# CURRICULUM

Technical School Leaving Certificate

In

# Veterinary Science

(Post-SLC intake)

Council for Technical Education and Vocational Training

## Curriculum Development Division

Sanothimi, Bhaktapur

2013

**Table of contents**

## 1. Introduction

This course is designed to produce lower level technical human resources in the field of veterinary science equipped with knowledge and skills necessary for Veterinary JTA so as to meet the demand of such technicians in the country.

## 2. Aim

The aim of the programme is to produce veterinary Junior Technical Assistant (JTA) who will provide veterinary clinical services and some livestock extension services to the livestock community being either wage or self employed in the country or abroad.

## 3. Objectives

After completing this curricular program, the students will be able:

- To extend skills and knowledge of veterinary science (medicine) to the livestock farming communities in order to contribute in community development as well as entrepreneurship development.
- To provide suggestion about animal nutrition and fodder production to the livestock farmers
- To facilitate farmers for scientific production of livestock / livestock products
- To make farmers conscious about veterinary epidemiological hazards and its impact on public health and related precautions to be taken
- To diagnose/treat/manage diseases/disorders of livestock and poultry
- To provide disease treatment/management services to the livestock farming communities
- To handle simple surgical cases
- To handle simple gynaecological cases and cases of obstetrics

## 4. Programme Description

This program consists of the subjects like veterinary extension and communication; veterinary anatomy and physiology; animal nutrition and fodder production; veterinary epidemiology and public health; animal husbandry and entrepreneurship development; Veterinary medicine; veterinary laboratory technology; general veterinary pharmacology; and theriogenology and basic surgery with skills and knowledge necessary for a veterinary JTA.

It also includes three month's *"on the job training (OJT) program"* with a view to provide opportunity, to the students, to be familiar with and gain actual work experience of their future world of work/profession.

## 5. Target group

The target group for this program will be all the interested individuals with academic qualification of SLC pass.

## 6. Target location

The target location of this program will be all over Nepal.

## 7. Group size

The group size of this training program will be not more than 40.

## 8. Entry criteria

Individuals who meet the following criteria will be allowed to enter into this program:

- Should have passed ~~SLC~~
- Should pass entrance examination administered by CTEVT
- Final selection will be made on the basis of merit list.
- Candidates should submit the following documents at the time of application
  - SLC pass mark sheet
  - Character certificate
  - Citizenship certificate (for the name, parents' name, age, date of birth and address verification purpose only)
- Special quota for different category of students will be as per the policy of CTEVT
- Preference will be given to female, Dalit, Janjati, Conflict affected people and Disadvantaged Groups (DAGs)

## 9. Medium of Instruction

The medium of instruction will be in English and/or Nepali language.

## 10. Course Duration

The duration will be of one year (39 weeks/ 1560 hours) plus 3 months (on-the-job training).

## 11. Pattern of Attendance

The students should have at least 80% attendance in theory classes and 90% in practical/ performance to be eligible for internal assessments and final examinations.

## 12. Teacher and Student Ratio

- Overall ratio of teacher and student must be 1:10 (at the institution level).
- Teacher and students ratio for theory class should be as per nature of classroom
- Teacher and student ratio for practical should be 1:10
- Minimum 75% of the teachers must be fulltime.

## 13. Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- Printed Media Materials (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- Non-projected Media Materials (Display, Models, Photographs, Flip chart, Poster, Writing board etc.).
- Projected Media Materials (Opaque projections, Overhead transparencies, Slides etc.).

- Audio-Visual Materials (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes, Multimedia etc.).
- Computer-Based Instructional Materials (Computer-based training, Interactive video etc.)

## 14. Teaching Learning Methodologies

The methods of teaching for this curricular program will be a combination of several approaches. Such as Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Laboratory observation, Field visit, Report writing, Term paper presentation, Case analysis, Tutoring, Role-playing, and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work.
- Practical: Demonstration, Observation and Self-practice.
- On the Job Training

## 15. Evaluation Details

- Continuous evaluation of the students' performance is to be done by the related instructor/ trainer to ensure the proficiency over each competency under each area of a subject specified in the curriculum.
- Related technical knowledge learnt by students will be evaluated through written tests.
- Students must score a minimum of 40% marks in theory test and 60% in practical test in all subjects.
- There will be at least three internal assessments and one final examination in each subject. Moreover, the mode of an assessment and an examination will include both theory and practical or as per the nature of instruction as mentioned in the course structure.
- Students should pass internal assessments both in theory and practical tests in all subjects for attending final examination.
- The ratio between the theory and practical tests will be 20:80 in all subjects.
- Out of 100%, 50% weightage is allotted for the internal assessments and the remaining is allotted for the final examination
- On-the-job training has to be evaluated keeping 300 as full marks. The evaluation of the performance of the student is to be carried out by three agencies with equal marks; 1.Concerned institute 2. Industry/organization where the student worked and the 3. CTEVT unless otherwise directed by Technical Division of the CTEVT. Here also the student has to score 60% or above for successful completion of the course.

## 16. Grading system

The grading system will be as follows:

| Grading System | Overall marks |
|---|---|
| Distinction | 80% or above |
| First division | 75% or above |
| Second division | 65% or above |
| Third division | Pass aggregate to below 65% |

## 17. Certificate Requirements

The council for technical education and vocational training will award certificate of **"Technical School Leaving Certificate in Veterinary Science"** to those students who successfully complete the requirements prescribed by the curriculum.

## 18. Career Path

The graduate will be eligible for the position equivalent to Non-gazetted 2nd class/level 4 (technical) as Junior Technical Assistant (Veterinary, JTA) in the field of Veterinary services or as prescribed by the Public Service Commission.

## 19. Course Structure

(a) Summary (TSLC in veterinary science)

| | | | Hours/ | Hours Distribution | | | Marks Distribution | | |
|---|---|---|---|---|---|---|---|---|---|
| SN | Subjects | Nature | week | Th. | Pr. | Tot. | Th. | Pr. | Tot. |
| 1. | Veterinary Extension and Communication | T + P | 4 | 32 | 124 | 156 | 20 | 80 | 100 |
| 2. | Veterinary Anatomy and Physiology | T + P | 2 | 16 | 62 | 78 | 10 | 40 | 50 |
| 3. | Animal Nutrition and Fodder Production | T + P | 2 | 16 | 62 | 78 | 10 | 40 | 50 |
| 4. | Veterinary Epidemiology and Public Health | T + P | 2 | 16 | 62 | 78 | 10 | 40 | 50 |
| 5. | Animal Husbandry and Entrepreneurship Development | T + P | 8 | 64 | 248 | 312 | 40 | 160 | 200 |
| 6. | Veterinary Medicine | T + P | 12 | 96 | 372 | 468 | 60 | 240 | 300 |
| 7. | Veterinary Laboratory Technology | T + P | 4 | 32 | 124 | 156 | 20 | 80 | 100 |
| 8. | General Veterinary Pharmacology | T + P | 2 | 16 | 62 | 78 | 10 | 40 | 50 |
| 9. | Theriogenology and Basic Surgery | T + P | 4 | 32 | 124 | 156 | 20 | 80 | 100 |
| | Sub total: | | 40 | 320 | 1240 | 1560 | 200 | 800 | 1000 |
| | On the job training(OJT) | P | | 0 | 480 | 480 | 0 | 300 | 300 |
| | All total: | | | 320 | 1720 | 2040 | 200 | 1100 | 1300 |

(a) Detail Course structure

| TSLC in Vet. Science | Nature | Hrs | Total hrs | | | Marks |
|---|---|---|---|---|---|---|
| Subjects/units/sub units | | /wk | Th | Pr. | Tot. | Tot. |
| **1. Veterinary Extension and Communication** (Veterinary extension, Veterinary communication, Social mobilization and Community development) | T + P | 4 | 32 | 124 | 156 | 100 |
| 2. **Veterinary Anatomy and Physiology**<br>**Anatomy** (Osteology, Arthrology and Myology; Neurology and Angiology; Splanchnology; General Histology and Embryology)<br>**Physiology** (Locomotor, Cardiovascular, Blood & Respiratory system; Digestive, Excretory and Nervous System; Reproduction, Lactation and Endocrinology) | T + P | 2 | 16 | 62 | 78 | 50 |
| **3. Animal Nutrition and Fodder Production** (Fodder production, Animal nutrition and Pasture management) | T + P | 2 | 16 | 62 | 78 | 50 |
| 4. **Veterinary Epidemiology and Public Health** (Epidemiology, Public Health and Zoonoses, Meat inspection and abattoir practice & Environmental hygiene) | T + P | 2 | 16 | 62 | 78 | 50 |
| **5. Animal Husbandry and Entrepreneurship Development [Livestock production and management(**cattle and buffalo production, Sheep and Goat Production, Pig and Poultry Production, Wild life, Bees and pet animal management, Animal Product Technology, Introduction to Dairy Science, Basic Dairy Technology*),* **Animal breeding, aquaculture & Entrepreneurship Development]** | T + P | 8 | 64 | 248 | 312 | 200 |
| 6. **Veterinary Medicine**<br>▪ General Medicine<br>▪ Internal Medicine(Gastro-Intestinal and Respiratory)<br>▪ Internal Medicine (Cardiovascular, Uro-genital, Nervous and Musculoskeletal diseases)<br>▪ Internal Medicine (Metabolic and Deficiency diseases)<br>▪ Preventive Medicine (Bacterial and Fungal Diseases)<br>▪ Preventive Medicine (Viral Diseases)<br>▪ Preventive Medicine (Parasitic & Protozoan Diseases and Poisoning)<br>▪ Ethics and jurisprudence<br>▪ Management | T + P | 12 | 96 | 372 | 468 | 300 |
| 7. **Veterinary Laboratory Technology**<br>• General laboratory<br>• Bio-safety/Safety<br>• Preparation of clean glass wares, cleaning and Sterilization<br>• Postmortem technique, Specimen collection & transportation<br>• Biochemistry<br>• Immunology/ Serology<br>• Introduction to parasitology<br>• Introduction to internal parasites<br>• Introduction to protozoan parasites<br>• External parasites (Introduction)<br>• Introduction of Haematology and Blood, Serum & plasma<br>• Microbiology- Staining Methods<br>• Introduction to Media and Biochemical tests | T + P | 4 | 32 | 124 | 156 | 100 |
| 8. **General Veterinary Pharmacology** (Basic Veterinary Pharmacology, Chemotherapy and Toxicology) | T + P | 2 | 16 | 62 | 78 | 50 |
| **9. Theriogenology and Basic Surgery** (Animal Reproduction, Gynecology & Obstetrics, and Andrology & Artificial Insemination, Basic Surgery and Radiology) | T + P | 4 | 32 | 124 | 156 | 100 |
| Subtotal: | | 40 | 320 | 1240 | 1560 | 1000 |
| On the job training(OJT) | P | | 0 | 480 | 480 | 300 |
| All total: | | | 320 | 1720 | 2040 | 1300 |

## 20. Subjects

1. Veterinary Extension and Communication
2. Veterinary Anatomy and Physiology
3. Animal Nutrition and Fodder Production
4. Veterinary Epidemiology and Public Health
5. Animal Husbandry and Entrepreneurship Development
6. Veterinary Medicine
7. Veterinary Laboratory Technology
8. General Veterinary Pharmacology
9. Theriogenology and Basic Surgery

# 1. Veterinary Extension and Communication

Total: 156 Hrs
Theory: 32 Hrs
Practical: 124 Hrs

Total marks: 100
Theory marks: 20
Practical marks: 80

**Description**
This course is designed to provide basic knowledge and skills of Veterinary Extension that includes the extension approach used by the Government of Nepal, developing extension materials and skills related to Communication, Social Mobilization and Community Development.

**Objectives**
Upon the completion of this course, students will be able to:

- Explain the concept of Veterinary Extension and apply the extension techniques in the field.
- Develop the basic extension materials necessary at field level
- Select appropriate extension technique based on the field situation
- Select and apply different communication channel and media to make communication effective in the veterinary extension program.
- Organize the farmer's group and motivate them to organize themselves for their self help
- Select and apply the most appropriate process, approaches and techniques in developing rural and community development programs by appreciating the importance of socially organized groups and their mobilization in the developmental activities.

| SN | Tasks/skills | Related knowledge | Th. | Pr. | Tot. |
|---|---|---|---|---|---|
| | **Agricultural Extension** | | | | |
| 1 | Explain the basic concepts of extension | **Basic concept of extension**<br>• Definition of extension<br>• Philosophies of extension<br>• Principles of extension | 0.8 | 3.2 | 4.0 |
| 2 | Explain the concept of education<br>• Divide the students into 3 groups to discuss the importance and role of formal, informal and non-formal education | **Concept of education**<br>• Definition of education<br>• Classification of education : Formal, informal and non-formal<br>• Difference in different types of education<br>• Role of non-formal education in Nepal | 0.8 | 3.2 | 4.0 |
| 3 | Learn different extension approaches used by district | **Extension approaches used by DLSO** | 0.8 | 3.2 | 4.0 |

| | | | | | |
|---|---|---|---|---|---|
| | Livestock services office (DLSO)<br>• Visit to nearby district livestock Services office to learn the extension approach used by DLSO | • Extension systems used in livestock sector in Nepal<br>• Organizational structure of department of livestock services | | | |
| 4 | Describe the extension teaching methods | **Extension teaching methods**<br>• Types of extension teaching methods :individual, group and mass contact<br>• Advantages and disadvantages of different teaching methods | 1.2 | 4.8 | 6.0 |
| 5 | Explain teaching learning process | **Teaching learning process**<br>• Elements of teaching learning process<br>• Factors affecting learning<br>• Factors affecting adult learning<br>• Adult learners characteristics | 0.8 | 3.2 | 4.0 |
| 6 | Explain adoption and diffusion process | **Adoption and diffusion**<br>• Adoption process<br>• Innovation decision process<br>• Adopter's categories and their characteristics<br>• Factors affecting the rate of adoption | 1.2 | 4.8 | 6.0 |
| 7 | Explain characteristics of extension worker | **Characteristics of extension worker**<br>• Characteristics of good extension worker<br>• Duties and responsibilities of extension worker | 0.4 | 1.6 | 2.0 |
| 8 | Explain program planning process<br>• Perform participatory program planning | **Program planning process**<br>• Definition of program planning<br>• Importance of program planning<br>• Principles of program planning<br>• Concept of participatory program planning<br>• Role of local bodies in program planning | 0.8 | 3.2 | 4.0 |
| 9 | Develop skills on monitoring and evaluation | **Monitoring and evaluation**<br>• Importance of monitoring and evaluation<br>• Types of evaluation<br>• Basic steps in evaluating extension program | 0.8 | 3.2 | 4.0 |
| 10 | Develop leadership skills | **Leadership**<br>• Basic elements of leadership<br>• Importance of leadership in | 0.8 | 3.2 | 4.0 |

