

**PROGRAMME OUT COME, PROGRAMME SPECIFIC OUTCOME
AND COURSE OUTCOME**

BS.C GENETICS	
PROGRAMME OUTCOME	<p>On completing the B.Sc.Genetics students are expected to have achieved</p> <ul style="list-style-type: none"> • The knowledge to design, conduct and analyse the experimental results in animal and human model systems • Skills of applying the genetic technologies in industries related to pharmaceuticals, biotechnology, and diagnostic clinics. • Highlighting's of mathematical, statistical and computational basis of genetic analysis that use genome data sets in system biology. • To bring awareness to human society on various genetic disorders, its inheritance patterns and to develop the methods, and techniques of fighting against the diseases. • Applications of genetics in to various fields of life science like Statistics, Chemistry, Physics, Computer Science, Developmental Biology, Biotechnology, Genetics and Society (eugenics and euphenics), Genetics and Evolution. • To develop the application of software skills related to Bioinformatics. Designing and executing the programmes related to structural and functional aspects of genes and proteins. • Ability to draw and evaluate conclusion for genetic data • Development of communication skills required for the oral presentations in conferences, workshops, and research paper publications. • Team work and leadership skills including group discussion, co-ordinately working in research laboratory. Writing of research report.
PROGRAMME SPECIFIC OUTCOME	<p>By the theoretical and practical exposure students are trained to become Scientists, Project Scientists, Research Assistants, Research Technicians, Field Researchers, Data Scientists in Life Sciences, Clinical Research Associate, Drug Designer and Evaluator, Field Technician, Gene Editing Manager, Genetic Counsellor, Hospital Research Assistant, Oncology Researcher, Quality Control Analyst.</p>

COURSE OUTCOME

SEMESTER I

THEORY: GNP 101: FUNDAMENTALS OF CELL BIOLOGY

Upon successful completion of this course student should be able to

- Know the working principle behind microscopy, different types of microscopes used in cell biology. Construction and applications of microscopy.
- Understand the cells as structural and functional unit of life
- Studying the various cellular components of cells. The primary structure and ultra-structure of cellular organelles, its composition and functions.
- To understand the basic difference between prokaryotic cell and eukaryotic cell.
- The glimpses of control of cell cycle, the mechanism of cell death, different types of cell divisions.
- Studying the theoretical aspects of model organisms of prokaryotes and eukaryotes. Including structure, life cycle and genetic significance.

PRACTICAL: GNP101: FUNDAMENTALS OF CELL BIOLOGY

- Handling of microscope- studying the different parts of microscope, its construction.
- Observation of the objects, cells and microscopic organisms under the microscope.
- Mitotic slide preparation of onion root tips and observation of all cell divisions.
- Staining techniques- staining of a cell or organism to observe it under light microscope
- Studying the model organisms of prokaryotes and eukaryotes, their structure life cycle and genetic significance using charts, permanent slides and specimens.

SEMESTER II

THEORY: GNT 201: PRINCIPLES OF GENETICS

Upon successful completion of this course student should be able to study

- History and scope of Genetics
- Understanding the pre mendelian genetic concepts
- To study the laws and concepts of Mendelian inheritance.
- Principles of deviation from Mendelian inheritance with examples.
- Concepts of multiple alleles with examples.
- Understanding the mechanism of sex determination in different organisms.
- Application of statistical concepts used in health medical science, plants and animal system
- Interpretation of results commonly used in statistical analysis

PRACTICAL: GNP 201: PRINCIPLES OF GENETICS

- Meiotic slide preparation from grass hopper testes and observation of stages. Under the light microscope.
- Blood typing and interpretation of results
- Solving the problems related to- measures of central tendency, and measures of dispersion. Studying analysing and solving the hypothetical tests like t test, chi square test.
- Use basic analytical techniques to generate results.
- Make appropriate use of statistical software.

SEMESTER III

THEORY:GNT 301: CYTOGENETICS

Objective of studying this paper is

- To study the primary structure, ultra-structure of prokaryotic and eukaryotic chromosome.
- To learn the concepts of linkage and sex linkage.
- Explain the prokaryotic and eukaryotic organisation and variation.
- Discuss the chromosomal anomalies with respect humans' plants and animals.
- To study the extrachromosomal inheritance pattern.
- Brief introduction to genomics and proteomics.

PRACTICAL: GNP 301: CYTOGENETICS

- Culturing and handling techniques of *Drosophila melanogaster*. Identification of male and female flies.
- Dissection and mounting of sex comb.
- Preparation of polytene chromosome from salivary glands of *Drosophila melanogaster*,
- Study of chromosomal aberrations with charts and preparation of translocated chromosomes from *Rhoeodiscolor*
- Observation and morphological study of mutants of *Drosophila melanogaster*.

