## I SEM NEP Syllabus

I Semester : Content of Course 1: Theory: DSC-1, Cell Biology and Genetics	56 Hrs
Unit – 1:Cell as a Basic unit of Living Systems and Cellular Organelles Concept, Development and Scope of Biotechnology. Historical perspectives, Discovery of cell, the Cell Theory Ultra structure of plant and animal cells Structural organization and functions of plasma membrane, cell wall, Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Peroxisomes, Nucleus (Nuclear envelope, nuclear pore complex, Nucleolus, Nucleoplasm and Chromatin). Vacuole, Cytosol. Cytoskeleton structures (Microtubules, Microfilaments & Intermediate filaments).	14Hrs
Unit- 2. Chromosomes and Cell Division Chromosomes: Discovery, Morphology and structural organization – Centromere, Secondary constriction, Telomere, Chromonema, Euchromatin and Heterochromatin, Chemical composition and Karyotype. Single-stranded and multi- stranded hypothesis, folded- fibre and nucleosome models. Special type of chromosomes: Salivary gland and Lampbrush chromosmes. Cell Division: Cell cycle phases and mechanism, phases and significance of Mitosis and meiosis, regulation of cell cycles, cell cycle checkpoints & enzymes involved in regulation, Interphase nucleus, achromatic apparatus, synaptonemal complex Cell Senescence and programmed cell death.	14Hrs
<ul> <li>Unit-3. Genetics:</li> <li>Mendel's Genetics: Introduction and brief history of genetics.</li> <li>Mendelian theory: Laws of inheritance- dominance, segregation &amp; independent assortment, incomplete dominance, codominance with an example, test cross &amp; back cross.</li> <li>Gene interaction: Supplementary factors: comb pattern in fowls, Complementary genes-Flower colour in sweet peas, Multiple factors–Skin colour in human beings, Epistasis– Plumage colour in poultry, Multiple allelism: Blood groups in Human beings.</li> <li>Maternal Inheritance: Plastid inheritance in Mirabilis, Petite characters in yeast and Kappa particles in paramecium.</li> <li>Sex-linked inheritance: Colour blindness, haemophilia, Y linked traits. Chromosome theory of inheritance.</li> </ul>	14Hrs
<ul> <li>Unit-4. Linkage and Crossing Over</li> <li>Linkage - Introduction, Coupling and repulsion hypothesis, Linkage in maize and Drosophila, chromosome mapping-linkage map in maize.</li> <li>Crossing Over -Types, mechanism and importance of crossing over.</li> <li>Chromosomal variations: structural and numerical aberrations.</li> <li>Chromosomal evolution of wheat and cotton.</li> <li>Mutations: Types of mutations, Spontaneous and induced.</li> <li>Mutagens: Physical and chemical, Mutation at the molecular level.</li> <li>Mutations in plants, animals and microbes for economic benefit of man.</li> <li>Sex Determination in Plants and animals: Concept of allosomes and autosomes,</li> </ul>	14Hrs

XX- XY, XX-XO, ZW-ZZ, ZO-ZZ types. **Human Genetics:** Karyotype in man, inherited disorders – Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down's syndrome and Cri-Du-Chat Syndrome). **Epigenetics :** Plants & animals

### **Course 1: Practical: I Semester- Cell Biology and Genetics**

1)Study of divisional stages in mitosis from onion root tips

2)Study of divisional stages in meiosis in grasshopper testes/onion or Rhoeo flower buds.

#### 3)Haemocytometry

4)Micrometery – calibration & measurement

5)Study of the process of plasmolysis using leaves of Tradescantia or Rheo

6)Isolation and staining of Mitochondria

7)Isolation and staining of Chloroplast

8)Mounting of polytene chromosomes

9) Buccal smear - Barr bodies

- 10) Study of mutagenic effects of food colours and UV radiations on Chromosomes
- 11) Normal and Abnormal Karyotype analysis of Human beings
- 12) Simple genetic problems based on theory