| | | | | | |
|---|---|---|---|---|---|
| | | extension<br>• Roles of local leaders<br>• Types of leaders<br>• Characteristics of good leader<br>• Methods of discovering leader<br>• Use of local leader in extension program | | | |
| 11 | Conduct farmer's training | **Farmer's training**<br>• Needs of farmer's training<br>• Key points for making farmer's training effective<br>• Training process | 0.8 | 3.2 | 4.0 |
| 12 | Perform participatory rural appraisal (PRA) | **Participatory rural appraisal**<br>• What is PRA?<br>• Methods for PRA | 1.2 | 4.8 | 6.0 |
| 13 | Perform rapid rural appraisal (RRA) | **Rapid rural appraisal**<br>• What is RRA?<br>• Methods for RRA | 1.2 | 4.8 | 6.0 |
| 14 | Observe / participate in fair and exhibition and field day and field tour | **Observe / participate in fair**<br>• Observation and participation in fair and exhibition and field day and field tour | 0.8 | 3.2 | 4.0 |
| 15 | Develop skills for client dealing<br>▪ Deal with clients for developing the skills | **Client dealing**<br>• What is client dealing<br>• Importance of client dealing<br>• Skills of client dealing | 0.8 | 3.2 | 4.0 |
| 16 | Conduct social survey<br>▪ Visit to community/farmer's group for survey | **Social survey**<br>• What is social survey<br>• How to conduct social survey | 0.8 | 3.2 | 4.0 |
| 17 | Develop questionnaires<br>▪ Identify the survey topic and develop questionnaire for the same | **Develop questionnaires**<br>• What is questionnaires<br>• Types of questionnaires | 0.8 | 3.2 | 4.0 |
| 18 | Select appropriate sampling methods for social survey | **Sampling methods**<br>• What is sampling?<br>• Methods of sampling for social survey | 0.8 | 3.2 | 4.0 |
| 19 | Identify key communicators | **Identify key communicators**<br>• Who are key communicators?<br>• How can we identify them? | 0.8 | 3.2 | 4.0 |
| 20 | Conduct awareness campaigns on different veterinary and animal husbandry issues such as prevention of diseases, artificial insemination, clean-milk production, infertility etc. | **Awareness campaigns**<br>• What is awareness campaign?<br>• How to conduct awareness campaign | 0.8 | 3.2 | 4.0 |
| 21 | Announce death of animal to the | **Announcing death of animal** | 0.4 | 1.6 | 2.0 |

| | | | | | |
|---|---|---|---|---|---|
| | owner | • How to announce death of animals to the owner? | | | |
| 22 | State role of animal in the economy, health and socio-psychology of rural, semi-urban and urban society | **Role of animal**<br>• Role of animal in the economy, health and socio-psychology of rural, semi-urban and urban society | 0.4 | 1.6 | 2.0 |
| 23 | State animal husbandry patterns in rural and urban areas their economic, health, and psychological impacts. | **Animal husbandry patterns**<br>• Animal rearing patterns in rural and urban areas their economic, health, and psychological impacts. | 0.4 | 1.6 | 2.0 |
| 24 | Carry out interaction meeting/visits with livestock service center / Sub service center (LSC/LSSC) to learn their extension strategies | **Visit to LSC/LSSC**<br>• Extension systems followed by LSC/LSCC | 0.4 | 1.6 | 2.0 |
| 25 | Carry out interaction meeting/visits with an NGO, and its local group and study their planning process, plan of work and implementation | **Interaction with NGO**<br>• Interaction meeting/visits with an NGO, and its local group and study their planning process, plan of work and implementation | 0.4 | 1.6 | 2.0 |
| | **Communication** | | | | |
| 26 | Select and apply different communication process models, channel and media to make communication effective in the veterinary extension program. | **Communication**<br>• Definition of communication<br>• Types of communication<br>• Role of communication in Extension<br>• Barriers in communication<br>• Line agencies coordination | 0.8 | 3.2 | 4.0 |
| 27 | Prepare pamphlet | **Pamphlet**<br>• What is pamphlet?<br>• Principles of pamphlet making | 0.8 | 3.2 | 4.0 |
| 28 | Prepare leaflet | **Leaflet**<br>• What is leaflet?<br>• Principles of leaflet making | 0.8 | 3.2 | 4.0 |
| 29 | Prepare folders | **Folders**<br>• What is folder?<br>• Principles of folder making | 0.8 | 3.2 | 4.0 |
| 30 | Prepare poster | **Poster**<br>• What is poster?<br>• Principles of poster making | 0.8 | 3.2 | 4.0 |
| 31 | Prepare flash card | **Flash card**<br>• What is flash card?<br>• Principles of flash card making | 0.8 | 3.2 | 4.0 |
| 32 | Prepare booklet | **Booklet**<br>• What is booklet? | 0.8 | 3.2 | 4.0 |

| | | | | | |
|---|---|---|---|---|---|
| | | • Principles of booklet making | | | |
| 33 | Prepare pictorial book | **Pictorial book :**<br>• What is pictorial book?<br>• Principles of pictorial book making | 0.8 | 3.2 | 4.0 |
| 34 | Prepare radio script | **Radio script**<br>• Importance of radio script in extension | 0.8 | 3.2 | 4.0 |
| 35 | Prepare one act drama and folk song | **Drama and folk song**<br>• Importance of drama and folk song in extension | 0.8 | 3.2 | 4.0 |
| 36 | Visit different livestock agencies and study their communication strategies implication of communication approaches currently in use in farming community in the vicinity with the help of livestock service center and sub-centers. | **Visit to different livestock centers**<br>• Visit to different livestock agencies and study their communication strategies implication of communication approaches currently in use in farming community in the vicinity with the help of livestock service center and sub-centers. | 0.8 | 3.2 | 4.0 |
| | **Social mobilization, community development and gender** | | | | |
| 37 | Explain social mobilization, community development, gender and select/apply the most appropriate process, approaches and techniques in developing rural and community development programs. | **Social mobilization, community development and gender**<br>• Definition of sociology<br>• Uses and importance of sociology<br>• Terminologies used in sociology : society, community, institution, association<br>• Difference between rural and urban society<br>• Concept of community development<br>• Differentiation between extension and community development<br>• Major problems and issues of rural and community development in Nepal.<br>• Concept and purposes of social mobilization<br>• Processes of social mobilization.<br>• Self governance act<br>• Decentralization | 4 | 12 | 16.0 |

| | | | | | |
|---|---|---|---|---|---|
| | | • Introduction to gender concepts, difference between sex and gender.<br>• Gender needs, roles, analysis, gender sensitive planning gender mainstreaming in livestock development | | | |
| | | **Total:** | **32** | **124** | **156** |

**References**


1. Dongol, B.B.S. 2004. Extension Education.
2. Ban, A.W. Van Den and H.S. Hawkins. 1998. Agricultural Extension. S.K. Jain for CBS Publishers and Distributors, New Delhi.
3. Bhatnagar, O.P. and O.P. Dahama. 1998. Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
4. Sandhu, S.A. 1996. Extension Program Planning. Oxford and IBH Publishing Co. Pvt. Ltd.G New Delhi.
5. Kumar, A. 1999. The mass communication. Amul Publishing Pvt. Ltd. New Delhi.
6. Ray, G.L. 1998. Extension communication and management. Naya Prakashan Bidden Saran, Calcutta.
7. Khan, S.S. and J.S. Sah. 2001. Social mobilization manual based on Syanga Experience, Social Mobilization Experimentation and Learning Centre.

## 2. Veterinary Anatomy and Physiology

Total hours: 78 hrs
Theory hours: 16 hrs
Practical hours: 62 hrs

Total marks: 50
Theory marks: 10
Practical marks: 40

**Description:**
This includes the skills and knowledge related to anatomy (osteology, arthrology and myology; neurology and angiology; splanchnology; general histology and embryology) and physiology (of locomotor, cardiovascular, blood & respiratory system; digestive, excretory and nervous system; reproduction, lactation and endocrinology) of animals.

**Objectives:**
Upon completion of this course, the student will be able to:

- Explain cells, tissues and the organization of animal body.
- Apply their acquired knowledge of the field of veterinary osteology, myology, arthrology and identify gross structure of major bones, muscles and joints efficiently.
- State physiology of muscle contraction.
- State the network of gross blood and nerve supply systems to the different parts of animal body.
- State physiology of cardiovascular and nervous system.
- State the visceral organs present in the body with the account of structure, location, and relation of the organs.
- State physiology of respiration, digestion and absorption, endocrine and reproductive system as well as excreta system.
- Explain and state basic facts, principles, and development processes of animals.

| S.N. | Tasks/Skills | Related knowledge | Time (Hrs.) | | |
|---|---|---|---|---|---|
| | | | Th. | Pr. | Tot. |
| 1. | Explain cells, tissues and the organization of animal body | **Cells, tissues and organization of animal body**<br>• Cell and its structure<br>• Cell division<br>• Tissue, its kinds and basic histological structure<br>• Membranes and glands, their types<br>• Anatomical terms; Terms related to veterinary physiology<br>• Body cavities<br>• Body fluids<br>• Diffusion and osmosis | 1.4 | 5.6 | 7 |
| 2. | Be familiar with the structure of bones, identify bovine bones and their major parts, carry out comparison with bones of other species | **Skeletal system**<br>• Chemical composition of bones<br>• Compact and cancellous bones<br>• Types of bones<br>• Gross study of appendicular skeleton system: fore limb-Scapula, humerus, radius/ulna, carpus, metacarpus, phalanges; hind limb-pelvic girdle, femur, tibia and | 2.4 | 9.6 | 12 |

| | | | | | |
|---|---|---|---|---|---|
| | | fibula, patella, tarsus, metatarsus, digits, and comparison with those of other species<br>• Gross study of axial skeleton system: skull, vertebral column, ribs, sternum, and comparison with those of other species | | | |
| **3.** | Be familiar with the basic concept of arthrology and perform dissection to study the main synovial joints of the limbs | **Arthrology**<br>• Different terms used in arthrology<br>• Introduction, classification of joints<br>• Gross study of main synovial joints of the limbs with the major muscles involved in them | 1 | 4 | 5 |
| **4.** | State the sliding filament theory of contraction of skeletal muscle and perform dissection to study major skeletal muscles | **Muscular system**<br>• Muscle and its classification<br>• Sliding filament theory of contraction of skeletal muscles<br>• Rigor mortis and muscle fatigue<br>• Gross study of muscles of the head and neck<br>• Gross study of muscles of the back<br>• Gross study of muscles of the abdominal wall<br>• Gross study of the muscles of the pelvic floor<br>• Healing of muscle fibers | 1 | 4 | 5 |
| **5.** | Carry out study of blood, heart and the network of blood vessels, and their functions | **Circulatory system**<br>• Introduction, composition of blood, blood cells<br>• Erythrocytes: formation, maturation and fate. Life span of RBC<br>• Synthesis of hemoglobin<br>• Leucocytes: formation, their classification, and role of leucocytes in immunity<br>• Thrombocytes: formation and fate<br>• Blood coagulation<br>• Immunity and defense mechanisms<br>• Introduction of circulatory system<br>• Blood vessels<br>• Bovine heart, gross study of its specimen and comparison with that of other species<br>• Blood supply to the heart and conduction system<br>• Blood pressure and pulse<br>• Blood circulation (pulmonary circulation and Systemic circulation)<br>• Fetal circulation | 2.6 | 10.4 | 13 |
| **6.** | Perform collection of blood | **Blood sample collection:** | 0.2 | 0.8 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | samples | • Collection of blood samples from various animals and birds | | | |
| **7.** | Perform enumeration of erythrocytes, leucocytes, differential leucocyte count, platelet count | **Enumeration**:<br>• Enumeration of erythrocytes, leucocytes, differential leucocyte count, platelet count | 0.4 | 1.6 | 2 |
| **8.** | Be familiar with lymphatic system | **Lymphatic system**<br>• Introduction<br>• Lymph vessels<br>• Lymph nodes: structure and functions<br>• Other lymphatic tissues | 0.2 | 0.8 | 1 |
| **9.** | Carry out the study of gross structure and physiology of nervous system | **Nervous system**<br>• Introduction<br>• Neurones<br>• Physiology of nerve impulse (action potential)<br>• Types of nerves<br>• Brain: gross study of its specimen and comparison with other species, functions<br>• Cerebrospinal fluid<br>• Spinal cord<br>• Reflex<br>• Peripheral nervous system (spinal and cranial nerves)<br>• Autonomic nervous system and its functions | 1.2 | 4.8 | 6 |
| **10.** | Carry out gross and physiological study of the special senses | **Special senses**<br>• Gross study of eye and ear<br>• Physiology of sight<br>• Physiology of hearing and balance<br>• Physiology of smell and taste<br>• Skin and its appendages: structure and functions; temperature regulation in animals and birds | 1.0 | 2.0 | 3 |
| **11.** | Carry out gross (through dissection) and physiological study of visceral organs present in the body with the account of structure, location, and relation of the organs | **Splanchnology: anatomy and physiology**<br>• Introduction, peritoneum<br>• Gross study of organs of digestive system, oral cavity and associated organs, gastro-intestinal tract, liver, pancreas, salivary glands and spleen<br>• Functions of organs of digestive system<br>• Process of digestion and absorption<br>• Digestion in poultry/non-ruminants<br>• Gross study of organs of respiratory system, nasal cavity and trachea, bronchi and lungs | 3 | 12 | 15 |

| | | | | | |
|---|---|---|---|---|---|
| | | • Functions of organs of respiratory system<br>• Respiration, its cycle and control; External and internal respiration; transport of gases in blood<br>• Respiration in birds<br>• Gross study of organs of urinary system, kidney, ureter, urinary bladder and urethra; microscopic structure of kidney<br>• Functions of different organs of urinary system; urine formation; excretion of urine in birds<br>• Gross study and functions of organs of reproductive system, male genitalia, female genitalia and accessory glands<br>• Puberty and sexual maturity; estrous cycle<br>• Pregnancy and physiology of parturition<br>• Process of milk let down<br>• Gross and physiological study of endocrine system (pituitary gland, thyroid gland, parathyroid glands, adrenal glands, pancreas, ovary and testes, and associated hormones); local hormones<br>• Dissection and study of all the body systems | | | |
| **12.** | Record temperature, respiratory rate and pulse rate, and perform counting of rumen motility | **<u>Recording of various parameters</u>**<br>• Temperature, respiratory rate and pulse rate<br>• Rumen motility | 0.4 | 1.6 | 2 |
| **13.** | Perform identification of physiological constituents of urine | **<u>Urine</u>:**<br>• Physiological constituents of urine | 0.2 | 0.8 | 1 |
| **14.** | Explain and understand basic facts, principles, and development processes of animals | **<u>Fundamentals of embryology</u>**<br>• Definition, principles and importance of embryology, significance of sexual reproduction in higher animals<br>• Gametes and gametogenesis, morphology of egg and sperm<br>• Ovulation and fertilization<br>• Formation of germ layers, external embryonic membrane | 0.6 | 2.4 | 3 |
| **15.** | Differentiate between fertilized and unfertilized eggs of fowl | **<u>Eggs of fowl:</u>**<br>• Differentiation of fertilized and unfertilized eggs of fowl | 0.2 | 0.8 | 1 |
| **16.** | Carry out microscopic study | **<u>Sperm of bull:</u>** | 0.2 | 0.8 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | of sperm of bull | • Microscopic study of sperm of bull | | | |
| | | **Total:** | 16 | 62 | 78 |

**References:**


1. Dyce, K.M., W.O. Sack and C.J.G. Wensing. 1996. Text book of veterinary anatomy. 2nd edition, W.B. Saunders Company.
2. Popesko, P. 1975. Atlas of topographical anatomy of the domestic animals volume, 4th edition, W.B. Saunders Company, Philadelphia, London (Vol. I and II).
3. Sisson, S. and J.D. Grossman. 1977. The anatomy of domestic animals. 5th edition, MacMillan, India (Vol. I and II).
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5. Greep, R.O. 1966. Histology, 2nd edition McGraw Hill Book Company, Kogakusha Company Ltd.
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7. Cunningham, J.G. 1997. Text book of veterinry physiology, 2nd edition, W.B. Saunders Company Ltd.
8. Ganong, W.F. 1991. Review of medical physiology, 15th edition, Prentice-Hall International Inc.
9. Duke's Physiology of Domestic Animals

## 3. Animal nutrition and fodder production

Total hours : 78 Total marks: 50
Theory hours: 16 Theory marks: 10
Practical hours: 62 Practical marks: 40

**Description**
This course is designed to provide the skills and knowledge related to principle and practices of animal nutrition including concepts of feeding different categories of livestock, basic feed formulation techniques, fodder production and its cultivation practices and principles and practices of pasture management.

