SURGERY</td>
<td>2+0</td>
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<tr>
<td>VSR 602</td>
<td>CLINICAL PRACTICE – I</td>
<td>0+3</td>
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<tr>
<td>VSR 603</td>
<td>CLINICAL PRACTICE – II</td>
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<tr>
<td>VSR 604</td>
<td>SMALL ANIMAL ANAESTHESIA</td>
<td>2+1</td>
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<tr>
<td>VSR 605</td>
<td>LARGE ANIMAL ANAESTHESIA</td>
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<tr>
<td>VSR 606</td>
<td>DIAGNOSTIC IMAGING TECHNIQUES</td>
<td>2+1</td>
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<tr>
<td>VSR 607</td>
<td>VETERINARY OPHTHALMOLOGY AND DENTISTRY</td>
<td>1+1</td>
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<tr>
<td>VSR 608</td>
<td>SMALL ANIMAL SOFT TISSUE SURGERY</td>
<td>2+1</td>
</tr>
<tr>
<td>VSR 609</td>
<td>LARGE ANIMAL SOFT TISSUE SURGERY</td>
<td>2+1</td>
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<tr>
<td>VSR 610</td>
<td>ORTHOPAEDIC AND LIMB SURGERY</td>
<td>2+1</td>
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<tr>
<td>VSR 691</td>
<td>MASTER’S SEMINAR</td>
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<tr>
<td>VSR 699</td>
<td>MASTER’S RESEARCH</td>
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</table>

### Major Subject

- Veterinary Surgery and Radiology

### Minor Subjects*

- Veterinary Anatomy, Veterinary Medicine, Veterinary Pharmacology & Toxicology, Veterinary Physiology, Veterinary Pathology, Veterinary Gynaecology and Obstetrics

*The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the department and Dean post graduate studies.
VETERINARY SURGERY AND RADIOLOGY

Course Contents

VSR 601 PRINCIPLES OF SURGERY 2+0

Objective
To impart the basic knowledge of principles of surgery.

Theory
UNIT I
Wound healing, current concepts of inflammation and management, wound infections, antimicrobial therapy, principles of surgical asepsis, sterilization and disinfection.

UNIT II

UNIT III

UNIT IV
Operating room emergencies, cardio-pulmonary embarrassment and resuscitation, monitoring of surgical patient.

UNIT V
Principles of laser surgery, cryosurgery, electrosurgery, lithotripsy and endoscopy, physiotherapy, stem cell therapy etc.

Suggested Readings

VSR 602 CLINICAL PRACTICE – I 0+3

Objective
To impart practical training in anaesthesia, diagnostic imaging techniques and surgery.

Practical
Client management, public relations, code of conduct, management of surgical affections, designing of surgical hospital, hospital management, database management, attending surgical cases, surgical facilities, equipments, disaster management.

Suggested Readings

VSR 603 CLINICAL PRACTICE – II 0+3

Objective
To impart practical training in surgery, anaesthesia and diagnostic imaging techniques.
Practical
Client management, animal welfare and rehabilitation, public relations, code of conduct, management of surgical affections, designing of surgical hospital, hospital management, database management, attending surgical cases, surgical facilities, equipments and personnel, disaster management.

Suggested Readings

VSR 604 SMALL ANIMAL ANAESTHESIA 2+1
Objective
To impart the basic and practical knowledge of principles of companion animal anaesthesia.

Theory
UNIT I
General considerations for anaesthesia, peri-operative and post-operative pain and its management.
UNIT II
Sedation: analgesia and pre-medication, anaesthetic agents (injectable anaesthetics, dissociative anaesthetics, inhalation anaesthetics), muscle relaxants, neuromuscular blocking agents and local analgesia.
UNIT III
Anaesthetic techniques, anaesthetic equipments, artificial ventilation.
UNIT IV
Anaesthesia of small animals, pediatric and geriatric patients, birds.
UNIT V
Monitoring of anaesthesia, anaesthetic emergencies, complications and their management, euthanasia.

Practical
Anaesthetic equipments and instrumentation, artificial ventilation, use of various preanaesthetic and anaesthetic agents in small animals, anaesthetic triad, balanced anaesthesia, total intravenous anaesthesia.

Suggested Readings
Thurmon JC, Tranquilli WJ & Benson JG. (Eds.). 1996. Lumb and Jone’s Veterinary Anaesthesia. Williams & Wilkins.