SEMESTER IV

THEORY:GNT 401: MOLECULAR GENETICS

Upon successful completion of this course student should be able to

- Learning and understanding the concepts of central dogma of molecular biology.
- Explain the concept of DNA and RNA as genetic material through experimental techniques.
- Studying the structure of DNA and RNA, and its types.
- To discuss the mechanism of DNA replication in prokaryotes and eukaryotes.
- To explain the protein synthesis machinery in prokaryotes and eukaryotes.
- Introducing to microbial genetics
- Studying the regulatory mechanism of gene.
- Structure of prokaryotic and eukaryotic gene. Types of gene mutation.

PRACTICAL: GNP 401: MOLECULAR GENETICS

- To conduct the experimental method of DNA extraction from plants and animal source.
- To study the technique of separation of protein molecules using chromatography
- Demonstration of effect of radiation on the organism.
- Study of theoretical concept of gene mutation in sickle cell anaemia and thalassemia.

SEMESTER V

THEORY: GNT501 RECOMBINANT DNA TECHNOLOGY

Objective of this course is to

- Familiarise the students with basic concepts of genetic engineering.
- Outline the fundamental steps of genetic engineering and describe the versatile tools and techniques employed in genetic engineering.
- Discuss the techniques used to probe DNA for specific gene of interest.
- Explain the methodology of PCR and its applications.
- Outline the applications of genetically modified organisms (GMO'S)
- Understanding the applications of rDNA technology from academic and industrial perspective.

PRACTICAL: GNP501: RECOMBINANT DNA TECHNOLOGY

Aim of this practical is to

- Experimentation of quantification of DNA/ RNA
- Learning the working principle of instruments used in genetic engineering ie UV transilluminator and PCR.
- Studying the structure of vector molecules through charts and photographs.
- Demonstration of experiments of restriction enzyme digestion, ligation of DNA fragments.

SEMESTER V

THEORY: GNT 502: BASIC HUMAN GENETICS

This course is expected to introduce

- The rapid advancements in understanding the role of human genome in health and disease.
- Basic concepts of identifying human chromosome,
- Inheritance of human traits, and pedigree analysis.
- Objectives and outcome of human genome project.
- To create awareness to human society through genetic counselling.
- Introducing to eugenics and euphenics to human society.
- Introducing to types of cancer and molecular basis of cancer biology.
- Prenatal testing methods, introducing to stem cell techniques and studying of gene therapy.
- Basic concepts of immunology, antigen -antibody reaction methods.

PRACTICAL: GNP 502: BASIC HUMAN GENETICS

Aim of this practical is to

- Learn the basic concepts of Mendelian traits; identify the charts of normal and abnormal karyotypes.
- Differential blood staining for Identification of types of blood cells in humans.
- Performance of Counting of RBC and WBC from human blood sample.
- Exposure to studying of dermatoglyphic pattern.
- Demonstration of immunological experiments to study antigen and antibody reactions in ODD(Ouchterlony Double Diffusion) and RID(Radial Immuno Diffusion)

SEMESTER VI:

THEORY: GNT 601 DEVELOPMENTAL AND EVOLUTINARY AND BIOMETRICAL GENETICS

Objective of this course is to

- Introduce to developmental genetics of plants and animals
- The context of the course is to orient developmental genetics in genome perspective
- Know the main morphological principles for development and reproduction in classical model organisms
- Gain the knowledge of genetic and molecular mechanisms that operate in development and reproduction.
- The evolution section deals with population genetics: Hardy-Weinberg law, basic evolutionary processes, quantitative genetics and speciation.
- Speciation models are introduced to understand the evolutionary process in facilitating reproductive isolation.

PRACTICAL: GNP 601 DEVELOPMENTAL AND EVOLUTINARY AND BIOMETRICAL GENETICS

Aim of this practical is to

- Identification of charts pertaining to developmental genetics of *Arabidopsis thaliana* and *Drosophila melanogaster*.
- Solving and analysing the problems with respect to
- Quantitative inheritance in kernel colour in wheat, and skin colour in man.

SEMESTER VI

THEORY: GNT 602: APPLIED AND BEHAVIORAL GENETICS

Objective of this course is to

- Able to describe the concept of DNA fingerprinting and DNA typing.
- Define the principles behind DNA fingerprinting methodologies using molecular markers RFLP, RAPD, STR, and SNP's
- Applications of DNA fingerprinting in medical diagnosis and research
- Describe the history, scope and importance of bioinformatics and role of internet in bioinformatics.
- Explain about the methods to characterise and manage the different types of biological data
- To gain the knowledge about various biological databases that provides information about nucleic acids and protein.
- Introduction to the basics of sequence alignment and analysis.

PRACTICAL: GNP 602: APPLIED AND BEHAVIORAL GENETICS

Aim of this practical is to

- Diagnose the tests for typhoid and tuberculosis through WIDAL and VDRL method.
- Exposure to study of hybridization methods in plants and animals.
- Discuss behaviour genetics aspects in insects.
- Exposure to thorough knowledge of undertaking project work.
- Developing a skill of writing research report