**Objectives**
Upon the completion of this course, students will be able to

- Formulate ration for ruminants and non-ruminants and identify different nutrients, their functions and deficiency symptoms in major farm animals and poultry.
- Explain basic principles of fodder and forage production, identify seasonal common fodders and explain their cultivation practices.
- Apply knowledge of animal nutrition in practice and explain feeds and feeding system for ruminants and non-ruminants.
- State the basic principle and practice of pasture management with respect to production and management of pasture

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|---|---|---|---|---|---|
| SN | Tasks/skills | Related knowledge | Th. | Pr. | Tot. |
| | **Principles of animal nutrition** | | | | |
| 1 | Explain the basic concepts of animal nutrition | **<u>Principles of animal nutrition</u>**<br>• Terminologies used in animal nutrition<br>• Classification of nutrients and their function<br>o Protein<br>o Carbohydrate<br>o Lipid<br>o Minerals<br>o Vitamins<br>o Water<br>• Digestion and absorption of feed in ruminants and non-ruminants<br>• Metabolism of nutrients<br>• Feed ingredients and their classification<br>• Feeding standard for cattle, buffalo, sheep, goat, pig and poultry | 1.0 | 3.0 | 4.0 |
| 2 | Identify feed ingredients | **<u>Identification of feed ingredients</u>** | 0 | 2.0 | 2.0 |

| | | | | | |
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| | | • Identification of feed ingredients | | | |
| 3 | Perform sampling of feed ingredients for chemical analysis | **Sampling of feed ingredients**<br>• Sampling of feed ingredients for chemical analysis | 0 | 2.0 | 2.0 |
| 4 | Perform proximate analysis of feeds and fodder: dry matter, Ether extract , crude fiber , crude protein , total ash and NFE | **Proximate analysis of feeds and fodder**<br>• Proximate analysis of feeds and fodder: dry matter, Ether extract , crude fiber , crude protein , & total ash and NFE | 1.6 | 6.4 | 8.0 |
| 5 | Formulate ration using hit and trial method for: cattle and buffalo | **Formulation of ration for cattle and buffaloes**<br>• Formulation of ration for cattle and buffaloes | 0.8 | 3.2 | 4.0 |
| 6 | Formulate ration using hit and Trial method for: sheep and goat | **Formulation of ration for sheep and goats**<br>• Formulation of ration for sheep and goats | 0.8 | 3.2 | 4.0 |
| 7 | Formulate ration using hit and trial method for: pig & poultry | **Formulation of ration for pig and poultry**<br>• Formulation of ration for pig and poultry | 0.6 | 2.4 | 3.0 |
| 8 | Explain feeds / feeding system for ruminants and non-ruminants | **Feeds and feeding system**<br>• Chemical composition of different feed ingredients<br>• Basis of classifying feedstuffs<br>• Feed additives<br>• Use of conventional and unconventional feeds in animal feeding<br>• Use of agro-industrial by-products as animal feeds<br>• Use of NPN substances in animal feeding | 1.8 | 2.2 | 4.0 |
| 9 | Explain Feeding of different categories of livestock and storage of feeds | **Feeding of Livestocks**<br>• Feeding of livestock and poultry:<br>o Feeding calf<br>o Feeding young stock<br>o Feeding pregnant and lactating animals<br>o Feeding breeding bulls<br>o Feeding goats — kids, pregnant does, buck<br>o Feeding sheep<br>o Feeding pigs<br>o Feeding poultry, ducks and quails | 0.8 | 3.2 | 4.0 |

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| | | • Feed storage | | | |
| 10 | Perform treatment of straws | **Treatment of straws**<br>• Treatment of straws | 0.4 | 1.6 | 2.0 |
| 11 | Prepare urea molasses block | **Preparation of urea molasses block**<br>• Uses and importance of urea molasses block<br>• Steps for preparing it | 0.4 | 1.6 | 2.0 |
| | **Principle and practices of fodder production** | | **0** | **0** | **0** |
| 12 | Explain the principle / practices of fodder production | **Principle and practices of fodder production**<br>• Definition of fodder and forage<br>• Importance and scope of fodder production in Nepal<br>• Factors associated with fodder production<br>• Principle of grass seed production<br>• Use of marginal land, community forests, terrace etc for fodder<br>• Commonly used fodder trees and their nutritive value<br>• Silvi-pasture system and its importance in Nepal | 0.8 | 3.2 | 4.0 |
| 13 | Explain the cultivation practices of common fodder/forages | **Cultivation practices of common annual and perennial fodder/grasses**<br>• Preparation of rhizobium culture : importance and uses in legumes<br>• Oats, bajra, teosinte, maize, siratro, berseem, lucerne, vetch, stylo, molasses, setaria, para, rhodes, napier, desmodium, clover, forage peanut, cowpea, amriso etc | 1.2 | 4.8 | 6.0 |
| 14 | Identify seasonal fodders forage, tree fodders at vicinity | **Identification of seasonal fodders**<br>• Identification of seasonal fodders forage at vicinity | 0.4 | 1.6 | 2.0 |
| 15 | Prepare seasonal calendar | **Preparation of seasonal calendar**<br>• Preparation of seasonal calendar | 0.4 | 1.6 | 2.0 |
| 16 | Prepare nursery bed | **Nursery bed preparation**<br>• Nursery bed preparation | 0.4 | 1.6 | 2.0 |
| 17 | Cultivate seasonal fodder covering winter and summer | **Cultivation of seasonal fodder**<br>• Cultivation of seasonal fodder | 0.8 | 3.2 | 4.0 |

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|---|---|---|---|---|---|
| | | covering winter and summer | | | |
| 18 | Determine green and dry matter yield | **Determination of green and dry matter yield**<br>• Determination of green and dry matter yield | 0.4 | 1.6 | 2.0 |
| 19 | Carry out preparation of fodder tree sapling, plantation and management | **Preparation of fodder tree sapling, plantation and management**<br>• Preparation of fodder tree sapling, plantation and management | 0.4 | 1.6 | 2.0 |
| 20 | Prepare herbarium sheet of common fodders, forages and pasture grasses | **Preparation of herbarium sheet**<br>• Preparation of herbarium sheet | 0.4 | 1.6 | 2.0 |
| 21 | Preserve fodder/forage by making hay and silage | **Preparation of Hay and Silage**<br>• Hay making<br>• Silage making and little bag silage making | 0.6 | 2.4 | 3.0 |
| | **Principles and practices of pasture management** | | **0** | **0** | **0** |
| 22 | Explain the principles and practices of pasture management | **Principles and practices of pasture management**<br>• Terminology of pasture<br>• Importance and scope of pasture management in Nepal<br>• Common pasture species and cultivars in Nepal<br>• Pasture establishment; seed quality, sowing, soil environment, cultivated seed beds and management of pasture<br>• Management and planning of grazing systems | 0.8 | 3.2 | 4.0 |
| 23 | Identify pasture species | **Identification of pasture species**<br>• Identification of pasture species | 0.4 | 1.6 | 2.0 |
| 24 | Perform sampling pasture; grass and legumes | **Sampling pasture; grass and legumes**<br>• Sampling pasture; grass and legumes | 0.4 | 1.6 | 2.0 |
| 25 | Carry out pasture measurement procedure | **Pasture measurement**<br>• Pasture measurement procedure | 0.4 | 1.6 | 2.0 |
| | | Total | 16 | 62 | 78 |

**References**:


1. Benerjee, G.C. 1998. Feeds and Principles of Animal Nutrition. Oxford and IBH, New Delhi.
2. Ranjhan, S.K. 1993. Animal Nutrition and Feeding Practices in India. Vikash Publishing House Pvt. Ltd., India.
3. McDonald, P., R.A. Edwards, and I.F.D. Greenhalgh. 1987. Animal Nutrition. ELBS/Longman Publication ($4^{th}$ Edition).
4. Ghanse Bali Pustika. 2065/66. Published by Leasehold Forestry and Livestock Development Program, Hariharbhawan.
5. Pandey, K.K. 1982. Fodder tree and tree fodder in Nepal. Swiss Federal Institute of Forestry Research. Birmensdrof, Switzerland.
6. Pathak, N. N. and R. C. Jakhmola. 1983. Forage and livestock production. Bikash publishing house. New Delhi.
7. Relwani, L.L.1979. Fodder crops and grasses. ICAR Publication.
8. Ranjhan, S.K. 1993. Animal Nutrition in the Tropics, Vikash Publishing House Pvt. Ltd., India.
9. Pande R.S. 1997. Fodder and pasture development in Nepal. Udaya R.D. Service (P.) Ltd. Kathmandu. Nepal.

## 4. Veterinary epidemiology and public health

Total hours: 78 hrs
Theory hours: 16 hrs
Practical hours: 62 hrs

Total marks: 50
Theory marks: 10
Practical marks: 40

**Description**
This course is designed to provide basic concepts of veterinary epidemiology and public health including patterns, prevention, control, eradication of diseases, major zoonoses and their control, meat inspection and environmental hygiene.

**Objectives**
Upon completion of this course, the students will be able to:

- Explain how the disease occurs and spreads in the population
- Assist in the investigation of disease outbreaks
- Conduct field level disease surveillance and participatory disease surveillance
- Explain major zoonoses and their control measures
- Describe sources of contamination in water and air together with their prevention.
- Explain meat borne zoonoses and their control, and differentiate the meats of different food animals.

| S. N | Task / Skill | Related technical skill | Time | | |
|---|---|---|---|---|---|
| | | | Th. | Pr. | Tot. |
| | **Epidemiology** | | | | |
| 1 | Explain basic concepts of epidemiology and public health | **Basic concepts of epidemiology and public health**<br>• Definition of epidemiology and public health<br>• Terminologies used in epidemiology<br>• Uses and importance of epidemiology<br>• Epidemiological triad<br>• Iceberg principle of disease | 1.2 | 4.8 | 6.0 |
| 2 | Describe patterns of disease<br>• Practice on brown sheet to know the disease patterns | **Patterns of Disease**<br>• Sporadic, endemic, epidemic, pandemic<br>• Spatial distribution of diseases<br>• Temporal distribution of diseases | 0.8 | 3.2 | 4.0 |
| 3 | Calculate prevalence and incidence<br>• Practice calculation of prevalence rate, incidence rate, incidence risk based on example | **Calculation of Prevalence and Incidence**<br>• Prevalence rate, incidence rate, incidence risk | 0.4 | 1.6 | 2.0 |
| 4 | Prepare a report on outbreak | **Types of epidemiological studies** | 1.2 | 4.8 | 6.0 |

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| | investigation and explain the types of epidemiological studies | • Descriptive (main focus) : time, animal, place<br>• Analytical and experimental<br>**Outbreak investigation**<br>• What is outbreak?<br>• Why its investigation is needed?<br>• Steps of outbreak investigation | | | |
| 5 | Be familiar with disease surveillance<br>• Study disease surveillance<br>• Fill surveillance formats<br>• Practice some methods of PDS:<br>o Semi-structured interview<br>o Pair-wise simple ranking<br>o Proportional piling<br>o Matrix scoring<br>o Visualization tools- seasonal calendar, participatory mapping, time line, transect walk | **Basic Concept of Surveillance**<br>Definition of Survey, Monitoring and Surveillance<br>Types of Surveillance : Active and Passive<br>**Participatory disease Surveillance (PDS)**<br>• What is participatory disease surveillance?<br>• Uses and importance of PDS<br>• Some methods of PDS | 1.6 | 6.4 | 8.0 |
| 6 | Explain Disease Reporting System<br>• Practice to fill Disease reporting formats used by DLS | **Disease reporting system**<br>Disease reporting system in Nepal<br>**World animal health organization (OIE)**<br>What is OIE?<br>Structure, objectives and functions of OIE | 1.2 | 4.8 | 6.0 |
| 7 | Visit to DLSO/ SC/ SCC for data collection<br>• Collect data<br>• Analyze / process data using bar, pie, line etc | **Data collection**<br>• Why data are needed?<br>• Methods for data collection | 1.2 | 4.8 | 6.0 |
| 8 | Perform risk analysis using simple example | **Basic concept of risk analysis**<br>What is risk analysis?<br>Why is it necessary?<br>Steps of risk analysis | 0.4 | 1.6 | 2.0 |
| 9 | Explain causation<br>• Explain causation of disease with examples | **Basic concept of causation**<br>• Postulates on disease causation | 0.4 | 1.6 | 2.0 |
| | **Public health** | | 0 | 0 | 0 |
| 10 | Explain zoonoses | **Basic concept of zoonoses**<br>• Definition of zoonoses<br>• Classification of zoonoses (direct, cyclo, meta, sporozoonoses) | 0.4 | 1.6 | 2.0 |
| 11 | Explain water borne zoonoses | **Water borne zoonoses** | 0.4 | 1.6 | 2.0 |

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| | | • What do you mean by water borne zoonoses<br>• What are major water borne zoonoses<br>• Control of water borne zoonoses | | | |
| 12 | Explain milk borne zoonoses | **Milk borne zoonoses**<br>• What do you mean by milk borne zoonoses<br>• What are major milk borne zoonoses<br>• Control of milk borne zoonoses | 0.4 | 1.6 | 2.0 |
| 13 | Explain meat borne zoonoses | **Meat borne zoonoses**<br>• What do you mean by meat borne zoonoses<br>• What are major meat borne zoonoses<br>• Control of meat borne zoonoses | 0.4 | 1.6 | 2.0 |
| 14 | Explain important zoonotic diseases | **Important zoonotic diseases and their control**<br>• Rabies<br>• Brucellosis<br>• Tuberculosis<br>• Highly pathogenic avian influenza<br>• Swine flu | 1.2 | 4.8 | 6.0 |
| | **Meat inspection and abattoir practices** | | 0 | 0 | 0 |
| 15 | Assist in the meat inspection and abattoir practices<br>• Visit abattoir<br>• Perform ante-mortem inspection | **Principles of meat inspection**<br>• What is meat inspection?<br>• Why to do meat inspection?<br>• Pre-slaughter care<br>• Ante-mortem inspection<br>• Post-mortem inspection | 1.6 | 6.4 | 8.0 |
| | **Environmental Hygiene** | | 0 | 0 | 0 |
| 16 | Be familiar with environmental hygiene<br>• Disposal of farm wastes<br>• Sampling of water for bacteriological examination<br>• Coliform test to determine the potability of water | **Principles of environmental hygiene**<br>• What do you mean by environmental hygiene?<br>• Disposal of sewages and farm Wastes<br>• Sources of air pollution<br>• Purification and sanitation of water | 2.0 | 6.0 | 8.0 |
| 17 | Perform sample collections<br>• Collect milk samples<br>• Collect meat samples | **Sample collection**<br>• Methods for collection of milk and meat samples | 0.8 | 3.2 | 4.0 |
| 18. | Carry out carcass disposal | **Carcass disposal** | 0.4 | 1.6 | 2.0 |

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| | methods | • Methods for carcass disposal | | | |
| | | Total | 16 | 62 | 78 |

**References:**


1. Pfeiffer, Dirk U. Veterinary Epidemiology An Introduction. Wiley Blackwell
2. Stevenson, M. An Introduction to Veterinary Epidemiology
3. Karki, S. 2011. Basic Concepts of Epidemiology and TADs and Notifiable Livestock Diseases of Nepal (in Nepali Language).
4. Wilson, W.G. Wilson's Practical Meat Inspection. Blackwell Science ($6^{th}$ Edition)
5. Thronton, H. and J.F. Gracey. 1978. Text book of meat hygiene. The English Language Book Society (6th Edition).
6. Thapliyal, 1996. Fundamentals Animal Hygiene and Epidemiology. International- Distributing Company.
7. Acha, P.N. and B. Szyfres. 1989. Zoonosis and communicable diseases common to animals. Pan American Health Organization, USA ($2^{nd}$ Edition).