VSR 605 LARGE ANIMAL ANAESTHESIA 2+1
Objective
To impart the basic and practical knowledge of principles of farm animal anaesthesia and mechanism of pain.
Theory

UNIT I
General considerations for anaesthesia, peri-operative pain, and post-operative pain and its management.

UNIT II
Pre-anaesthetic and anaesthetic adjuncts, injectable anaesthetics, dissociative anaesthetics, inhalation anaesthetics.

UNIT III
Local anaesthetics, neuromuscular blocking agents.

UNIT IV
Anaesthetic techniques, anaesthetic machines, breathing systems, artificial ventilation.

UNIT V
Monitoring of anaesthesia, anaesthetic emergencies and complications, anaesthesia of pediatric and geriatric patients, euthanasia.

Practical
Anaesthetic equipments and instrumentation, artificial ventilation, use of various preanaesthetic and anaesthetic agents in large animals, anaesthetic triad, balanced anaesthesia, total intravenous anaesthesia.

Suggested Readings
Thurmon JC, Tranquilli WJ & Benson JG. (Eds.). 1996. Lumb and Jone’s Veterinary Anaesthesia. Williams & Wilkins.

VSR 606

DIAGNOSTIC IMAGING TECHNIQUES 2+1

Objective
To impart the basic and practical knowledge of principles of diagnostic imaging techniques and interpretation of radiographs, ultrasonograph/CT/MRI and other imaging techniques.

Theory

UNIT I
Conventional and digital X-ray machine, quality of radiation, formation of radiograph technique chart, artifacts and their prevention, special diagnostic radiographic procedures, radiographic quality, radiographic accessories, differentiation of radiographic densities in relation to clinical diagnosis.

UNIT II
Principles of radiographic interpretation, plain and contrast radiographic techniques of small and large animals, image intensification.

UNIT III
Principles of radiation therapy, medical radioisotope curves, radiation laws and regulations.

UNIT IV
Principles of ultrasound, basic physics, transducers, equipment controls, display models, terminology of echotexture and artifacts, application of ultrasound in small and large animals.
UNIT V
Doppler techniques echocardiography and its application, introduction to MRI, CT scan, nuclear medicine, xeroradiography, positron emission tomography technique and other imaging techniques.

UNIT VI
Electromagnetic radiations, hazards of electromagnetic radiations and protection and bio-safety.

Practical
Acquaintance with imaging equipments, dark room processing techniques and X-ray film handling, formulation of technique chart with fixed kVp and variable mAs, basics of radiographic interpretation of diseases, computer aided image acquisition and retrieval, radiographic positioning of different regions in domestic animals, angiography, cardiac catheterization and other contrast radiographic techniques of different types, interpretation of ultrasonographs, MRI, CT scans etc.

Suggested Readings
Goddard PJ. (Ed.). 1995. Veterinary Ultrasonography. CABI.

VSR 607 VETERINARY OPHTHALMOLOGY AND DENTISTRY 1+1

Objective
To impart the basic and practical knowledge of diagnosis and treatment of diseases of eye and teeth in domestic animals.

Theory
UNIT I
General Anatomical and physiological considerations for ophthalmic surgery.

UNIT II
Ophthalmic examination and diagnosis, local anaesthesia of eye, ocular therapeutics, diagnostic instruments.

UNIT III
General consideration for eye surgery, diseases and surgery of eye lids, lacrimal apparatus, naso-lacrimal duct.

UNIT IV
Diseases of conjuctiva, cornea, sclera, iris, orbit, lens, vitreous and aqueous humor, retina and optic nerve.

UNIT V
Ocular manifestation of systemic diseases.
UNIT VI

Practical
Ophthalmic instrumentation, examination of the eye and its adnexa, preparation of patient for eye anaesthesia and surgery, canthotomography, tarsorrhaphy, transplantation of cornea, keratoplasty, anterior chamber paracentesis, flushing of naso-lacrimal duct, iridectomy, lens extraction/implantation. Dentistry instrumentation, dental radiography, teeth cleaning, tooth extraction.

Suggested Readings
Tyagi RPS & Singh J. (Eds.). 1993. Ruminant Surgery. CBS.

VSR 608 SMALL ANIMAL SOFT TISSUE SURGERY 2+1

Objective
To familiarize with various surgical affections of different body systems and their treatment in small animals.

Theory
UNIT I
Skin and adnexa- the integument, management of skin wounds, principles of plastic and reconstructive surgery, pedicle grafts, skin grafts, burns, electrical chemical and cold injuries.

