Learning Objectives

The students are expected to:

- Have a thorough understanding of regulatory mechanisms that control various reproductive processes in cattle and buffaloes.
- Be able to make rational use of reproductive hormones for enhancing reproductive efficiency in cattle and buffaloes.
- Be able to suggest estrus synchronization programs for dairy cattle and buffaloes.

Theory

An overview of reproductive endocrinology: GnRH, gonadotropins (pituitary and placental); gonadal steroids and prostaglandins. Onset of puberty in cattle and buffaloes; bovine sexual cycle; Dynamics of follicular development; Oocyte growth, maturation and mechanism of ovulation; Estrus and ovulation synchronization strategies using progestogens, prostaglandin, GnRH and non-hormonal methods; Conceptus development and hormonal changes during pregnancy; Parturition and its management; Post-partum involution and ovarian activity; Effect of environment (heat stress, photoperiod, social factors etc.) on bovine reproductive performance; Reproductive efficiency in cattle and buffalo farming.

Practical

Physiological anatomy and histology of reproductive system of cattle and buffalo; Progesterone assay for estrus detection; Estrous cycle monitoring through rectal palpation and ultrasonography; Pregnancy diagnosis in the clinic.

Suggested Readings:

2. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives
The students are expected to:

- Have an up-to-date knowledge about the history, development and techniques of AI and selection criteria of breeding bulls
- Be able to collect & process the semen and perform artificial insemination (AI).

Theory
History, scope and development of artificial insemination; Genetics and sire selection; Puberty onset in male; Formation, migration and maturation of spermatozoa; Male sexual behaviour, erection and ejaculation; Maintaining libido; Significance of semen quality; Management and environmental factors affecting the reproductive efficiency of the male.
Evaluation of reproductive health status of female; insemination techniques; Factors affecting conception rate in artificial insemination; Control of estrus cycle in small ruminants; Organization of artificial insemination and record keeping; Economics of artificial insemination.

Practical
Washing and sterilization of equipment; Breeding soundness examination of the bull; Collection of semen and its evaluation; Evaluation of stored semen (post-thaw quality); Handling of semen in the field; Estrus detection and timing of insemination; Synchronization of estrus; rectal palpation; Insemination techniques in experimental animals and in the clinic; Case recording for AI.

Suggested Readings

2. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives
The students are expected to:
- Have a brief but comprehensive understanding of mechanisms that regulate the reproductive processes in buffaloes, cows, equines, dogs, cats, camels, sheep and goats in comparative terms.
- Be able to understand and suggest breeding protocols for different animal species.

Theory
Prenatal and postnatal development of gonads; Comparative aspects of reproductive anatomy and endocrinology in different species; Differences in hypothalamo-pituitary axis; photoperiodicity and sexual season; Sexual maturity and behavior; Reproductive cycles: ovulation; fertilization; cleavage; implantation; gestation; parturition and involution. Variations in sperm morphology and semen composition in different species; Physiological and endocrinological aspects of fertility and infertility in different species of animals.

Practical
Comparative functional anatomy of male and female reproductive organs; Types of placenta in different species; Comparison of semen characteristics among different species; Comparative reproductive behavior of different species; Pregnancy tests in different species.

Suggested Readings:
2. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives

The students are expected to:

- Have the advanced theoretical knowledge about the various biochemical constituents of the sperm and the seminal plasma.
- Be able to formulate suitable extenders for preservation of semen in liquid and frozen forms.

Theory

Contribution of various parts of the male reproductive tract to semen; Organic and inorganic constituents (including hormones and enzymes) of the sperm cell and seminal plasma; Physiochemical properties of semen; viscosity & specific gravity; osmotic pressure; pH; electrical conductivity and buffer system in semen. Energy production, transfer; storage and utilization system in spermatozoa. Metabolism of spermatozoa; glycolysis; respiration; aerobic glycolysis; Factors influencing metabolic rate of spermatozoa.

Suggested Readings:

1. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives
The students are expected to:
- Know the recent developments in the area of semen preservation.
- Be able to prepare extenders, process and handle the semen for better fertility results in the field.

Theory
Theory of cooling and freezing of semen. Extenders and extension of unfrozen semen; Extenders, buffers and cryoprotectants for frozen semen. Processing; extension; equilibration; Methods of deep freezing of semen. Storage and thawing of deep frozen semen.