## 5. Animal husbandry and entrepreneurship development

Total: 312 hrs. Total: 200 marks
Theory: 64 Theory: 40 marks
Practical: 248 Practical: 160 marks

**Description**:
This course consists of the skills and knowledge related to livestock production and management (cattle and buffalo production; sheep and goat production; pig and poultry production; wild and pet animal management; animal product technology; introduction to dairy science; & principals of dairy technology), animal breeding and aquaculture and entrepreneurship development.

**Objectives**:
Upon the completion of this course, students will be able to:

**Livestock production and management [45-1**77-222]

- Identify different breeds of cattle and buffalo/ rear them with sound management practices(***Cattle and buffalo production***)
- Identify different breeds of sheep and goats, and rear sheep and goats with the application of scientific management practices(***Sheep and goat production***)
- Identify breeds of pigs and poultry birds and apply skills / knowledge of scientific rearing methods of them (***Pig and poultry production)***
- Recognize the basics and importance of wild life and its ecosystem, bees and pet animal management (***Wildlife, bees and pet animal management***)
- State slaughtering techniques along with wholesaler and retailer pieces of meat, and judge quality(***Animal product technology***)
- Define milk and determine milk constituents, and get acquaintance with mammary gland, milking process and standardize milk (***Introduction to dairy science***)
- State principles and procedures for milk and milk products processing and dairy plant management(***basic dairy technology***)

**Genetics and animal breeding [5-16-21]**

- State basic principles and fundamentals of Mendalian, population and quantitative genetics, and be familiar with their application in animal breeding ***(Principle of genetics and animal breeding)***
- State principles and fundamentals of selection and mating system in animal breeding ***(Selection and mating system)***

**Aquaculture [6-24-30]**

- Explain types of fishes and their importance, their morphology and anatomy, different organ systems and their interrelation (***Introductory ichthyology***)
- Explain the basics of aquaculture, differentiate various cultivated indigenous and exotic fish species, and be familiar with various management aspects of aquaculture (***Principles of aquaculture***)
- Explain common fish diseases, differentiate parasitic and non-parasitic diseases of fish, list different causal organisms affecting fish, and be familiar with different methods of disease treatment of fish ***(Fish disease)***

***Entrepreneurial development*** **[8-31-39]**

- Apply /facilitate to apply entrepreneurial skills / knowledge to be an entrepreneur (***Entrepreneurial development***)

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|---|---|---|---|---|---|
| SN | Tasks/skills | Related knowledge | Th. | Pr. | Tot. |
| | **Livestock production and management** | | 45 | 177 | 222 |

| | | | | | |
|---|---|---|---|---|---|
| | ***Cattle and buffalo production*** | | **9** | **24** | **33** |
| 1. | Identify different breeds and body parts of cattle and buffalo; rear them with sound management practices | **Breeds; care and management of cattle and buffalo**<br>• Introduction, scope and statistics of ruminants<br>• Introduction of body parts of cow and buffalo<br>• Breeds and characteristics of buffalo<br>• Breeds and characteristics of cattle<br>• Care and management of cow and buffalo (before, during and after parturition; milking stage)<br>• Care and management of newborn calf and system of dairy calf rearing<br>• Cattle and buffalo bull rearing system | 2.4 | 7.6 | 10 |
| 2. | Draw design of houses of different classes of dairy animals | **Housing system**<br>• Housing principles and housing system of ruminants,<br>• Design and space for different classes of dairy stocks | 0.6 | 2.4 | 3 |
| 3. | Perform different scientific management practices for cattle and buffalo production | **Scientific management practices for cattle and buffalo production**<br>• Handling of animals<br>• Identification of animals (Tagging, tattoing, branding, ear notching, putting marks)<br>• Weighing<br>• Castration of bull<br>• Dehorning and disbudding of buffalo and cattle<br>• Determination of age<br>• Grooming of cattle and buffalo<br>• Judging of lactating cattle and buffalo<br>• Judging of replacement stock e.g. heifers<br>• Judging of breeding bulls<br>• Keeping farm records<br>• Milking practice<br>• Cleaning and disinfection of barn and tools/equipments | 6 | 14 | 20 |
| | ***Sheep and goat production*** | | **4** | **16** | **20** |
| 4. | Identify different breeds of sheep and goats and rear them with sound management practices | **Breeds and care and management of sheep and goats**<br>• Introduction, scope, importance and statistics of goat and sheep<br>• Introduction of body parts of goat and sheep | 2 | 8 | 10 |

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| | | • Prominent exotic and indigenous breeds and characteristic features of (a) sheep (b) goat<br>• Care and management of goat and sheep in pregnancy, lambing and milking stage<br>• Care and management of young stocks such as kids and lambs, and raising of orphan kids and lambs<br>• Care and management of breeding buck<br>• General feeding practices and feeding habits of sheep and goat<br>• Advantages and disadvantages of sheep and goat farming in free grazing system<br>• Different types of sheep and goat housing | | | |
| 5. | Perform different scientific management practices for sheep and goat production | **<u>Scientific management practices for sheep and goat production</u>**<br>• wool shearing, hoof trimming and docking in sheep<br>• Ageing by dentition and its importance in sheep and goats<br>• Methods of identification of sheep and goat identification(a)Tattoing (b) Tagging(c) Others<br>• Drenching and dipping of sheep and goat<br>• Castration of sheep and goat<br>• Weighing of the animals and live weight determination<br>• Comparison in wool and mutton production between local and improved breeds of sheep<br>• Quality of wool and factors affecting quality of wool<br>• Composition of goat milk and its importance for human<br>• Importance of farm records and different types of records used in sheep and goat farms | 2 | 8 | 10 |
| | ***Pig and poultry production*** | | **4** | **16** | **20** |
| 6. | Identify breeds of pigs and apply skills / knowledge of scientific rearing methods of them | **<u>Scientific pig rearing practices</u>**<br>• Introduction, scope and statistics of pig<br>• Prominent exotic and indigenous breeds and characteristic features of pig<br>• Care and management of gilt and pregnant sow and breeding boar | 2 | 8 | 10 |

| | | | | | |
|---|---|---|---|---|---|
| | | • Care and management of newborn piglets<br>• Feeding system and ration formulation for pigs<br>• Castration, marking (notching, ear tattoing, body tattoing, metal ear clips, branding), clipping the tusk of pigs<br>• Housing systems and practices of swine/pigs<br>• Importance of record keeping and types of records used in pig farms | | | |
| 7. | Identify different breeds of poultry and rear them with sound management practices | **<u>Scientific poultry rearing practices</u>**<br>• Introduction, scope and statistics of poultry<br>• Nomenclature and breeds of fowl; classification of fowls and their characteristics<br>• Different types of poultry keeping: Broilers, layers, backyard poultry, duck, turkey, quail and ostrich<br>• Housing systems , design of poultry house and poultry house equipments<br>• Feeding and watering system of poultry (common managerial practices)<br>• Bio-security in a commercial farm<br>• Egg formation, candling, grading and selection of eggs, and incubation<br>• Hatching the eggs<br>• Brooding methods (natural and artificial)<br>• Debeaking, vaccination and culling methods<br>• Poultry farm records | 2 | 8 | 10 |
| | ***Wild life, bees and pet animal management*** | | **13** | **50** | **63** |
| | ***Wildlife management:*** | | **6** | **24** | **30** |
| 8. | Recognize the basics and importance of wild life and its ecology | **<u>Introduction and importance of wildlife and its ecology</u>**<br>• Introduction, definition and values of wildlife<br>• Common vocabulary of wildlife<br>• zoogeography of Nepal<br>• Distribution, habitat requirement and behaviour of important wildlife of Nepal<br>• National parks, reserves and other protected areas in Nepal<br>• Wildlife population ecology: | 1 | 4 | 5 |

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| | | population density and biomass, population structure, natality, mortality, interaction of population characteristics, turnover, productivity, territory, home range and migration etc. | | | |
| 9. | Explain need and concept of wildlife conservation, process of marking and population census | **Wildlife conservation, marking and population census**<br>• Concept of threatened, endangered, rare and vulnerable species<br>• Capturing and marking of wild animals<br>• Population census<br>• Wildlife conservation and management: concept of conservation, need for conservation, approach to wildlife management – Nepal's approach, habitat improvement practices<br>• Status of wildlife conservation and management in Nepal | 1 | 4 | 5 |
| 10. | Explain the national legal arrangement, international convention and organizations related to wildlife conservation and management | **Legal and organizational framework for wildlife conservation and management**<br>• Wildlife law enforcement<br>• International organizations and conventions concerning wildlife conservation | 0.4 | 1.6 | 2 |
| 11. | Visit a national park for practical observation, prepare a visit report comprising main activities with the list of wild animals and birds in the park | **Visit of national park**<br>• Visit to a national park for practical observation<br>• Checklist of birds and wild animals found in the National Park<br>• Observe the main activities in the park | 1.2 | 4.8 | 6 |
| 12. | Visit a zoo for practical demonstration on use of dart gun, caging and transportation of wild animals; prepare a visit report comprising the basic care and management system(with feeding practices) of zoo animals | **Visit of Zoo**<br>• Visit to a zoo for practical demonstration on use of dart gun, caging and transportation of wild animals<br>• Care and management of zoo animals, feeding different species of animals and birds | 2.4 | 9.6 | 12 |
| | ***Pet animal and bee management:*** | | **7** | **26** | **33** |
| 13. | Explain the breed characters of dog | **Common breeds of dog**<br>• Common breeds of dog in Nepal and their characteristics | 0.4 | 1.6 | 2 |
| 14. | Handle dog | **Handling of dog**<br>• Methods of restraining and controlling of dog and cats<br>• Administration of medicines in | 0.8 | 3.2 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| | | dog and cats<br>Common pet birds and their management in Nepal | | | |
| 15. | Arrange for dog breeding | **Dog breeding**<br>• Oestrus cycle of dog<br>• Mating behavior<br>• Heat period of dog<br>• False pregnancy<br>• Accidental pregnancy | 1.0 | 2.0 | 3 |
| 16. | Care and manage different stages of dogs | **Care and management of dogs**<br>• Care and management of pregnant dog<br>• Care and management of mothers<br>• Care and management of pups | 1 | 4 | 5 |
| 17. | Carry out sound management tools to raise dogs | **Scientific management tools for dog rearing**<br>• Tools equipment used for care of dogs<br>• Bathing method<br>• Exercise for dog<br>• Training of dog<br>• Control of parasites(internal and external) and vaccination schedules<br>• Principle and procedure of castration<br>• Principle and procedure of spaying | 1.6 | 6.4 | 8 |
| 18. | Administer medicine in dog and cat | **Medicine administration**<br>• Administration of medicine in dog and cat | 0.4 | 1.6 | 2 |
| 19. | Explain concept of kennel club | **Introduction of kennel club**<br>• Scope and importance of kennel clubs<br>• Minimum requirement to establish a kennel club<br>• Preparation of a model of kennel club<br>• Services to be provided by a kennel club<br>• Example of kennel club in Nepal | 0.6 | 2.4 | 3 |
| 20. | Keep records | **Records of dogs management**<br>• Breeding, vaccination and health records | 0.4 | 1.6 | 2 |
| 21. | Recognize the basics and importance of bee keeping and carryout preventive / control measures of bee diseases | **Introduction of bee keeping**<br>• Introduction, importance and species of bees<br>• Study of bee hives<br>• Common diseases and parasites of bees, and their prevention and control measures | 0.8 | 3.2 | 4 |

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| | ***Animal product technology (meat, eggs and wool)*** | | **5** | **20** | **25** |
| 22. | Explain the meaning of related terminologies and composition of wool, meat and eggs | **Introduction of meat and wool production**<br>• Scope of meat production and per capita meat consumption, meat and wool related terminology<br>• Composition and nutritive value of fresh meat, poultry meat and eggs | 0.4 | 1.6 | 2 |
| 23. | Care and manage meat animals and birds before slaughter | **Care and management of meat animals before slughter**<br>• Pre-slaughter care, transportation and handling of meat animals and birds, | 0.6 | 2.4 | 3 |
| 24. | Produce, store and handle meat, eggs and its products safely and hygienically and judge quality | **Production, storage and handle of meat, eggs**<br>• Meat inspection and estimation of meat yield.<br>• Edible and inedible viscera of dressed carcasses and their handling and disposal<br>• Fundamentals of storage and maintenance of quality of meat, poultry and eggs<br>• Handling, preservation, cooling, freezing, packing and distribution of meat and poultry products | 0.8 | 3.2 | 4 |
| 25. | Explain the structure, characters and quality of wool, fibre and hair | **Introduction to wool production**<br>• Wool production history and present status in Nepal<br>• Growth, structure and quality of wool, fibre and hair<br>• General properties wool, fibre and hair | 0.4 | 1.6 | 2 |
| 26. | Perform the jobs from cutting, collection, grading, storage, preservation to marketing of wool and or hides. | **Cutting, collection, grading, storage, preservation and marketing of wool and hides**<br>• Shearing and collection procedures, grading, storage, marketing and transportation<br>• Hide collection, preservation and processing techniques | 0.8 | 3.2 | 4 |
| 27. | Visit a meat plant | **Visit of meat plant**<br>• Visit to a meat plant<br>• Identification of equipment related to meat and wool processing | 1 | 4 | 5 |
| 28. | Visit a layer processing plant and wool factory | **Visit of layer processing plant and wool factory**<br>• Visit to layer processing plant and wool factory | 1 | 4 | 5 |
| | ***Introduction to dairy science*** | | **3** | **12** | **15** |

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| 29. | Explain the basic background information of dairy sector in Nepal | **Introduction to dairy sector of Nepal**<br>• History of dairy development,<br>• scope and importance, constraints,<br>• present dairy policies ,<br>• major dairy industries in Nepal, role of DDC, NDDB, private dairy and dairy cooperative in dairy development,<br>• present status of milk production-demand and supply ratio of milk,<br>• statistics of dairy animals | 0.6 | 2.4 | 3 |
| 30. | Explain the composition and properties of milk | **Composition and properties of milk**<br>• Milk:<br>o Definition and diagrammatic representation of milk constituents<br>o Composition (fat, lactose, protein, enzymes, vitamins and minerals) and factors affecting the composition nutritive value<br>o Physical and chemical properties | 0.6 | 2.4 | 3 |
| 31. | Explain the physiology of lactation | **Lactation**<br>• Physiology of lactation:<br>o Mammary gland<br>o Milk secretion<br>o Let down of milk | 0.4 | 1.6 | 2 |
| 32. | State Clean milk production technique | **Clean milk production**<br>• Clean milk production and its importance<br>• Cleaning and sanitization milking barn, cleaning of utensils, cleaning of milch animal, personal hygiene of workers.<br>• Study of correct method of hand milking and machine milking | 0.8 | 3.2 | 4 |
| 33. | Explain the basic of dairy microbiology and perform estimation of MO by using microscope and CMT paddle | **Introduction to dairy microbiology**<br>• Types of MO found in milk, their sources of contamination, uses and significance of microorganisms in Dairy Industry<br>• Test milk by using CMT paddle | 0.6 | 2.4 | 3 |
| | ***Basic dairy technology*** | | **7** | **39** | **46** |
| 34. | Identify commonly used dairy equipments | **Commonly used dairy equipments**<br>• Commonly used dairy equipments in laboratory<br>• Commonly used equipments in collection center and chilling center<br>• Commonly used equipments in dairy processing plan | 0.6 | 2.4 | 3 |
| 35. | Clean and sanitize dairy equipments | **Cleaning and sanitization of dairy equipments** | 0.6 | 2.4 | 3 |