UNIT II
Surgical approaches/ affections of ear, oral cavity and pharynx, abdomen, thorax, the salivary glands, oesophagus, stomach, intestines, rectum and anus, liver and biliary system, pancreas.

UNIT III
Hernias - abdominal hernia, diaphragmatic hernia, perineal hernia, inguinal, scrotal, and umbilical hernia etc. Surgical approaches to thoracic wall, Pleura.

UNIT IV
Respiratory system- functional anatomy, diseases of upper respiratory system and lower respiratory system.
UNIT V
Surgical anatomy of the cardiovascular system, cardiovascular physiology, diagnostic methods, cardiac disorders, principles of vascular surgery, basic cardiac procedures, hypothermia, basic peripheral vascular procedures, peripheral vascular disorders, portacaval shunts and anomalies. Haemolymphatic system, bone marrow, spleen, tonsils, lymph nodes and lymphatics, thymus.

UNIT VI
Male reproductive system- anatomy of the male genital organs, diagnostic and biopsy techniques, surgical affections of male genital organs; female reproductive system- anatomy, diagnostic techniques, surgical affections of female genital organs.

UNIT VII
Urinary system- anatomy of the urinary tract, principles of urinary tract surgery, kidneys, ureters, surgery of the bladder, surgical diseases of the urethra, medical dissolution and prevention of canine uroliths, feline urologic syndrome.

UNIT VIII
Endocrine system- pituitary, adrenals, thyroid, parathyroid, surgical affections of mammary glands and tail. Surgical affections of nervous system, special sense organs.

Practical
Practice of various surgical techniques of skin and adnexa, alimentary system, hernias, respiratory system, cardiovascular system, male and female reproductive system, urinary system, mammary glands and tail.

Suggested Readings

VSR 609 LARGE ANIMAL SOFT TISSUE SURGERY 2+1

Objective
To familiarize with various surgical affections of different body systems and their treatment in large animals.

Theory
UNIT I
Abdominal wall, integumentary system - skin and appendages; mammary gland, tail, affections of oral cavity.

UNIT II
Surgical affections of respiratory system, cardiovascular and lymphatic system.

UNIT III
Surgical affections of digestive system, urinary and genital system.

UNIT IV
Surgical affections of nervous system, special sense organs.

Practical
Practice of various surgical techniques of skin, alimentary system, hernias, respiratory system, cardiovascular system, male and female reproductive system, urinary system, mammary glands and tail. Surgical affections of nervous system, special sense organs.
Suggested Readings
Tyagi RPS & Singh J. (Eds.). 1993. Ruminant Surgery. CBS.

VSR 610 ORTHOPAEDICS AND LIMB SURGERY 2+1

Objective
To familiarize with various affections of bones, joints, tendons, ligaments and foot as well as their treatment in animals.

Theory
UNIT I
Fractures and dislocations, fracture healing, ligaments and tendons - repair techniques.
UNIT II
Treatment of fractures of different bones in domestic animals, bone diseases.
UNIT III
Various affections of the joints, their diagnosis and treatment.
UNIT IV
Conformation of the limb, anatomy of hoof.
UNIT V
Lameness and allied surgical conditions of fore limbs/hind limbs, rehabilitation of orthopaedic patient.

Practical
Internal and external fixation of fractures and dislocation, arthrotomy, tenotomy, examination of limbs for lameness, nerve blocks, injections in joints, operations for arthritis, hoof surgery and corrective shoeing, physiotherapy. Instrumentation, neurological examination, imaging the spine; skull and brain, surgical approach to the cervical spine; thoracolumbar spine and brain.

Suggested Readings
Tyagi RPS & Singh J. (Eds.). 1993. Ruminant Surgery. CBS.