Practical
Semen collection, evaluation and modern assays; determination of pH and osmotic pressure of semen diluters; Care and handling of apparatus for semen processing. Preparation of different types of extenders for liquid and frozen semen. Deep freezing and thawing of deep frozen semen by different methods; Assessment of post thaw semen quality; Recent techniques of spermatozoa quality assessment (hypo-osmotic swelling; computer assisted semen analysis (CASA); flow cytometry).

Suggested Readings:
1. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives
The students are expected to:
- Have the advanced knowledge of various obstetrical problems in small and large animals.
- Be able to efficiently handle these problems for preserving the future breeding ability of the animal.

Theory
Obstetrical procedures, their economic importance and preferences; Recent advances related to gestational problems: prevalence and temporal trends of dystocia; Different types of dystocia and associated risk factors; Methods of manipulation of dystocia; Indications and methods of induction of parturition in mature and premature pregnancies; Manipulative procedure for per vaginal delivery; Injuries during handling of dystocia; Preventive and treatment procedures of diseases incidental to parturition; Care and management of newborn; Strategies regarding diagnosis, treatment and prevention of various puerperal disorders.

Practical
Obstetrical maneuvers; practice of various manipulative procedures; Use of various obstetrical instruments; Handling of obstetrical cases (abortion; torsion of the uterus; vagino-cervical & uterine prolapse; hydro-allantois; hydro-amnion; mummification and maceration of foetus); Operative interventions.

Suggested Readings:
1. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives

The students are expected to:
- Have up-to-date knowledge about various reproductive problems which result in infertility.
- Be able to suggest appropriate measures for the management/treatment of these problems.

Theory

General aspects of infertility in male and female animals and its economic importance; Causes of infertility; hereditary and environmental factors and their combination; Malformations of the sexual organs; Infertility due to malnutrition. Pathological changes in the male and female sexual organs; Factors affecting estrus and ovulation; Endocrine imbalance in the female; Anestrus and its management; Infertility due to bacterial, viral, fungal and protozoal causes; Pregnancy toxemia; Factors affecting serving ability, semen production ability and spermatogenesis in male animals; Infectious and non-infectious infertility in male animals; Effect of organic pollutants on male and female reproductive organs.

Practical

Evaluation of male and female animals for fertility and infertility; Diagnosis and treatment of gynecological disorders; Diagnosis of infectious infertility and various causes of abortion; Histopathological investigations of gonads; Methods for collection of samples for laboratory diagnosis; Isolation; identification and serological tests for genital infections.

Suggested Readings:
2. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objectives
The students are expected to:
- Have a comprehensive knowledge of recent developments in mechanisms that regulate the reproductive processes in equines.
- Be able to take measures for sexual health control in male and female equine species.
- Be able to identify research areas for improving reproductive performance in equines.

Theory
Puberty, estrous cycle, estrous and ovulation in equines. Effects of photoperiod on reproduction and artificial methods of control; Peculiarities of maternal and fetal hormones and gonads during pregnancy in the mare; Physiology of parturition; Abortion and other diseases of gestation; dystokia and postpartum complications; Endometritis and other fertility problems; Breeding management in equines; Methods of stallion semen collection; physiocal and biochemical properties of semen; Genital disorders of stallion and their managemnet; Factors affecting equine fertility; Economic aspects of equine breeding.

Practical
Study of equine reproductive organs; Rectal palpation; Clinical and laboratory methods of pregnancy diagnosis in equines; Monitoring physiological and pathological conditions of the internal genitalia through rectal examination; Diagnosis and treatment of infertility problems; Examination of stallion and mare for breeding soundness; Collection, processing and evaluation of stallion semen; Use of ultrasound imaging in the mare.

Suggested Readings:
2. Electronic sources – Digital libraries, e-books, journals, etc.
**Learning Objective**

The students are expected to:
- Have a thorough understanding of mechanisms that regulate various reproductive processes in canines.
- Be able to suggest measures for the management of reproductive abnormalities arising due to mismanagement, physiological deviations and pathological abnormalities of reproductive tract in male and female canines.

**Theory**

Puberty in the dog and bitch; estrous cycle and its induction in the bitch. Breeding management of the bitch; Physiology and endocrinology of canine pregnancy; Management of pregnant bitch; Pseudopregnancy and its complications; Normal and abnormal parturition; Relationship of ovaries and mammary gland diseases; Genetic and acquired developmental anomalies of the male and female reproductive tract; Reproductive disorders of male and female reproductive tract; Abnormal sexual behavior in canine species; Infectious and non infectious infertility in the canines; Contraceptive measures and termination of unwanted pregnancy in the bitch.