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| | | • Dairy detergents and sanitizers<br>• Method of cleaning and sanitization | | | |
| 36. | Collect and transport milk | **Collection and transportation of milk**<br>• Establishment and management of milk collection center and chilling center<br>• Reception, weighing , sampling , platform test (names of test only), straining, filtration of milk<br>• Transportation of milk from dairy farm to collection/chilling center, chilling center to dairy plant.<br>• Role of temperature in bacterial growth, chilling process, bulk milk tank cooler, plate chiller | 1.2 | 5.8 | 7 |
| 37. | Perform quality tests of raw milk/ pricing / payment | **Quality test of milk**<br>• Organoleptic test<br>• Alcohol test<br>• Clot on boil (COB) test<br>• Fat test<br>• SNF /TS test<br>• Methylene blue reduction (MBR) test<br>• Adulteration test for starch, sugar, soda, hydrogen peroxide, formalin and common salt<br>• Pricing of raw milk considering weight, volume, fat and SNF and other quality indicators;<br>• Different payment systems practiced | 0.4 | 6.6 | 7 |
| 38. | Prepare for milk processing | **Preparation for milk processing**<br>• Grading and sampling, weighing, pre-heating | 0.4 | 1.6 | 2 |
| 39. | Pasteurize milk | **Milk pasteurization**<br>• Definition of pasteurization,<br>• Batch-type pasteurization method<br>• Continuous type (HTST) pasteurization method<br>• Packaging, distribution and storage of pasteurized milk | 0.8 | 3.2 | 4 |
| 40. | Homogenize milk | **Homogenization of milk**<br>• Principal and procedure of homogenization of milk | 0.4 | 1.6 | 2 |
| 41. | Standardize milk | **Standardization of milk**<br>• Definition, method of standardization :reconstitution, toning, recombination, Pearson square method | 0.4 | 1.6 | 2 |

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| 42. | Perform quality tests of processed milk | **Quality test of processed milk**<br>• Organoleptic test<br>• Coliform test<br>• Total plate count<br>• Phosphatase test<br>• Fat and SNF test | 0.8 | 3.2 | 4 |
| 43. | Separate cream | **Cream separation**<br>• Definition of cream<br>• Uses and types of cream separator<br>• Method of cream separation<br>• Standardization of cream | 0.5 | 4.5 | 5 |
| 44. | Market milk/ milk products | **Marketing milk and milk products**<br>• Packing, distribution, advertisement and marketing strategy of milk/ milk products | 0.4 | 1.6 | 2 |
| 45. | Visit a milk plant | **Visit to a milk plant**<br>• What to observe ?<br>• Visit report | 0.5 | 4.5 | 5 |
| | **Genetics and animal breeding** | | **5** | **16** | **21** |
| 46. | Draw the structure of cell and describe the functions of organelles and process of cell division | **Structure of cell and cell division**<br>• Common genetical key terms<br>• Structure of animal cell and functions of cellular organelles<br>• Basic process of cell division (mitosis and meiosis)<br>• Gametogenesis | 1.6 | 5.4 | 7 |
| 47. | State basic concept and process of genetically phenomenon | **Basic genetically phenomenon**<br>• Primary concept of heredity<br>• Sex chromosome, mutation and variation<br>• Concept of selection and mating systems | 1.8 | 6.2 | 8 |
| | ***Selection and mating system*** | | | | |
| 48. | State principles and fundamentals of selection in animal breeding | **Methods of selection**<br>• Selection method<br>o Performance testing<br>o Pedigree selection<br>o Progeny testing<br>o Show ring selection | 0.8 | 2.2 | 3 |
| 49. | Describe the systems of animal breeding | **Systems of animal breeding**<br>• Inbreeding<br>o Close breeding<br>o Line breeding<br>• Out-breeding<br>o Out-crossing<br>o Cross breeding<br>o Species hybridization<br>o Grading up | 0.8 | 2.2 | 3 |
| | **Aquaculture** | | **6** | **24** | **30** |
| 50. | Classify fish species | **Introduction of fish culture**<br>• Introduction of fish and fish | 0.2 | 0.8 | 1 |

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| | | culture<br>• Zoological classification of fish | | | |
| 51. | Explain methods of fish culture | **Methods of fish culture**<br>• Pond fish culture, Cage culture, Riverine fish culture, Pen culture<br>• Running water vs stagnant water fish culture<br>• Fish farming zone of Nepal | 0.6 | 2.4 | 3 |
| 52. | Identify external body parts of fish | **External body parts of fish**<br>• Listing external body parts of fish with function of each parts<br>• Identification of each part of the external body of a fish | 0.2 | 0.8 | 1 |
| 53. | Identify common fish species found in Nepal | **Common fish species found in Nepal**<br>• Indigenous species<br>• Indian major carps: Rohu, Bhakur, Naini<br>• Locally popular fish: Asala, Katle, Buduna, Jalkapur<br>• Weed/ predatory fish: Magur, Bhoti, Shinghi, Barari<br>• Exotic species<br>• Chinese carps: big head carp, Silver carp, Grass carp<br>• Common carps: German carp, Israeli carp<br>• Rainbow trout fish | 0.6 | 2.4 | 3 |
| 54. | Explain type of fish culture | **Types of fish culture**<br>• Monoculture, polyculture, monosex culture<br>• Integrated fish culture: paddy cum fish culture, duck cum fish culture, pig cum fish culture etc | 0.4 | 1.6 | 2 |
| 55. | Explain fish breeding | **Fish breeding**<br>• General concept of fish breeding and fingerling production<br>• Select ion of brood fish<br>• natural breeding of common carp artificial breeding of indian major carps/chinese carps | 0.6 | 2.4 | 3 |
| 56. | Explain concept of rearing fish in aquarium | **Fish rearing in aquarium**<br>• General concept, purpose, type of fishes kept in aquarium, sources of fingerling, feeding habit and marketing | 0.4 | 1.6 | 2 |
| 57. | Identify natural feed in pond | **Natural feeding of fish**<br>• Feeding habits of different fishes<br>• Phytoplankton and zooplankton<br>• Importance of fertilizer in fish pond | 0.4 | 1.6 | 2 |
| 58. | Prepare feed for fish from locally | **Feeding of fish** | 0.6 | 2.4 | 3 |

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| | available ingredients | • Natural and artificial food<br>• Feeding requirement for different stages and types of fish<br>• Mixing of different ingredients for fish ration<br>• Feeding time, feeding behavior | | | |
| 59. | Explain different weed fishes | **Weed fishes**<br>• Puntius sps., channa sps,<br>• Control of weed fishes | 0.2 | 0.8 | 1 |
| 60. | Explain predatory fishes/ enemies | **Predatory fishes/ enemies**<br>• List of predatory fishes: *wallago attu, clarius batrachus, heteropneutis fosillis, anguila bengalensis*<br>• Fish enemies: snake, frog, crocodile, otter<br>• Control of predatory fishes and enemies | 0.4 | 1.6 | 2 |
| 61. | Control common fish diseases parasites | **Common fish diseases**<br>• Icthiothyriosis, white spot disease, fin rot, gill rot, argulosis, gyrodatylus, datylogyrus<br>• Sign and symptoms, control and treatment. | 0.8 | 3.2 | 4 |
| 62. | Harvest fish | **Harvesting of fish**<br>• Stage of harvesting, methods of harvesting<br>• Using Nets: drag net, scoop net, maji Jal<br>• Care and maintenance fish nets<br>• Fishing hook, harvesting by removal of water<br>• Harvesting by poisoning | 0.4 | 1.6 | 2 |
| 63. | Market fish | **Marketing of fish**<br>• Time of harvesting fish<br>• Marketing channel and fish market, Pricing<br>• Costumer behavior and marketing policy | 0.2 | 0.8 | 1 |
| | **Entrepreneurial development** | | **8** | **31** | **39** |
| 64. | Be familiar with the concepts/terminologies for entrepreneurial development | **Introduction of entrepreneurship**<br>• Concepts and terminologies related to :<br>o Entrepreneur<br>o Entrepreneurship<br>o Enterprise<br>o Women entrepreneur<br>o Rural/social entrepreneur<br>o Factors affecting entrepreneurial growth<br>o Entrepreneurial motivation | 0.4 | 1.6 | 2 |

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| | | ○ Entrepreneurial competencies<br>○ Entrepreneurial mobility<br>○ Entrepreneurship development programs(EDPs)<br>• Concepts and terminologies related to :<br>○ Small enterprises: an introductory frame work<br>○ Project identification, selection, formulation, and appraisal<br>○ Financing of enterprise<br>○ Ownership structure | | | |
| 65. | Explain production function | **Production function**<br>• Land, labor, capital<br>• Entrepreneur | 0.4 | 1.6 | 2 |
| 66. | Calculate cost relationship of a firm | **Calculation of cost relationship**<br>• Calculation of total cost, fixed cost, variable cost<br>• Calculation of average variable cost, average fixed cost, average total cost and average marginal cost | 0.8 | 3.2 | 4 |
| 67. | Explain farm planning/budgeting | **Farm planning and budgeting**<br>• Principle of farm planning and budgeting<br>• Steps of farm planning and budgeting | 0.8 | 3.2 | 4 |
| 68. | Identify sources of credits | **Sources of credits**<br>• Sources of loan:<br>• Individual lending,<br>• Institutional loan: bank and other financial institutions | 0.2 | 0.8 | 1 |
| 69. | Explain types of banks | **Types of bank**<br>• Central bank, commercial bank, Industrial bank<br>• Development bank, finance and cooperatives | 0.4 | 1.6 | 2 |
| 70. | Explain loan procedures | **Loan procedures**<br>• Types of loan, loan procedure, Priority sector loan, industrial sector loan, secured loan<br>• Long term loan, short term loan, collateral for loan, completion of loan application forms, loan payment schedule | 0.4 | 1.6 | 2 |
| 71. | Explain banking systems | **Banking systems**<br>• Explain rules of bank regarding payment of loans<br>• Calculation of simple interest for loan payment procedure for obtaining loan form bank and other sources (ADB, Rural Dev. Bank, | 0.6 | 2.4 | 3 |

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| | | Women's Dev. Office etc.) | | | |
| 72. | Perform bank transaction | **Bank transaction**<br>• Cash deposits and withdrawals:<br>• Fixed deposit account<br>• Saving account<br>• Current account<br>• Cheque issues and withdrawal system, demand draft, debit and credit card | 0.4 | 1.6 | 2 |
| 73. | Prepare livestock/ agriculture farm plan | **Preparing livestock/ agriculture farm plan**<br>• Scheme / farm plan preparation<br>• Capital investment: fixed capital investment, running capital<br>• Cost of production: fixed cost, variable cost<br>• Financial analysis: gross income and expenditure, net profit/loss, break even point | 0.8 | 3.2 | 4 |
| 74. | Make a simple yearly production plan based on market analysis | **Prepare yearly production plan**<br>• Components of a yearly production plan, including time tables and budgets (expenses expected, income expected)<br>• Decision - making regarding a particular product, based on a market analysis (including seasonal variations)<br>• Preparation of a cash flow chart based on production plan | 1 | 4 | 5 |
| 75. | Design a marketing plan | **Designing a marketing plan**<br>• Concept and need of a marketing plan<br>• How to design a marketing plan | 0.6 | 2.4 | 3 |
| 76. | Describe the qualities of a successful entrepreneur | **Qualities of a successful entrepreneur**<br>• Introduction to principles of small business<br>• Entrepreneurs' qualities<br>• Functions of entrepreneurs<br>• Importance of creativity | 0.4 | 1.6 | 2 |
| 77. | Describe types of enterprise | **Types of enterprises**<br>• Types of small business:<br>• Private, partnership, cooperatives, joint stock company; advantages and disadvantages of each | 0.8 | 2.2 | 3 |
| | **Total** | | **64** | **248** | **312** |

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**Entrepreneurial development**

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## 6. Veterinary Medicine

Total hours: 468
Theory hours: 96
Practical hours: 372

Total marks: 300
Theory marks: 60
Practical marks: 240

**Description**:
This course includes the knowledge and skills related to the etiology, clinical findings, prevention and control and treatment aspects related to different system such as digestive, respiratory, cardiovascular, urogenital, nervous, musculoskeletal system. This course also includes etiology, clinical findings, prevention and control and treatment aspects of the metabolic and deficiency diseases. The etiology, clinical findings, prevention and control and treatment aspects of infectious diseases such as bacterial, fungal, viral is included. The knowledge and skills related to etiology, clinical findings, prevention and control and treatment aspects is also incorporated in this course such as parasitic diseases, protozoan diseases, poisoning and toxins. The other topic includes herbal medicine, home remedy and veterinary ethics and jurisprudence.