Suggested Broad Topics for Master’s Research
* Evaluation of preanaesthetics and anaesthetics in domestic animals
* Management of pain in animals
* Surgical Management of gastrointestinal tract disorders in bovines
* Management of fractures in animals
* Ultrasonography of soft organs of large and small animals
# VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION

## Course Structure – at a Glance

<table>
<thead>
<tr>
<th>CODE</th>
<th>COURSE TITLE</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>AHE 601</td>
<td>FUNDAMENTALS OF VETERINARY AND ANIMAL HUSBANDRY EXTENSION</td>
<td>2+1</td>
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<tr>
<td>AHE 602</td>
<td>COMMUNICATION FOR LIVESTOCK DEVELOPMENT</td>
<td>1+1</td>
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<tr>
<td>AHE 603</td>
<td>DIFFUSION AND ADOPTION OF ANIMAL HUSBANDRY PRACTICES</td>
<td>2+1</td>
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<tr>
<td>AHE 604</td>
<td>EXTENSION TECHNIQUES AND AUDIO VISUAL AIDS</td>
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<tr>
<td>AHE 605</td>
<td>ANIMAL HUSBANDRY PROGRAMME PLANNING AND EVALUATION</td>
<td>2+1</td>
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<tr>
<td>AHE 606</td>
<td>RESEARCH METHODOLOGY IN VETERINARY AND ANIMAL HUSBANDRY EXTENSION</td>
<td>2+1</td>
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<tr>
<td>AHE 607</td>
<td>SOCIAL PSYCHOLOGY AND GROUP DYNAMICS</td>
<td>2+1</td>
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<tr>
<td>AHE 608</td>
<td>ANIMAL HUSBANDRY DEVELOPMENT PROGRAMMES</td>
<td>1+0</td>
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<tr>
<td>AHE 609</td>
<td>DEVELOPMENTS IN THE CONCEPT OF EXTENSION</td>
<td>1+0</td>
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<tr>
<td>AHE 610</td>
<td>HUMAN RESOURCE MANAGEMENT IN ANIMAL HUSBANDRY SECTOR</td>
<td>2+1</td>
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<tr>
<td>AHE 611</td>
<td>GENDER AND LIVESTOCK DEVELOPMENT</td>
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<tr>
<td>AHE 612</td>
<td>INFORMATION AND COMMUNICATION TECHNOLOGY IN LIVESTOCK DEVELOPMENT</td>
<td>1+1</td>
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<tr>
<td>AHE 691</td>
<td>MASTER’S SEMINAR</td>
<td>1+0</td>
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<tr>
<td>AHE 699</td>
<td>MASTER’S RESEARCH</td>
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</table>

**Major Subject**

Veterinary and Animal Husbandry Extension

**Minor Subjects***


* The choice of minor courses other than those listed above, may be allowed on the recommendations of advisory committee, if essentially required as per the research problem, with the concurrence of Head of the Department and Dean, Post Graduate Studies.
VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION

Course Contents

AHE 601  FUNDAMENTALS OF VETERINARY AND ANIMAL HUSBANDRY EXTENSION  2+1

Objective
To acquaint the students with the genesis, development and present status of animal husbandry extension and linkages among departments and various institutions.

Theory
UNIT I
Concept, philosophy, principles, genesis, growth and scope of extension education.
UNIT II
Earlier extension efforts and their implications. Emerging issues, problems and challenges of animal husbandry extension education.
UNIT III
Extension approaches of State and Central Governments, ICAR, SVUs/SAUs, NGOs and other organizations in delivery of animal husbandry and veterinary services.
UNIT IV
Linkages between researcher-extension agent - livestock farmer-industry in the generation, dissemination and utilization of animal husbandry practices.

Practical
Study of the organizational set-up and functioning of State Animal Husbandry Department and dairy/rural development agencies. Study of indigenous technical know-how about animal husbandry practices in villages.

Suggested Readings

Mosher AT. 1978. An Introduction to Agricultural Extension. ADC.
AHE 602 COMMUNICATION FOR LIVESTOCK DEVELOPMENT 1+1

Objective
To acquaint the students with concept and models of communication and to improve their communication skills.

Theory
UNIT I
Communication - meaning, concept, purpose and process.

UNIT II
Models and theories of communication. Types of communication - intrapersonal, interpersonal, verbal and non-verbal. Criteria of effective communication. Determinants of communication - Empathy, credibility, fidelity, distortion, feedback and barriers to communication.

UNIT III
Group and mass communication. Modern communication technologies. Key communicators and their role in animal husbandry development.

Practical

Suggested Readings


AHE 603 DIFFUSION AND ADOPTION OF ANIMAL 2+1 HUSBANDRY PRACTICES

Objective
To sensitize the students towards technology generation, dissemination and its adoption through effective communication.

Theory
UNIT I
UNIT II

UNIT III
Role of change agents in transfer of technology. Diffusion studies in veterinary extension. Role of communication in diffusion and adoption process.