#### **Text Books / References**

1. Molecular Biology of Cell - Bruce Alberts et al, Garland publications.

2. Animal Cytology and Evolution- MJD, White Cambridge University Publications

3. Molecular Cell Biology-Daniel, Scientific American Books

4.Cell Biology - Jack d Bruke, The William Twilkins Company

5. Principles of Gene Manipulations- Old & Primrose, Black Well Scientific Publications

6.Cell Biology-Ambrose & Dorothy M Easty, ELBS Publications

7. Fundamentals of Cytology- L. W. Sharp, McGraw Hill Company

8. Cytology-Willson&Marrison, Reinform Publications

9. Molecular Biology- Christopher Smith, Faber & Faber Publications

10. Cell Biology & Molecular Biology –De Robertis& EMF Robertis, Saunder

college

- 11. Cell Biology- C.B Powar, Himalaya Publications
- 12. Basic Genetics- Daniel L. Hartl, Jones & Barlett Publishers USA
- 13. Human Genetics and Medicine lark Edward Arnold P London
- 14. Genetics Monroe W Strickberger, Macmillain Publishers, New York
- 15. Genes V Benjamin Lewin, Oxford University Press.
- 16. Genes I Benjamin Lewin, Wiley Eastern Ltd., Delhi
- 17. Genes II Benjamin Lewin, Wiley & Sons Publications
- 18. Genes III- Benjamin Lewin, Wiley & Sons Publications
- 19. Principles of Genetics- Sinnott, L.C. Dunn, Dobzhansky, McGraw-Hill.
- 20. Genetics Edgar Altenburg Oxford & IBH publications
- 21. Principles of Genetics E.J. Gardener, M.J. Simmons and D.P. Snustad,
- 22. Genetics- P.K.Gupta, Rastogi Publication, Meert, India

# II SEM NEP Syllabus

II Semester Course: DSC-2 Microbiological Methods and Techniques	56 Hrs
<ul> <li>Unit - 1 General Microbiology and Instrumentation</li> <li>Introduction to Microbiology: Scope and relevance of microbiology, important contributions by Robert Koch, Leeuwenhoek, Jenner, Pasteur, Flemming, Ivanowsky.</li> <li>General account on structure, classification and reproduction of bacteria, virus and fungi.</li> <li>Microscopy: Principles and applications of Compound microscope, Dark field microscope, Phase contrast microscope, Fluorescence Microscope, Confocal microscope, Electron Microscopes- TEM and SEM.</li> <li>Analytical techniques: Working principles and applications: Centrifuge, Ultracentrifuge, Spectrophotometer, Chromatography: Paper, TLC, Column (adsorption, gel-filtration, ion exchange, affinity), HPLC, GC.</li> </ul>	14Hrs
<ul> <li>Unit - 2 Sterilization techniques</li> <li>Definition of terms-sterilization, disinfectant, antiseptic, sanitizer, germicide, microbicidal agents, microbiostatic agent and antimicrobial agent.</li> <li>Physical methods of control: Principle, construction and applications of moist heat sterilization- Pasteurization, Boiling, Fractional sterilization-Tyndallization and autoclave. Dry heat sterilization-Incineration and hot air oven.</li> <li>Filtration – Diatomaceous earth filter, seitz filter, membrane filter and HEPA Radiation : Ionizing radiation-γ rays and non ionizing radiation- UV rays</li> <li>Chemical methods: Alcohol, aldehydes, phenols, halogen, metallic salts, Quaternary ammonium compounds and sterilizing gases as antimicrobial agents.</li> </ul>	14Hrs
<ul> <li>Unit – 3 Microbiological techniques</li> <li>Culture Media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media</li> <li>Pure culture methods: Serial dilution and plating methods (pour, spread, streak); cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria</li> <li>Microbial growth and its measurements: Growth curve, enumeration methods (turbidity, cell counting, colony counting)</li> <li>Stains and staining techniques: Principles of staining, Types of stains-simple stains, structural stains, negative stain &amp; differential stains.</li> </ul>	14Hrs
Unit – 4: Antimicrobial agents	

14Hrs

## **II Semester : Practicals: Microbiological Methods and Techniques**

- 1. Preparation of culture media NA, NB, PDA.
- 2. Isolation of bacteria and fungi from soil, water and air
- 3. Plating techniques: Spread plate, pour plate and streak plate.
- 4. Colony characteristics study of bacteria from air exposure plate
- Staining techniques: Bacteria– Gram's, Negative, Capsule & Endospore staining Fungi – Lactophenol cotton blue staining
- 6. Biochemical Tests IMViC test, Starch hydrolysis, Catalase test, Gelatin hydrolysis
- 7. Turbidometry
- 8. Bacterial cell motility hanging drop technique
- 9. Antibiotic sensitivity test by disc diffusion test
- 10. Isolation of Rhizobium from root nodules
- Identification of some fungal colonies from fruits and vegetables (Rhizopus, Penicillium, Aspergillus using temporary mounts )
- 12. Identification of microorganisms from skin , mouth & milk

### **Text Books / References**

- 1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.
- 2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice

Hall

3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.

- 4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology.
- 5. 5th edition Tata McGraw Hill.

6. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht

7. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.

8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.

9. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

10. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited

- 11. Microbiology- Concepts and applications by Paul A. Ketchum, Wiley Publications
- 12. Fundamentals of Microbiology Frobisher, Saunders & Toppan Publications
- 13. Introductory Biotechnology-R.B Singh C.B.D. India (1990)
- 14. Fundamentals of Bacteriology Salley
- 15. Frontiers in Microbial technology-P.S. Bison, CBS Publishers.
- 16. Biotechnology, International Trends of perspectives A. T. Bull, G.
- 17. General Microbiology –C.B. Powar

## NOTE:

- Employability Green colour
- Skill enhancement Blue colour
- Entrepreneurship Yellow colour