**Practical**

Vaginal cytology and estrus detection in the bitch; Diagnostic techniques for pregnancy; Clinical examination and diagnosis for infertility; use of vaginal cultures for diagnostic purposes; Handling and management of pseudopregnancy and pyometra; Demonstration of caesarean section and termination of unwanted pregnancy; Semen collection and evaluation in the dog; Ultrasound imaging in the bitch.

**Suggested Readings:**

1. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objective

The students are expected to:

- Have a thorough understanding of embryo transfer technology applications for improving production potentials of our farm animals.
- Be able to understand the rationale of various superovulatory regimens in farm animals.
- Be able to practically perform laboratory and field activities relating to embryo transfer.

Theory

Background and milestones in the development of embryo transfer technology (ETT) in farm animals; Practical uses of ETT; Selection of donors and recipients; synchronization of recipient and the donors; Drugs and regimens for superovulation; Factors affecting superovulation response; Short term storage of embryos; Methods of cryopreservation and thawing of embryos; Embryo–pathogen interactions in relation to disease transmission.

Practical

Preparation of flushing and culture media for embryos; Superovulation and insemination of the donor; Preparation of equipment for embryo collection; Demonstration and practice of non-surgical embryo collection procedures; Evaluation of embryos on the basis of morphology; Embryo freezing and storage; Demonstration and practice of embryo transfer to the recipient.

Suggested Readings:

1. Electronic sources – digital libraries, e-books, journals, etc.
**Learning Objectives**
The students are expected to:
- Have understanding about the principle, technique and applications of ultrasonography in animal reproduction.
- Be able to efficiently apply this technique in the field for the sexual health management in small and large animals.

**Theory**
Introduction to diagnostic ultrasonography; Hsitory and nature of ultrasound; Principle of ultrasound, and its scope in animal reproduction; Acoustic variables and characteristics of ultrasound waves; Generation of ultrasound waves; transducers and their types; linear and curvilinear arrays and sector scanners; receivers and their functions; Propagation speed and attenuation of ultrasound waves; Ultrasound display formats: amplitude; brightness and motion modes; Commonly encountered artifacts; Bioeffects of ultrasound.

**Practical**
Ultrasound equipment and its operation; Pre-requisites for ultrasound imaging; Selection of wave frequency; Ultrasound imaging of the female and male reproductive organs from slaughtered animals; Imaging of uterus at different stages of pregnancy; Preparation of animal for ultrasound examination; Transrectal imaging of ovaries and uterus in normal and infertile cows and buffaloes; Transcutaneous imaging in sheep, goats, dogs and cats for pregnancy diagnosis; Pregnancy diagnosis in the cattle; buffalo and mare; Pixel analysis.
Transcutaneous imaging of the testis and epididymis in normal males; Demonstration of the ultrasound appearance of various testicular and epididymal lesions e.g. testicular degeneration with mineralization; abscesses and neoplasms; spermatocele; hydrocele and sperm granulomata.

**Suggested Readings:**
2. Electronic sources – digital libraries, e-books, journals, etc.
Learning Objective
The students are expected to:
- Have a comprehensive knowledge of mechanisms that regulate the reproductive processes in camels.
- Be able to identify research areas for improving reproductive performance of camels.

Theory
Introduction to camel reproduction; Geographical distribution and fertility rates; Anatomy and physiology of male and female genital system of the camel; puberty and sexual maturity in female and male camel; ovarian follicular wave pattern in female camel; developing and regressing corpora lutea; induced ovulation; fertilization; embryonic development. Physiology and endocrinology of the placenta; pregnancy and parturition; care of parturient dam and newborn. Postpartum prolapse of vagina; postpartum metritis. Dystokia; maternal dystokia; foetal dystokia; torsion of the uterus. Ovarian abnormalities; diseases of oviduct; diseases of uterus; diseases of the cervix; diseases of the vagina and vulva; early embryonic death; abortions. The rut and sexual cycle in males; copulation and mating behaviour. Pathology of male reproductive system; inflammation of prepuce; paraphymosis; phymosis; hydrocele and pyocele; haematoma of testes; tumors of testes; Orchitis; cryptorchidism. Artificial insemination and embryo transfer technology in camel. Ultrasonography of the genital tract in camel for detection of normal and abnormal conditions. Factors affecting camel reproduction.

Practical
Pregnancy diagnosis; use of ultrasonography for detection of morphological characteristics and different gynaecological problems. Method of semen collection; evaluation of semen.

Suggested Readings:
2. Electronic sources – digital libraries, e-books, journals, etc.