**Objectives:**
Upon the completion of this course, student will be able to:

- Describe the importance of veterinary medicine
- Examine and differentiate healthy and sick animals
- Describe the disease etiology, clinical findings, control and treatment of the diseases of different systems (*Internal Medicine*- **digestive, respiratory, cardiovascular, urogenital, nervous, musculoskeletal)**
- Describe the disease etiology, clinical findings, control and treatment of different of **metabolic and deficiency** diseases
- Describe the disease etiology, clinical findings, control and treatment of different infectious diseases **(bacterial, fungal, viral)**
- Describe the disease etiology, clinical findings, control and treatment of different **parasitic and protozoan** diseases
- Describe the etiology, clinical findings, control and treatment of **poisoning and toxin**
- Explain use of **herbal medicine and home remedy**
- Apply and Follow veterinary **ethics and jurisprudence**
- Apply management skills/knowledge in workplace.( ***Management*)**

| | | | Time(hours) | | |
|---|---|---|---|---|---|
| SN | Tasks/skills | Technical knowledge | Th. | Pr. | Total |
| 1 | **General Medicine** | | **14** | **56** | **70** |
| | • Describe the importance of veterinary medicine,<br>• Perform clinical examination of sick animal (history and patient data),<br>• Take present and past | **<u>General Medicine</u>**<br>• Major terminology used in medicine, history and importance of veterinary medicine, concept of health and disease.<br>1. Present and past disease history.<br>2. Clinical examination and methods of | | | |

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| | disease history and find out morbidity, mortality rate<br>• Collect urine/faeces/ skin scrapings/blood/milk / other body fluids for lab. test.<br>• Record clinical cases<br>• Perform clinical Practice and disease outbreak investigation | physical examination, handling of the animals, clinical examination of an ailing animal including history and patient data<br>3. Method of restraining, restraining of domestic animals and pet (dog and cat)<br>4. Temperature, pulse and respiration rate in domestic animals and pets, morbidity and mortality rate<br>5. Collection of materials like urine, feces, skin scrapings, blood, milk, and other body fluids for lab. test, clinical case recordings<br>• Clinical practice- epidemiological Investigation, visit to hospital and field<br>6. Attend health camps (vaccination, deworming, infertility camp, sample collection) | | | |
| 2 | **Internal Medicine (digestive and respiratory)** | | **12** | **54** | **66** |
| | • Explain etiology, clinical findings, control and treatment of disease of digestive and respiratory system<br>• Perform clinical Practice and disease outbreak investigation | **<u>Digestive and respiratory</u>**<br>• **Examination of digestive system**<br>• Definition, etiology, clinical findings, control and treatment of major GI system such as stomatitis, pharyngitis, oesophagitis, choking, indigestion, impaction, tympany, traumatic reticulitis, vomition, colic, enteritis).<br>• Etiology, clinical findings, control and treatment of peritonitis, ascites, jaundice and diseases of liver.<br>• **Examination of respiratory system**<br>• Definition, etiology, clinical findings, control and treatment of major respiratory disorders sucha s epistaxis, bronchitis, pneumonia, pulmonary emphysema pleurisy, hydrothorax, asthma,<br>• clinical practice- epidemiological investigation, visit to hospital and field<br>• Attend health camps (vaccination, deworming, infertility camp, sample collection | | | |
| 3 | **Internal medicine (cardiovascular, urogenital, nervous and musculoskeletal)** | | **10** | **24** | **34** |

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| | • Explain etiology, clinical findings, control and treatment of disease of Cardiovascular, Urogenital, Nervous, and Musculoskeletal system<br>• Perform clinical practice and disease outbreak investigation | **<u>Cardiovascular, urogenital, nervous and musculoskeletal</u>**<br>• Examination of cardiovascular, urogenital, nervous and musculoskeletal diseases<br>• Definition related to systems, etiology, clinical findings, control and treatment of cardiovascular diseases, hemorrhage, edema, toxaemia, anaemia, dehydration, fever.<br>• Etiology, clinical findings, control and treatment of lymph system<br>• Etiology, clinical findings, control and treatment urinary system<br>• Define and etiology, clinical findings, control and treatment of major nervous system.<br>• Define and etiology, clinical findings, control and treatment of major musculoskeletal system diseases.<br>• Clinical practice-<br>o Epidemiological investigation, visit to hospital and field<br>o Attend health camps (vaccination, deworming, infertility camp, sample collection | | | |
| 4 | **Internal Medicine (Metabolic and Deficiency diseases)** | | **10** | **44** | **54** |
| | • Explain, diagnose, treatment of metabolic and deficiency diseases perform clinical examination of sick animals suffering from perform clinical examination of sick animals suffering from deficiency / toxic diseases metabolic problems<br>• Collect blood, serum, ruminal fluid<br>• Perform clinical practice and disease outbreak investigation | **<u>Metabolic and Deficiency diseases</u>**<br>• Importance of metabolic and deficiency diseases<br>• Define and etiology, clinical findings, control and treatment milk fever, downer's cow syndrome, hypomagnesemic tetani, acetonemia, haemoglobinuria, rickets, osteomalacia, obesity, pregnancy toxaemia in cow.<br>• Clinical symptoms, pathogenesis, clinical pathology, diagnosis, treatment and control of major vitamins and mineral diseases.<br>• Definition, etiology, symptoms, pathogenesis, clinical pathology, diagnosis, differential diagnosis, treatment and control of neonatal infections.<br>• Clinical examination of sick animals suffering from metabolic problems, | | | |

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| | | clinical examination of sick animals suffering from deficiency and toxic diseases<br>• Collection of blood and serum separation, ruminal fluid for metabolic profile test and hemoglobin, Ketone body)<br>• Clinical practice-<br>o Epidemiological investigation, visit to hospital and field<br>o Attend health camps (vaccination, deworming, infertility, sample collection | | | |
| 5 | **Preventive Medicine (bacterial and fungal diseases)** | | **12** | **56** | **68** |
| | • Explain etiology, epidemiology, clinical findings, prevention control and treatment of bacterial and fungal diseases<br>• Perform clinical practice and disease outbreak investigation | **<u>Bacterial and fungal Diseases</u>**:<br>• General epidemiology of infectious diseases, modes of diseases transmission<br>• Bacterial disease<br>o Haemorrhagic septicaemia, black quarter, tetanus, anthrax tuberculosis, actinobacillosis and actinomycosis, brucellosis, listeriosis and leptospirosis, toxoplamosis, mastitis, salmonellosis and fowl typhoid strangles, glanders, colibacillosis<br>o Fungal disease-<br>o Contagious bovine pleuropneumonia (CBPP), campylobacteriosis, chlamydiosis, botulism, foot rot, contagious caprine pleuropneumonia (CCPP), ulcerative lymphangitis , swine erysepalas<br>• Ringworm, mycoplasmosis<br>• Notifiable disease of Nepal<br>• Dagnella disease, exotic disease of importance<br>• Clinical practice-<br>o Epidemiological investigation, visit to hospital and field<br>o Attend health camps (vaccination, deworming, infertility, sample collection | | | |
| 6 | **Preventive medicine (viral diseases)** | | **12** | **56** | **68** |
| | • Explain etiology, epidemiology, clinical | **<u>Major viral diseases</u>:**<br>• FMD,rinderpest, rabies, ephemoral | | | |

| | | | | | |
|---|---|---|---|---|---|
| | findings, prevention control and treatment of bacterial and fungal diseases<br>• Perform clinical practice and disease outbreak investigation<br>• List common viral diseases of livestock and poultry in Nepal | fever, IBR, pox diseases, scrapie, Blue tongue, pestes petits des ruminant (PPR), infections equine anaemia, hog cholera, swine vesicular disease, swine influenza, canine distemper, parvo virus infection,<br>• Ranikhet, infectious bronchitis, Infectious bursal disease (gumboro disease), mareks disease, avian leucosis complex (ALC), fowl pox,<br>• Notifiable disease in Nepal<br>• EDS-76 (egg drop syndrome-76), exotic disease of importance-ILTC (infectious laryngo tracheitis)<br>• Clinical practice- epidemiological investigation, visit to hospital and field<br>• Attend health camps (vaccination, deworming, infertility, sample collection<br>• Listing of common viral diseases of livestock and poultry in Nepal<br>• Clinical practice-<br>o Epidemiological investigation, visit to hospital and field<br>o Attend health camps (vaccination, deworming, infertility, sample collection | | | |
| 7 | **Preventive medicine (parasitic & protozoan diseases and poisoning)** | | **10** | **36** | **46** |
| | • Explain etiology, epidemiology, clinical findings, prevention control and treatment of bacterial and fungal diseases<br>• Perform clinical practice and disease outbreak investigation | **<u>Parasitic & protozoan diseases and poisoning)</u>**<br>• Importance of Parasitic & protozoan diseases and cases of poisoning<br>• Theileriosis , babesiosis, other red water diseases, anaplasmosis, trypanosomiasis, toxoplasmosis, coccidiosis,<br>• Facioliasis, paramphistomiasis, ascariasis, gastro Intestinal nematodiasis, cestodiasis,<br>• Poison and toxin: cyanide, nitrite, strychnine , mercury, lead, arsenic, phosphorous, chlorinated hydrocarbons, organophosphate, snake bite and their symptoms and treatment, Insect bite<br>• **Clinical practice-** | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | o Epidemiological investigation, visit to hospital and field<br>o Attend health camps (vaccination, deworming, infertility, sample collection | | | |
| 8 | **Ethics and jurisprudence** | | **8** | **24** | **32** |
| | Apply and follow veterinary ethics and jurisprudence | **<u>Ethics and jurisprudence</u>**<br>• Legal duties of veterinarian,<br>• Legislations: animal health and livestock service act, animal slaughter house and meat inspection act and regulation, Nepal veterinary council act and regulation, bird Flu order, local administration act and regulation, and standards, muluki yii<br>• Animal welfare and its importance<br>• Forensic laws, acts and regulation: Techniques of soundness examination for animals ,clinical examination of injuries , causes of sudden animal death and their detection, post-mortem examination for detection of death cause , examination for frauds, malicious poisoning, bestiality, mischief and cruelty, poisoning drugs and their cautious use, insurance of livestock, OIE terrestrial animal health code and guidelines | | | |
| 9 | **Management** | | **8** | **22** | **30** |
| | Apply management skills/knowledge:<br>• Be familiar with Policies/ plans/organization structure/programs/ procedures/problems & issues/solution alternatives / legal status of veterinary services in Nepal<br>• Manage veterinary services center<br>• Manage veterinary sub-services center<br>• Manage veterinary hospital<br>• Manage slaughter house manage animal health | **<u>Management</u>:**<br>• Veterinary services in Nepal : policies, plans, organization structure, programs, procedures, problems & issues, solution alternatives and legal status<br>• Veterinary services center and sub center management in Nepal<br>• Veterinary hospitals management in Nepal<br>• Slaughter house management<br>• Animal health care management | | | |
| | | **Total:** | **96** | **372** | **468** |

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## 7. Veterinary laboratory technology

Total hours: 156 Total marks: 100
Theory hours: 32 Theory marks: 20
Practical hours:124 Practical marks: 80

**Description**: This course includes the knowledge and skills related to veterinary laboratory technology including Microbiology (General microbiology, immunology, Serology, Mycology and Virology), Parasitology (General Parasitology, Helminthology, External and Internal Parasites, blood protozoan), Pathology (General Pathology, Systemic Pathology) and Biochemistry (General biochemistry, physiological chemistry, clinical biochemistry). The course also includes type of tests available for the disease diagnosis in Nepal and their samples. It also includes collection, packing, labeling and dispatching of the clinical specimen.

**Objectives:**
Upon the completion of this course, student will be able to:

- Describe the laboratory procedure, safety measures, equipments preparation for lab testing
- Describe the sample collection techniques, packing, labeling of the clinical specimen
- Describe the major parasitological diseases, causative agent and proper samples
- Describe the major hematological and biochemistry and samples
- Describe the major microbiological diseases, causative agent and proper samples

| | Tasks/skills | Technical knowledge | Th | Pr | Total |
|---|---|---|---|---|---|
| | **General laboratory** | | **4** | **14** | **18** |
| 1. | • Explain general laboratory requirements(basic requirement for laboratory)<br>• State rule / regulations of the laboratory/ personnel behavior / clothing<br>• Handle/care / maintain laboratory equipments(such as: microscope, oven, centrifuge, water bath, incubator, autoclave, balance and deionizer) | **General laboratory**<br>• Laboratory equipments, type of room, general management, light facility, electricity facilities, washing facilities, water supply, tidiness<br>• Rule & regulations of the laboratory, personnel behavior and clothing<br>• Care & maintenance of laboratory equipments, such as: microscope, oven, centrifuge, water bath, incubator, autoclave, balance and deionizer<br>• Introduction and handling of microscope, assembling, care & management of microscope<br>• Use of different microscope ( fluorescent microscope, use dark | | | |

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|---|---|---|---|---|---|
| | | ground microscope) | | | |
| | **Bio-safety/Safety** | | **1** | **4** | **5** |
| 2. | • Describe bio-safety/safety measures in the laboratory<br>• Prepare disposal containers for sharp needles, broken glass<br>• Apply bio-safety/safety measures | **<u>Bio-safety/Safety</u>**<br>• Concept, needs/importance and application of bio-safety /safety<br>• Bio-safety/safety measures in the laboratory<br>• Hazards, first aid, dispatch of specimen, working practices, handling of pathological samples, disposal and decontamination of materials/specimen/working palace<br>• Preparation of disposal containers for sharp needles, broken glass | | | |
| | **Preparation of clean glass wares, cleaning and sterilization** | | **2** | **8** | **10** |
| 3. | • Prepare/clean glass wares<br>• Perform various sterilization techniques<br>• Sterilize glass wares<br>• Follow bio-safety/safety precautions | **<u>Cleaning and sterilization</u>**<br>• Techniques for washing and cleaning of laboratory glassware<br>• Sterilization techniques- drying, moist heat, dry heat, radiation, filtration, autoclave, hot air oven, filtration, chemical and boiling | | | |
| | **Postmortem technique, specimen collection & transportation** | | **2** | **8** | **10** |
| 4. | **Perform postmortem technique/ specimen collection / transportation**<br>• Perform preparation of PM room /handling / disposal of carcass<br>• Prepare equipment and container for PM<br>• Prepare preservatives for specimen collection<br>• Prepare fixative for pathological sample & worms and ticks<br>• Prepare container/bags / sterilized bottle for sample collection<br>• Perform collection of pathological samples for hematological/serological/ biochemical/bacteriological / histopathological tests<br>• Perform collection of external parasites/worms | **<u>Postmortem technique, specimen collection & transportation</u>**<br>• Preparation of PM room /handling / disposal of carcass<br>• Preparation of equipment and container for PM<br>• Preparation of preservatives for specimen collection<br>• Preparation of fixative for pathological sample & worms and ticks<br>• Preparation of container, bags & sterilized bottle for sample collection<br>• Collection of pathological samples- ( blood, urine, skin scraping, faecal, herbage sample, wound swab, pus swab, tracheal swab, body fluid, blood )<br>• Collection of external parasites/worms | | | |

| | | | | | |
|---|---|---|---|---|---|
| | **Biochemistry** | | **1** | **4** | **5** |
| 5. | • Explain basic biochemistry-<br>• Prepare different solutions<br>• Handle/ care maintain ph meter / distillation plant<br>• Identify/pecify use of colorimeter/ spectrometer/ dipstick/ series of turbid solution tubes/ sahlis haemometer anticoagulants mixture & solutions | **<u>Biochemistry</u>**<br>• Definition of biochemistry, importance of terms, and biochemistry in animal diseases<br>• Prepare different types of solutions, normal solution, molar solution, buffer solution and percentage solution (w/v, v/v),<br>• Use and maintenance of ph meter and distillation plant<br>• Use of colorimeter, spectrometer, dipstick, series of turbid solution tubes, sahlis haemometer anticoagulants mixture & solutions | | | |
| | **Immunology/ Serology** | | **4** | **12** | **16** |
| 6. | • Explain immunity/ type and principles of serological techniques<br>• Prepare reagents/ buffer used for ELISA test<br>• Perform ELIZA test/interpret the test result<br>• Prepare reagent / perform Agglutination test / Slide test/Plate test/ tube test | **<u>Immunology/ Serology</u>**<br>• Explain Antigen, Antibody, antigen antibody reaction,<br>• Principle of serological technique- direct and Indirect detection,<br>• Principle, test procedure and significant of Enzyme Linked Immunosorbent Assay (ELISA), HA/HI, AGID test<br>• Preparation of reagents, buffer used for ELISA test<br>• Perform ELIZA test, Interpret the Result<br>• Preparation of reagent and test Agglutination test , Slide test, Plate test, tube test | | | |
| 7. | **Introduction to parasitology** | | **1** | **4** | **5** |
| 8. | • Be familiar with parasitology<br>• Explain parasite-host-agent relationship<br>• Define related terminologies | **<u>Introduction to parasitology</u>**<br>• Define Parasitology<br>• Define: Parasitism - (Commensalism, Mutualism, Symbiosis,<br>• Define: Endo/Ecto parasites,<br>• Define: Obligatory/facultative parasites<br>• Temporary/periodic/permanent )<br>• Define: Parasites- (Occasional or accidental parasites, Pathogenic & nonpathogenic parasites)<br>• Define: Host- (Normal host, Intermediate host, Reservoir, | | | |

