BTPC2003 CELL BIOLOGY AND GENETICS (3-0-0)

Module I: (6 hours)
Structural intricacy & Chemical composition of cells, Organization of Cell (Prokaryotic and Eukaryotic), Cell Wall & Cell Membrane, Cell Organelles, Endoplasmic reticulum, Nucleus, Cytoskeleton

Module II: (8 hours)
Molecular Organization of Chromosome (Nucleosome concept), Cell Cycle, Cell Divisions- Mitosis and Meiosis, Programmed cell death. introduction to cell fate and early embryonic patterning in different organisms (*Drosophila)*, Stem Cell (Embryonic and adult types and characteristics)

Module III: (8 hours)
Origin and evolution of Miochondria and chloroplast, Role of these organelles in cellular energetics: Oxidative and photophosphorylation, chemiosmotic hypotheses, Membrane transport & trafficking, mechanisms of protein sorting and targeting, intercellular communication and associated signaling pathways, cell death pathways

Module IV: (10 hours)
Mendel's law of Inheritance: Mendel's experiments–Mendels materials, crossing technique, results of Mendel's experiments, phenomenon of dominance, variation in dominance relation, incomplete dominance, co-dominance, principle of segregation monohybrid cross, mechanism of segregation, monohybrid ratio, principle of independent assortment, Mendels dihybrid cross, mechanism of independent assortment, dihybrid ratio, back cross and test cross

Module V: (8 hours)
Linkage, crossing over and mapping: Linkage – coupling and repulsion hypothesis, Morgan's view on linkage, chromosome theory of linkage, kinds of linkage-complete linkage, incomplete linkage, linkage groups, significance of linkage, crossing over, duplication of chromosomes, crossing over by breakage and union, terminalization, Molecular mechanism of recombination- Holiday model

Course Outcomes (COs):
1. Cell Structure: Explain the structure and function of cell organelles and their roles in cellular processes.
2. Membrane Dynamics: Understand the properties and functions of biological membranes, including transport mechanisms.
3. Cell Cycle: Describe the phases of the cell cycle and the mechanisms of cell division (mitosis and meiosis).
4. Fundamental Concepts: Students will understand the fundamental principles of classical genetics, including segregation, independent assortment, dominance, and epistasis.

Program Outcomes (POs):
1. Comprehensive Knowledge: Demonstrate a thorough understanding of cell biology principles, including cell structure, function, and regulation.
2. Research Skills: Develop and apply research skills in cell biology, including experimental design, data collection, and data analysis.
3. Analytical Thinking: Apply critical and analytical thinking to solve complex problems in cell biology.
4. Communication: Communicate scientific information effectively through oral and written presentations.
5. Ethical Standards: Understand and apply ethical standards in scientific research and practice.

Program Specific Outcomes (Psos)
1. Advanced Techniques Proficiency: Graduates will be proficient in advanced cell biology techniques such as fluorescence microscopy, flow cytometry, and live-cell imaging.
2. Cellular Mechanisms: Graduates will have a deep understanding of cellular mechanisms and how they relate to disease processes.
3. Biotechnological Applications: Graduates will be capable of applying cell biology concepts and techniques in biotechnology and pharmaceutical industries.

4. Regenerative Medicine: Graduates will understand the principles of stem cell biology and its applications in regenerative medicine.
5. Environmental Cell Biology: Graduates will be knowledgeable about the impact of environmental factors on cellular processes and how cells respond to environmental stressors.

Books

1. The Cell Molecular approach, Geoffrey M.Cooper, ASMpress Washington D.C.Sinauer Associates,Inc.
2. Principles of Genetics,Robert Tamarin,Tata McGraw Hill
3. Molecular Biology of Cell–Alberts, Garland Science,Taylor & Francis Group.
4. Molecular Biology of The Cell (Fifth edition), 2007 by BruceAlberts, AlexanderJohnson,Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Publisher: Garland Publications
5. Molecular Cell Biology (sixth edition), 2008 by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, Hidde Ploegh, Paul Matsudaira. Publisher: W H Freeman & Company
6. Essential Cell Biology (Third Edition), 2009 by BruceAlberts, DennisBray, KarenHopkin, AlexanderJohnson, JulianLewis, MartinRaff, KeithRoberts, PeterWalter. Publisher: Garland Science