B. Sc. 6th SEMESTER
DISCIPLINE SPECIFIC ELECTIVES (DSEs)

HG616D: HUMAN GENETICS

CREDITS: THEORY 4, PRACTICAL 2

OPTION - I

HG616DA: HUMAN GENETICS - CLINICAL GENETICS/ MEDICAL GENETICS

THEORY SYLLABUS

UNIT 1: Replication Errors and their Repair

1.1 DNA damage (by deamination, alkylation, radiation and base analogues)
1.2 DNA Repair
1.3 Diseases caused by defect in DNA repair (Xeroderma pigmentosum, Bloom syndrome, Cockayne syndrome)
1.4 Southern blotting and its application in disease diagnosis

UNIT 2: Genetics of Carcinogenesis

2.1 Genetic and environmental basis of carcinogenesis
2.2 Tumor suppressor genes and oncogenes
2.3 Retrovirus and their role in cancer
2.4 Colon cancer and Familial melanoma

UNIT 3: Genetics of Immune system

3.1 Innate and adaptive immune system (Basic concept)
3.2 Major classes of immunoglobulins and genes associated with them
3.3 Major Histocompatibility complex
3.4 Immunodeficiency diseases (SCID, X linked agammaglobulinemia, leucocyte adhesion deficiency)

UNIT 4: Population Genetics

4.1 Principles for screening genetic disease in population
4.2 New born screening (like PKU, galactosemia, hyperthyroidism) and their effective interventions
4.3 Prenatal diagnosis of Genetic diseases (amniocentesis, chorionic villus sampling and ultrasonography)
4.4 Gene therapy by retroviral vector

PRACTICALS (2 CREDITS)

1. ABO blood grouping
2. Study of Barr body from smear of buccal epithelial cells
3. Identification of structural and numerical aberrations through karyotype
4. Project work (PTC tasting/Albinism/twin study/ any genetic trait in population)

B. Sc. 6th SEMESTER
DISCIPLINE SPECIFIC ELECTIVES (DSEs)

HG616D: HUMAN GENETICS

CREDITS: THEORY 4, PRACTICAL 2

OPTION - II

HG616DB: HUMAN GENETICS - REPRODUCTIVE GENETICS

THEORY SYLLABUS

UNIT I: Male Reproductive System

1.1 Anatomy of Male reproductive system.
1.2 Male sex hormones
1.3 Spermatogenesis
1.4 Hormonal control of reproduction

Unit II. Female Reproductive System

2.1 Anatomy of female reproductive system
2.2. Female sex hormones
2.3 Oogenesis
2.4 Hormonal control of oogenesis

Unit III. Female reproductive Cycle and Pregnancy

3.1. Menstrual Cycle
3.2 Hormonal control of menstrual cycle
3.3 Fertilization
3.4. Embryonic development upto three germ layers

UNIT III: Reproductive Genetics

4.1 Genetics of sex determination & sexual differentiation
4.2 Reproductive technologies, artificial insemination, cryo-preservation of oocyte, sperm & embryo
4.3 In vitro fertilization, embryo transfer, intra-cytoplasmic sperm injection, ethical issues, prenatal diagnosis, pre-implantation genetic diagnosis (PGD)
4.4 Genetic technologies used in PGD, Genetic causes of male and female infertility,

PRACTICALS (2 CREDITS)

Study of Histological studies
1. Male Reproductive System
   a) T.S. Testes, T.S. Sperm Structure,C.S. Penis
   b) Spermatogenesis
2. Female Reproductive System
   a) structure of mammalian Ovary
   b) Oogenesis in Mammals
3. Study of Embryo upto three germ layers in mammals (various stages)

B. Sc. 6th SEMESTER
DISCIPLINE SPECIFIC ELECTIVES (DSEs)

HG616D: HUMAN GENETICS

CREDITS: THEORY 4, PRACTICAL 2

OPTION - III

HG616DC: HUMAN GENETICS - CELL COMMUNICATION AND SIGNALING

THEORY SYLLABUS

1.1. Overview of extracellular and intracellular signaling.
1.2. Basics of cell signaling – paracrine, endocrine, autocrine. .
1.3. Secondary messengers and their role in cell communication and signaling
1.4. G-protein coupled receptors and Tyrosine Kinase receptors.

Unit II: Cell cycle

2.1. An overview of cell cycle and Components of cell cycle control system
2.2. Necrosis, senescence, programmed cell death (apoptosis).
2.3.. Mechanism of necrosis, senescence and programmed cell death (intrinsic and extrinsic factors).
2. 4. Apoptosis in relation with Cancer

UNIT III: Chromosome Banding Techniques

3.1. Chromosome nomenclature
3.2 Chromosome banding techniques.
3.2. Molecular correlates of chromosome bands and fragile sites.
3.3. Use of Human cyto-genetics in medical science

UNIT IV: Gene Mapping

4.1 Genetic mapping of Mendelian characters:
4.2 Recombinants, Non-recombinants, Genetic markers,
4.3. Two point mapping, Multipoint mapping,
4.4 Fine mapping using extended pedigrees and ancestral haplotypes

PRACTICALS (2 CREDITS)

1. Basic sterilization required for cytological techniques.
2. Numericals on structural and numerical aberrations
3. Peparation Pedigree charts
4. Preparation of Karyotype from Images of chromosomes
5. Demostration of cell culture techniques