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| | | Vector) | | | |
| | **Introduction to internal parasites** | | **4** | **12** | **16** |
| 9. | • Explain life cycle/ susceptible species/ laboratory diagnosis / control of internal parasites<br>• Identify nematodes/ cestode/ trematodes<br>• Collect feces<br>• Examine ova of nematode/cestode<br>• Identify eggs | **<u>Introduction to internal parasites</u>**<br>• Define life cycle, susceptible species, laboratory diagnosis and control of internal parasites and identify Nematodes, Cestode, Trematodes<br>• Collection methods of feces,<br>• Examination of ova of nematode, cestode and trematodes by using various technique<br>• Eggs identification | | | |
| | **Introduction to protozoan parasites** | | **3** | **10** | **13** |
| 10. | • Explain life cycle/ susceptible species/ diagnosis/laboratory diagnosis / control of protozoan parasites<br>• Collect specimens<br>• Prepare / preserve blood smear(thick and thin smears)<br>• Perform packing/dispatching to laboratory<br>• Perform staining techniques( Liesmans / Giemsa staining)<br>• Perform test by using various techniques( for Coccidia, Babesia, Theleria, Anaplasma)<br>• Identify Trypanosomes | **<u>Introduction to protozoan parasites</u>**<br>• Collection of specimen<br>• Preparation and preservation of blood smear, (thick and thin smears)<br>• Packing and dispatching to laboratory<br>• Staining techniques- Liesmans and Giemsa staining<br>• Tests by using various techniques for Coccidia, Babesia, Theleria, Anaplasma<br>• Trypanosomes- concept, identification and importance | | | |
| | **Introduction to External parasites** | | **1** | **4** | **5** |
| 11. | • Explain types of external parasites<br>• Identify external parasites<br>• Collect flea/ticks<br>• Prepare preservative for external parasites<br>• Perform skin scraping<br>• Perform preservation / dispatch / testing | **<u>Introduction to external parasites</u>**<br>• Identification of external parasites<br>• Collection of flea and ticks<br>• Preparation of preservative for external parasites<br>• Skin scraping<br>• Preservation, dispatch & testing | | | |
| | **Introduction of Haematology ( Blood, Serum & plasma)** | | **3** | **14** | **17** |

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| 12. | **Perform haematological tests (Total WBC, Total RBC, Total Platelets count)**<br>• Be familiar with the definition/ appearance/composition / functions of blood, plasma, serum and storage of blood serum.<br>• Collect blood from different species of animal using syringe / vacutainer<br>• Separate plasma and serum<br>• Perform packing / storage of blood<br>• Dispose sharp needles<br>• Perform total (RBC,WBC and Platelets) count/ calculate the result<br>• Prepare / examine Leismans staining-thin blood smears | **<u>Haematology ( blood, serum & plasma)</u>**<br>• Definition, appearance, composition and functions of blood, plasma, serum and storage of blood serum.<br>• Collection of blood from different species of animal using syringe and vacutainer<br>• Separati0n of plasma and serum<br>• Packing and storage of blood, dispose of sharp needles,<br>• Total count (RBC,WBC and Platelets count), calculation of the results<br>• Prepartion and examination of Leismans staining-thin blood smears | | | |
| | **Microbiology- Basic techniques for staining methods** | | **3** | **14** | **17** |
| 13. | • Explain basic microbiology and staining methods for identification of bacteria<br>• Prepare staining solutions<br>• Perform Methylene blue staining,/Grams staining,/Zehl-Neelsen staining<br>• Perform fungal test /observe under microscope | **<u>Staining methods and tests</u>**<br>• Concept, need & importance of micologuy /basic techniques for staining methods<br>• General introduction of staining methods for bacterial, fungal and viral diseases<br>• Preparation of staining solutions and performing tests such as Methylene blue staining, Grams staining, Zehl-Neelsen staining<br>o Fungal tests<br>o Observe under microscope | | | |
| | **Introduction to Media and Biochemical tests** | | **3** | **14** | **17** |
| 14. | • Explain types of media / their importance for different biochemical test<br>• identify types of media<br>• classify media (selective, enriched, basic, differential, transport and enrichment)<br>• Prepare reagent and media (blood agar and Maconkey | **<u>Media and Biochemical tests</u>**<br>• Importance and types of media<br>• Classification of media (selective, enriched, basic, differential, transport and enrichment)<br>• Preparation of reagent and media (blood agar and Maconkey agar, nutrient broth, slant agar tubes, semisolid media).<br>• Sterilization and test of sterility of | | | |

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| | agar, nutrient broth, slant agar tubes, semisolid media).<br>• Sterilize / test the sterility of the media and their storage<br>• Perform tests (Catalase, Coagulase, Oxidase, Indole tests/Methyl red and vogas proskeur (MR VP), Citrate, Oxidation and fermentation tests/ Hydrogen sulphide test/ Oxidation and fermentation tests)<br>• State principle/procedure / preparation of Muller Hilton agar and antibiotic disc<br>• Prepare the antibiotics disc<br>• Perform antibiotic sensitivity tests, disc diffusion test<br>• Interpret the results | the media and their storage<br>• Tests: Catalase, Coagulase, Oxidase, Indole test, Methyl red and vogas proskeur (MR VP), Citrate, Oxidation and fermentation test, Hydrogen sulphide test, Oxidation and fermentation test<br>• Principle, procedure and preparation of Muller Hilton agar and antibiotic disc.<br>• Preparation of antibiotics disc<br>• Antibiotic sensitivity tests, disc diffusion test<br>• Interpret the result | | | |
| | | **Total:** | **32** | **12 4** | **156** |

**References:**


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## 8. General veterinary pharmacology

Total: 78 Total: 50
Theory: 16 Theory: 10
Practical: 62 Practical: 40

**Description**:
This course includes the knowledge and skills related to basic veterinary pharmacology, chemotherapy and toxicology.

**Objectives**:
Upon the completion of this course, student will be able to:

- State pharmacological properties of drugs, formulate and store drugs, and dispense drugs as per prescription.
- Explain and suggest drugs acting on body systems
- Explain and suggest antibacterials, antifungals, anthelmintics, antiprotozoals, ectoparacidals, and antiseptics and disinfectants
- State basic concepts of toxicology

| | | | Time (Hrs.) | | |
|---|---|---|---|---|---|
| **S.N.** | **Tasks/Skills** | **Technical knowledge** | **Th.** | **Pr.** | **Tot.** |
| 1 | Be familiar with basic concept and terms used in Veterinary Pharmacology | **Basic concepts of veterinary pharmacology**<br>• History of Pharmacology<br>• Branches and Scope of Pharmacology<br>• Some terms used in Veterinary Pharmacology<br>• Sources of drugs<br>• Principles of drug administration, different routes of drug administration.<br>• Absorption, distribution, metabolism and excretion of drugs administered by different routes | 1.4 | 5.6 | 7 |
| 2 | Identify/use pharmacological apparatus | Pharmacological apparatus, their identification and usages | 0.2 | 0.8 | 1 |
| 3 | Describe the role of veterinary drugs | **Role of veterinary drugs**<br>• Introduction<br>• Classification of veterinary drugs<br>• Common veterinary drugs available in the market<br>• Generic and brand names<br>• Safe use of chemicals and medicines | 1.4 | 5.6 | 7 |
| 4 | Prepare a veterinary drug index | Preparation of veterinary drug index | 0.4 | 1.6 | 2 |
| 5 | Make some formulations in the laboratory | **Formulation of some drugs**<br>• Method of preparation of potassium permanganate solution, | 0.8 | 3.2 | 4 |

| | | | | | |
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| | | tincture iodine, golden lotion, iodine ointment, eye lotion, turpentine liniment, boric acid ointment, zinc oxide ointment | | | |
| 6 | Follow prescriptions | **Following of prescriptions**<br>• Introduction, writing a prescription<br>• Reading of prescription | 1.0 | 2.0 | 3 |
| 7 | Store medicines | **Storage of medicines**<br>• Read labels and follow directions<br>• Store medicines: Protection from direct sunlight, moisture, vermin<br>• Arrangement of the stock in the store | 0.4 | 1.6 | 2 |
| 8 | Explain side effects of drugs | **Side effects of drugs**<br>• Allergic reactions of drugs<br>• Restriction of use of antibiotic in ruminants<br>• Antimicrobial resistance | 0.4 | 1.6 | 2 |
| 9 | Calculate drug dosage | **Calculation of drug dosage**<br>• Determine approximate weight of the animal<br>• Calculate the dosage of drug, vaccine or biological<br>• Concept of drug measurements (µg, mg, ml, L, g, I.U.); Use of conversion table | 0.4 | 1.6 | 2 |
| 10 | Administer drugs orally | **Oral drug administration**<br>• Feeding of tablet, bolus, powder, capsule, etc. with feed and water<br>• Drenching of liquid medicine with drenching pipe/gun; Use of stomach tube<br>• Precaution to be taken during drenching | 0.6 | 2.4 | 3 |
| 11 | Administer drugs by injection | **Administration of drugs by parenteral route**<br>• Cleaning of needles and syringes<br>• Mixing medicines<br>• Intramuscular, subcutaneous and intravenous injections | 1.6 | 6.4 | 8 |
| 12 | Administer drugs locally | **Local administration of drugs**<br>Use of ointment, liniments; Topical use of antiseptic, eye and ear drops | 0.4 | 1.6 | 2 |
| 13 | Explain action of drugs acting on skin and mucous membrane, blood, digestive system, respiratory system and urinary system | **Basic pharmacology of drugs acting on skin and mucous membrane, blood, digestive, respiratory and urinary system**<br>• Drugs acting on skin and mucous membrane<br>• Anticoagulants and hemopoeitic drugs | 1 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| | | • Some important drugs acting on digestive, respiratory and urinary systems | | | |
| 14 | Explain action of antipyretic, analgesic and antiinflammatory drugs | **Basic concept of action of antipyretic, analgesic and antiinflammatory drugs**<br>• Pharmacology of antipyretic drugs<br>• Pharmacology of analgesics<br>• Pharmacology of antiinflammatory drugs | 1 | 4 | 5 |
| 15 | Be familiar with basic concept and terminologies related to chemotherapy | **Basic concepts of chemotherapy**<br>• Chemotherapy: Introduction and its principles<br>• Drug resistance and ways to reduce drug resistance | 0.4 | 1.6 | 2 |
| 16 | Be familiar with antibiotics, and antibacterial, antifungal and antiprotozoal agents | **Antibiotics, antifungal and antiprotozoal agents**<br>• Antibiotic groups and their general mechanism of action<br>• Antifungal and Antiprotozoal agents | 1 | 4 | 5 |
| 17 | Be familiar with anthelmintics, ectoparacidals, and antiseptic and disinfectants | **Anthelmintics, Ectoparacidals, Antiseptic and disinfectants**<br>• Anthelmintics; Resistance against anthelmintics<br>• Ectoparacidals: Definition, Type and Application<br>• Definition, Classification and Application of Antiseptics and Disinfectants | 1 | 4 | 5 |
| 18 | Be familiar with terms used in and basic concept of toxicology | **Basic concepts of Toxicology**<br>• Introduction; Terms used in toxicology<br>• Sources of poisoning<br>• Line of treatment in poisoning<br>• Identification of antidotes and their use in toxicological cases | 0.8 | 3.2 | 4 |
| 19 | Identify locally available medicinal plants | **Medicinal plants**<br>• Morphology of locally used medicinal plants<br>• Plant parts used for medicinal purpose<br>• Use in common diseases and disorders<br>• Methods of preparation<br>• Dose and frequency<br>• Precaution during usage | 1.8 | 7.2 | 9 |
| | | **Total:** | 16 | 62 | 78 |

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# 9. Theriogenology and Basic Surgery

Theory: 32 hrs. Theory: 20
Practical: 124 hrs. Practical: 80
Total: 156 hrs. Total: 100

**Description:**
This course includes thee knowledge and skills related to animal reproduction, gynecology & obstetrics, and andrology & artificial insemination, basic surgery and radiology.

**Objectives:**
Upon the successful completion of this course, student will be able to:

- Describe the structure of reproductive system and understand the roles of hormones on reproductive system.
- Diagnose pregnancy
- Correct cases of prolapse
- Explain anestrous, infertility, repeat breeding and abortion
- Sterilize the Artificial Insemination (Al) and A.V. equipment, and gain the knowledge on collection, evaluation, preservation of semen as well as conduction of Al**.**
- Identify the general surgical conditions, and be familiar with anaesthetic emergencies and their management
- Take X-ray of affected parts and explain about radiological hazards and preventive techniques.
- Diagnose and correct the fracture and some basic surgical problems

| | | | Time (hrs.) | | |
|---|---|---|---|---|---|
| S.N. | Tasks/Skills | **Technical knowledge** | Th. | Pr. | Tot. |
| 1 | Be familiar with the concept of animal reproduction/ gynecology | **<u>Basic concepts of animal reproduction/ gynecology</u>**<br>• Introduction and definition of animal reproduction, gynecologyand obstetrics, and andrology<br>• Development of ovaries and female genital tract<br>• Development of testes and male genital tract<br>• Physiology of reproductive hormones hypothalamic and pituitary hormones<br>• Puberty and sexual maturity<br>• Oogenesis and ovulation<br>• Fertilization and zygote formation<br>• Position of foetus in uterus<br>• Mammary gland and lactation<br>• Period of organogenesis<br>• Foetal membranes and placenta | 1.6 | 6.4 | 8 |
| 2 | Perform study of the bony pelvis and its associated | **<u>Bony pelvis and its associated structures</u>** | 0.8 | 3.2 | 4 |

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|---|---|---|---|---|---|
| | structures | • Study of the bony pelvis and its associated structures | | | |
| 3 | Detect heat by external signs | **Detection of heat**<br>• Oestrous cycle<br>• Importance of heat detection<br>• Signs and symptoms of heat in cattle/buffalo | 0.4 | 1.6 | 2 |
| 4 | Detect standing heat on cow/buffalo and yak/chauri | **Detection of standing heat**<br>• Detection of heat by use of a teaser<br>• Mounting to other animals | 0.2 | 0.8 | 1 |
| 5 | Collect/ examine vaginal mucous | **Vaginal mucous**<br>• Collection and examination vaginal mucous | 0.4 | 1.6 | 2 |
| 6 | Perform study of the different organs of female reproductive system (slaughter house material) | **Organs of female reproductive system**<br>• Study of the different organs of female reproductive system (slaughter house material) | 0.8 | 3.2 | 4 |
| 7 | Perform study of the contents of the pelvis through rectal palpation | **Contents of the pelvis**<br>• Study of the contents of the pelvis through rectal palpation | 0.4 | 1.6 | 2 |
| 8 | Perform study of the organs of reproductive system by rectal palpation | **Organs of reproductive system & rectal palpation**<br>• Study of the organs of reproductive system by rectal palpation | 0.8 | 3.2 | 4 |
| 9 | Explain Artificial Insemination (AI) | **AI concept**<br>• Introduction, history, advantages and disadvantages of AI | 0.2 | 0.8 | 1 |
| 10 | Explain steps of AI | **Steps of AI**<br>• Sterilize AV equipment<br>• Assembling of AV set<br>• Semen collection<br>• Evaluation, Dilution and Storage | 0.8 | 3.2 | 4 |
| 11 | Perform live and dead count of spermatozoa | **Sperm count**<br>• Live and dead sperm count | 0.4 | 1.6 | 2 |
| 12 | Inseminate cow by AI method | **AI technique**<br>• Insemination techniques<br>• Sterilization and assembling of AI gun<br>• Thawing, loading and insemination | 1.2 | 4.8 | 6 |
| 13 | Detect proper time of AI | **Detection of proper time of AI**<br>• Breeding behavior<br>• History taking form owner<br>• Examination of vaginal mucosa | 0.6 | 2.4 | 3 |
| 14 | Observe normal parturition | **Parturition**<br>• Parturition and its stages<br>• Observation of normal parturition | 0.4 | 1.6 | 2 |
| 15 | Identify gynecological and obstetrical instruments | **Gynecological and obstetrical instruments**<br>• Identification of gynecological and obstetrical instruments | 0.4 | 1.6 | 2 |
| 16 | Perform pregnancy | **Pregnancy diagnosis** | 1.2 | 4.8 | 6 |