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

Suggested Readings

AHE 604 EXTENSION TECHNIQUES AND AUDIO VISUAL AIDS 2+1

Objective
To train the students about various techniques/methods for transfer of animal husbandry technologies through suitable audio-visual aids.

Theory
UNIT I

UNIT II
Extension approaches in livestock development– individual, group and mass approach (electronic and non electronic). Relative merits and demerits of different teaching methods in animal husbandry extension.

UNIT III
Audio-visual aids– classification, use and evaluation. Selection criteria of audio-visual aids.

UNIT IV
Multi-media projection and computer aided teaching aids for animal husbandry extension.

UNIT V
Selection of different extension methods for dissemination of animal husbandry technologies and media-mix.

Practical
Preparation and presentation of various audio-visual aids. Use of different teaching methods in field situations. Review of research studies in teaching methods and A.V. aids.
AHE 605
ANIMAL HUSBANDRY PROGRAMME
2+1
PLANNING AND EVALUATION

Objective
To expose the students on planning, formulation, implementation and evaluation of various animal husbandry development programmes.

Theory

UNIT I
Importance of programme planning in veterinary and animal husbandry extension. Objectives, principles and steps in programme planning process. Role of animal husbandry extension agencies, local leaders, livestock owners and institutions in planning and implementation of need-based veterinary extension programmes.

UNIT II
Genesis, nature and principles of planning. Planning Commission and its role. Five Year Plans with reference to animal husbandry development. Organizational structure for planning at different levels.

UNIT III
Concept, principles, types and methods of evaluation. Importance of monitoring various livestock development programmes.

UNIT IV
Needs assessment— meaning, importance, classification and steps. Concept of FSR, Participatory Approaches- Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA)

UNIT V

Practical
Preparation of livestock development plan for a village. Developing instruments for monitoring and evaluation of on-going development programme at village level (Logical Frame Work ). Exercises on Participatory approaches (RRA,PRA, Case study, Problem Based Learning).

Suggested Readings


AHE 606

RESPESCHETH BOETHOETH IN VETERINARY 2+1

AND ANIMAL HUSBANDRY EXTENSION

**Objective**

To apprise the students about the selection criteria of research problem, variables, research design, sampling techniques, data collection procedure and report writing in the field of animal husbandry extension.

**Theory**

**UNIT I**

Concept, nature and scope of research in social sciences. Types of research—fundamental, applied and action research, experimental and non-experimental research. Variables, types and their measurement. Selection and formulation of research problem. Hypothesis—importance, selection criteria (quality of workable hypothesis), formulation and testing of hypothesis.

**UNIT II**

Measurement and levels of measurement; Research designs—exploratory, experimental, and ex-post-facto research design. Action research. Sampling methods—probability and non-probability sampling. Sources of errors.

**UNIT III**


**UNIT IV**


**Practical**

Selecting a research problem and working it out with all the steps; report writing and presentation of the report.

**Suggested Readings**


AHE 607
SOCIAL PSYCHOLOGY AND GROUP DYNAMICS 2+1

Objective
To acquaint the students with the structure and functioning of social groups and socio-psychological aspects in interacting with livestock farmers.

Theory
UNIT I
Meaning, scope and importance of psychology in animal husbandry extension work. Orientation of psychology.

UNIT II
Perception- nature, laws and selectivity in perception, factors in perception, importance of perception in extension work. Attitude- nature, theories, measurement and change of attitude towards livestock owners, formation of stereo types and prejudice, factors in attitude change.

UNIT III

UNIT IV
Intelligence- nature, theories and measurement. Personality- nature, traits, types, biological and socio-cultural determinants of personality. Group and individual behaviour.

UNIT V
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.

Practical
Study of structure and functioning of selected Self Help Groups (SHGs), factors influencing the success/ failure of SHGs, Milk Cooperative Societies.

Suggested Readings
AHE 608  ANIMAL HUSBANDRY DEVELOPMENT PROGRAMMES 1+0

Objective
To make the students aware of livestock development programmes launched by various agencies.

Theory
UNIT I
Concept of development, social and economic development; Historical overview on Rural Development in India

UNIT II
Ongoing Animal Husbandry Development Programmes - NPCBB, PM assistance livestock development programme, rural development programmes with special reference to livestock- SGSY, EGS

UNIT III

UNIT IV
Understanding the functioning of livestock development institutions - DRDA, NABARD, Insurance Companies, NGOs.

Suggested Readings


AHE 609  DEVELOPMENTS IN THE CONCEPT OF EXTENSION  1+0

Objective
To acquaint the students with the recent development in extension.