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| | diagnosis | • Concept, principle and methods of pregnancy diagnosis | | | |
| 17 | Be familiar with Vaginitis, Metritis and Endometritis | **Vaginitis, Metritis and Endometritis**<br>• Introduction of Vaginitis, Metritis and Endometritis<br>• Irrigating the uterus having endometritis with normal saline solution | 0.4 | 1.6 | 2 |
| 18 | Explain anestrous, infertility, repeat breeding and abortion | **Anestrous, infertility, repeat breeding and abortion**<br>• Introduction, causes, symptoms and prevention of anestrous, infertility and repeat breeding in farm animals<br>• Introduction and causes of abortion, precautions to be taken | 0.8 | 3.2 | 4 |
| 19 | Correct uterine/vaginal prolapse | **Correction of uterine/vaginal prolapse**<br>• Introduction, causes, correction techniques<br>• Precautions to be taken | 0.8 | 3.2 | 4 |
| 20 | Assist for correction of retained placenta | **Retention of placenta**<br>• Introduction, causes, correction techniques<br>• Precautions to be taken | 0.8 | 3.2 | 4 |
| 21 | Assist to handle cases of Dystocia | **Dystocia**<br>• Various fetal presentations<br>• Manipulative delivery of fetal malpresentations<br>• Precautions to be taken during handling of cases of dystocia | 1.2 | 4.8 | 6 |
| 22 | Assist to perform various gynecological operations | **Gynecological operations**<br>• Performing of various gynecological operations | 1.6 | 6.4 | 8 |
| 23 | Assist to perform post operative care | **Post operative care**<br>• Post operative care: concept, needs and procedures | 0.4 | 1.6 | 2 |
| | **Veterinary surgery** | | 0 | 0 | 0 |
| 24 | Be familiar with the basic concept of veterinary surgery | **Basic concept of veterinary surgery**<br>• Introduction, history, classification, and development of veterinary surgery<br>• General surgical principles, pre and post operative considerations<br>• Asepsis, antiseptics and their application in veterinary surgery<br>• Sterilization of surgical materials and instruments:<br>o Physical methods<br>o Chemical methods<br>o Radiation | 1 | 4 | 5 |
| 25 | Identify common | **Equipment and instrument** | 0.2 | 0.8 | 1 |

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| | equipment/ surgical instruments | • Identification of common equipments and surgical instruments | | | |
| 26 | Make knots and observe basic suture patterns | **Knots and basic suture patterns**<br>• Suturing materials<br>• Knots and basic suture patterns | 0.6 | 2.4 | 3 |
| 27 | Identify the general surgical conditions | **General surgical conditions**<br>• Inflammation<br>• Abscess, haematoma, and their treatment<br>• Wound: Classification, symptoms, diagnosis and preliminary treatment<br>• Complication of wound and their prevention and remedies<br>• Hemorrhage, hemostasis and shock<br>• Burn and scalds, frost bite, sinus and fistula and their preliminary treatment<br>• Yoke gall/sore neck: Introduction, causes, symptoms, first aid of yoke gall | 1.2 | 4.8 | 6 |
| 28 | Conduct fluid therapy | **Fluid therapy**<br>• Concept and application of fluid therapy<br>• Principles and procedures of fluid therapy | 0.4 | 1.6 | 2 |
| 29 | Be familiar with anesthetic agents | **Basic concepts of anesthetic agents**<br>• General consideration and types of anesthesia<br>• Preparation of patient for anesthesia<br>• Stages of general anesthesia<br>• Anesthetic emergencies and management | 0.6 | 2.4 | 3 |
| 30 | Restrain different species of animals | **Restraints**<br>• Restraints of different species of animal | 0.8 | 3.2 | 4 |
| 31 | Prepare/ sterilize surgical packs | **Surgical packs and sterilization**<br>• Preparation of surgical packs and sterilization | 0.4 | 1.6 | 2 |
| 32 | Administer drugs by different routes | **Drugs administration**<br>• Administration of drugs by different routes | 0.8 | 3.2 | 4 |
| 33 | Perform passing of stomach tube | **Stomach tube passing**<br>• Passing of stomach tube | 0.4 | 1.6 | 2 |
| 34 | Be familiar with anaesthetic apparatus/ endo-tracheal device/ laryngoscope | **Anaesthetic apparatus, endo-tracheal device, laryngoscope**<br>• Familiarization with anaesthetic apparatus, endo-tracheal device, laryngoscope | 0.2 | 0.8 | 1 |
| 35 | Be familiar with chemical methods of restraints of zoo | **Chemical methods of restraints**<br>• Chemical methods of restraints of | 0.8 | 3.2 | 4 |

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| | / wild animals (visit to a wild animal facility envisaged) | zoo and wild animals (visit to a wild animal facility envisaged) | | | |
| 36 | Take X-ray of affected parts and explain about radiological hazards and preventive techniques | **Basic Veterinary Radiology**<br>• Working principles of X-ray machine, radiographic accessories and dark room equipment<br>• Positioning and radiography of different parts of body in small and large animals<br>• Handle and view X-ray film<br>• Factors influencing production of radiograph (Radiographic factors, photographic factors etc.)<br>• Radiological hazards and preventive techniques | 2 | 8 | 10 |
| 37 | Apply cold / hot application/massages and planned exercise | **Cold and hot application, massages and planned exercise**<br>• Use of cold and hot application, massages and planned exercise | 0.4 | 1.6 | 2 |
| 38 | Diagnose / correct simple limb fracture | **Fracture**<br>• Fracture and classification<br>• Plaster of Paris bandage and use of splint in calves/non-ruminants | 0.8 | 3.2 | 4 |
| 39 | Diagnose/ correct / some basic surgical problems | **Surgical problems of foot and horns**<br>• Anatomy of foot, examination of foot, treatment of avulsion of hoof and declawing<br>• Horns: Avulsion of horns, debudding and amputation (Saw/Fetotomy wire methods) | 1.2 | 4.8 | 6 |
| 40 | Perform exploration of the mouth / use various mouth gags | **use of various mouth gags**<br>• Exploration of the mouth and use of various mouth gags | 0.4 | 1.6 | 2 |
| 41 | Be familiar with various orthopaedic instruments | **Orthopaedic instruments**<br>• Familiarisation with various orthopaedic instruments | 0.2 | 0.8 | 1 |
| 42 | Perform tooth rasping | **Tooth rasping**<br>• Concept, need and process of tooth rasping | 0.2 | 0.8 | 1 |
| 43 | Perform Closed castration in ruminants and open castration in pigs | **Castration**<br>• Closed castration<br>• Open castration | 1.6 | 2.4 | 4 |
| 44 | Perform Examination of horses for soundness | **Horse examination**:<br>• Examination of horses for soundness | 0.4 | 1.6 | 2 |
| 45 | Assist in carrying out surgical operations | **Surgical operations**<br>• Concept, needs and importance<br>• Assistance in carrying out different surgical operations | 0.8 | 3.2 | 4 |
| | | | 32 | 124 | 156 |

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# 21. On the job training (OJT)

Total: 480 hrs. Total: 300 marks.
Theory: 0 Theory: 0
Practical: 480 hrs. Practical: 300 marks

**Description:**
This includes skills/tasks related to prevention of animal diseases, treatment of bacterial diseases of animals, treatment of viral diseases of animals, treatment of fungal diseases of animals, treatment of protozoan diseases of animals, treatment cases of external parasites in farm animals, treatment cases of helminth/internal parasites in farm animals, treatment of metabolic/nutritional diseases of animals, treatment of gynecological diseases of animals, treatment of non-specific diseases of animals, livestock management, primary surgical services to livestock, basic veterinary laboratory bench works, pathological specimens/samples, livestock breeding, feeding livestock, and communication.

**Objectives:**
On completion of this training, the students will be able to:

- Prevent animal diseases
- Treat diseases of animals (bacterial / viral /fungal / protozoan/ metabolic/nutritional / gynecological /non-specific diseases)
- Treat cases of external parasites in farm animals
- Treat cases of helminth/internal parasites in farm animals,
- Apply livestock management,
- Provide primary surgical services to livestock,
- Perform basic veterinary laboratory bench works,
- Collect pathological specimens/samples,
- Perform livestock breeding,
- Feed livestock,
- Perform communication.

**List of skills/tasks to be reviewed/practiced/re-practiced during OJT:**

**1: Prevention of animal diseases**

1. Suggest for prevention of livestock diseases
2. Vaccinate animals against FMD
3. Vaccinate animals against HS
4. Vaccinate animals against BQ
5. Vaccinate animals against Rabies
6. Vaccinate animals against Swine Fever
7. Vaccinate animals against Anthrax
8. Vaccinate animals against PPR
9. Vaccinate animals against Rani-khet
10. Vaccinate animals against Fowl Pox
11. Vaccinate animals against Gumboro
12. Drench/deworm animals
13. Perform dipping/dusting/spraying
14. Perform hygiene sanitation
15. Identify common livestock diseases

**2: Treatment of Bacterial diseases of animals**

1. Diagnose/treat HS
2. Diagnose/treat BQ

3. Diagnose/treat Anthrax
4. Diagnose/treat Mastitis
5. Diagnose/treat Calf Scour
6. Diagnose/treat Enterotoxaemia
7. Diagnose/treat Salmonellosis
8. Diagnose/treat Fowl Cholera
9. Diagnose/treat Swine Erysepelas
10. Diagnose/treat Navel ill
11. Diagnose/treat Tetanus

**3: Treatment of viral diseases of animals**

1. Diagnose/treat FMD
2. Diagnose/treat RP
3. Diagnose/treat PPR
4. Diagnose/treat Rabies
5. Diagnose/treat Fowl Pox
6. Diagnose/treat Rani Khet
7. Diagnose/treat ephemerial fever
8. Diagnose/treat Orf.
9. Diagnose/treat Swine Fever

**4: Treatment of fungal diseases of animals**

1. Diagnose/treat Ring worm

**5: Treatment of protozoan diseases of animals**

1. Diagnose/treat Coccidiosis
2. Diagnose/treat Babesiosis
3. Diagnose/treat Thileriosis
4. Anaplasmosis
5. Diagnose/treat Trypanosomiasis

**6: Treatment cases of external parasites in farm animals**

1. Treat cases of Ticks in farm animals
2. Treat cases of Lice in farm animals
3. Treat cases of Fleas in farm animals
4. Treat cases of Mites in farm animals
5. Treat cases of Leech in farm animals
6. Treat cases of Maggots in farm animals

**7: Treatment cases of Helminth/internal parasites in farm animals**

1. Treat cases of Liver Fluke in farm animals
2. Treat cases of Round Worm in farm animals
3. Treat cases of Haemonchosis in farm animals
4. Treat cases of Tape Worms in farm animals

**8: Treatment of Metabolic/Nutritional diseases of animals**

1. Diagnose/treat Milk Fever
2. Diagnose/treat Ketosis
3. Diagnose/treat Tympanitis
4. Diagnose/treat Rickets
5. Diagnose/treat Pica
6. Diagnose/treat Vitamin-A deficiency
7. Diagnose/treat Anemia

**9: Treatment of Gynecological diseases of animals**

1. Diagnose/treat Dystokia
2. Diagnose/treat Anestrus
3. Diagnose/treat Retained placenta

**10: Treatment of Non-specific diseases of animals**

1. Diagnose/treat Fever
2. Diagnose/treat Diarrhea
3. Diagnose/treat Dysentery
4. Diagnose/treat Constipation
5. Diagnose/treat Dehydration
6. Diagnose/treat Anorexia
7. Diagnose/treat vomition
8. Diagnose/treat Choke
9. Diagnose/treat Haumaturia
10. Diagnose/treat Retention of urine
11. Diagnose/treat Pneumoni

**11: Livestock management**

1. Identify body parts of animals
2. Restrain/handle farm animals
3. Castrate male farm animals
4. Perform numbering of farm animals
5. Perform dehorning/debudding of farm animals
6. Perform debeaking of poultry
7. Perform hoof-trimming of farm animals
8. Determine age of farm animals by dentation
9. Determine live weight of farm animals by measurement
10. Carry out care/management of new born
11. Clean/disinfect farm animal houses
12. Fumigate poultry birds
13. Select/cull farm animals/birds
14. Prepare/maintain veterinary/livestock records
15. Identify the milch animals from external observations
16. Manage sick/pregnant/milking animals
17. Calculate space requirement for farm animals/birds
18. Determine/manage housing requirements for livestock
19. Identify market of livestock/ livestock products

**12: Primary surgical services to livestock**

1. Perform suturing to injured animals
2. Perform dressing of wounds
3. Correct/treat prolapsed of anus/vagina
4. Perform splinting/plastering in cases of fractures
5. Administer drugs from various routes
6. Perform haemostatic measures in bleeding animals
7. Treat Mastitis/Tympanitis/Urolithiasis/suspension of urine
8. Treat Yoke gall necrosis
9. Sterilize equipment/animal tissue
10. Perform treatment of pre/post operative cases
11. Castrate pig by open method
12. Apply anesthesia for the treatment of wounds/fractures

**13: Basic veterinary laboratory bench works**

1. Collect tools/materials/equipment for a simple vet. Lab
2. Wash lab wares
3. Sterilize lab wares
4. Maintain microscope/centrifuge
5. Prepare stain smears
6. Detect mastitis by CMT
7. Detect helminthes' eggs in faeces
8. Prepare report of faecal examination
9. Keep work records
10. Apply safety measures in the lab

**14: Pathological specimens/samples**

1. Prepare different concentration of formalin
2. Collect/preserve/dispatch parasitic specimens
3. Collect skin scrapings
4. Identify major abnormalities in organs of livestock
5. Collect specimens/samples for histopathology
6. Collect specimens/samples for microbiology
7. Collect blood samples
8. Prepare/fix blood smears
9. Separate serum from coagulated blood
10. Collect faecal samples
11. Collect urine sample for routine examination

**15: livestock breeding**

1. Identify breeds of livestock
2. Select breeding males
3. Select breeding females
4. Identify/draw/illustrate reproductive systems of animals
5. Determine puberty/heat symptoms/estrous cycle/gestation period in animals
6. Manage mating/re-mating of animals
7. Assist for AI
8. Select broody hens
9. Select hatching eggs
10. Identify incubator/brooder

**16: Feeding livestock**

1. Identify important fodder trees
2. Identify grasses/legumes
3. Inoculate legume seeds
4. Perform pitting/planting of fodder tree saplings
5. Manage nursery
6. Make hay
7. Make silage
8. Prepare urea/molasses/mineral blocks
9. Calculate feed requirements
10. Prepare feeds/rations
11. Identify nutrient contents in feeds/rations
12. Carrying out feeding/watering

**17: Communication**

1. Take case history of animals in the disease out break area
2. Perform clinical examination for investigation
3. Collect samples for investigation
4. Perform preliminary investigation of disease out break
5. Report the disease to the concerned
6. Keep simple records of animal diseases
7. Create animal health awareness in farming community
8. Organize/help DLSO for extension activities
9. Maintain linkages among farmers/VAHWs?/DLS authorities
10. Conduct farmers meetings

**Personnel involved**

The council for technical education and vocational training (CTEVT) extends heartfelt thanks to the following experts (content and process experts) who contributed a lot while developing this curriculum:

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