Theory
UNIT I
Important concepts in extension science; various schools of thought; Systems concept in extension.

UNIT II
Changing approaches – Farmer participatory approaches; Global concepts of extension as applied to Indian Context.
UNIT III

UNIT IV
Various stake holders in Livestock development; stakeholder analysis, problem tree

Suggested Readings

AHE 610 HUMAN RESOURCE MANAGEMENT IN ANIMAL HUSBANDRY SECTOR 2+1

Objective
To expose the students in human resource management techniques and dealing with the hierarchical and organizational problems.

Theory
UNIT I

UNIT II
Training— models, methods, identification of training needs, training evaluation and developing strategies for human resource development in animal husbandry sector.

UNIT III
Supervision- meaning, process and techniques. Work motivation. job efficiency and job satisfaction.

UNIT IV
Organizational communication. Organizational climate. Conflict management.

UNIT V
Personnel management in animal husbandry organizations and disaster management.

Practical
Training needs assessment, development of training module, organization, evaluation of a training programme

Suggested Readings
AHE 611 GENDER AND LIVESTOCK DEVELOPMENT

Objective
To acquaint the students with the concept of gender, its importance in livestock development, livestock development polices and programmes of the government to empower women.

Theory

UNIT I

UNIT II
Policies and programmes in livestock for empowering women, Composition of livestock sector- dairying and poultry sector, Women entrepreneurship in livestock, Institutional structure in livestock production, processing and marketing- co-operatives, contract farming and SHGs, Case studies- success and failures- from the state, country and other countries.

UNIT III

Suggested readings
Objective
To apprise the students about information system, networking and use of various ICT tools.

Theory
UNIT I
ICT – concept, importance and types of tools; Development and application of ICT tools including information kiosks, E-learning

UNIT II
Concept of information system and networking, component of information system, information resources, sharing and networking. Types of network – PAN, LAN, WAN, Internet, AGRINET, AKIS, Indian National Agricultural Research database.

UNIT III
ICT programmes in livestock development, Problems and prospects of ICTs in livestock development, Digitisation, Simulation models.

Practical
Study of various ICT tools in livestock development.

Suggested Readings

Suggested Broad Topics for Master’s Research
* Veterinary Education
* Training
* Communication and development
* Diffusion and adoption
* Management and entrepreneurship
* Livestock economics
* Evaluation of animal husbandry programmes
COMPULSORY NON-CREDIT COURSES
(Compulsory for Master’s programme in all disciplines; Optional for Ph.D. scholars)

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<tr>
<th>CODE</th>
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<tr>
<td>PGS 501</td>
<td>LIBRARY AND INFORMATION SERVICES</td>
<td>0+1</td>
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<tr>
<td>PGS 502</td>
<td>TECHNICAL WRITING AND COMMUNICATIONS SKILLS</td>
<td>0+1</td>
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<td>PGS 503</td>
<td>INTELLECTUAL PROPERTY AND ITS MANAGEMENT</td>
<td>1+0</td>
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<td>(e-Course)</td>
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<td>PGS 506</td>
<td>DISASTER MANAGEMENT</td>
<td>1+0</td>
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Course Contents

PGS 501 LIBRARY AND INFORMATION SERVICES 0+1

Objective
To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines etc.) of information search.

Practical
Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information- Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-resources access methods.

PGS 502 TECHNICAL WRITING AND COMMUNICATIONS SKILLS 0+1

Objective
To equip the students/scholars with skills to write dissertations, research papers, etc.
To equip the students/scholars with skills to communicate and articulate in English (verbal as well as writing).

Practical
Technical Writing - Various forms of scientific writings- theses, technical papers, reviews, manuals, etc; Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion); Writing of abstracts, summaries, précis, citations etc.; commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations; Writing of numbers and dates in scientific write-ups; Editing and proof-reading; Writing of a review article.
Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks); Error analysis (Common errors); Concord; Collocation; Phonetic symbols and transcription; Accentual pattern: Weak forms in connected speech; Participation in group discussion: Facing an interview; presentation of scientific papers.

Suggested Readings


PGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT
(e-Course)

Objective

The main objective of this course is to equip students and stakeholders with knowledge of intellectual property rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy.

Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of animal varieties and farmers’ rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

**Objectives**

To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

**Theory**

**UNIT I**

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion

**UNIT II**

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

**UNIT III**

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

**Suggested Readings**


