

**CELLULAR AND MOLECULAR PHARMACOLOGY**  
(MPL 104T)

**Scope:**

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

**Objectives:**

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

<b>THEORY</b>	<b>60 Hrs</b>
1. Cell biology	12
Structure and functions of cell and its organelles	Hrs
Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing	
Cell cycles and its regulation.	
Cell death– events, regulators, intrinsic and extrinsic pathways of apoptosis.	
Necrosis and autophagy.	
2 Cell signaling	12
Intercellular and intracellular signaling pathways.	Hrs
Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors.	
Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol.	
Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.	

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| 3 | <p>Principles and applications of genomic and proteomic tools<br/> DNA electrophoresis, PCR (reverse transcription and real time),<br/> Gene sequencing, micro array technique, SDS page, ELISA and<br/> western blotting,<br/> Recombinant DNA technology and gene therapy<br/> Basic principles of recombinant DNA technology-Restriction<br/> enzymes, various types of vectors. Applications of recombinant<br/> DNA technology.<br/> Gene therapy- Various types of gene transfer techniques, clinical<br/> applications and recent advances in gene therapy.</p> | 12<br>Hrs |
| 4 | <p>Pharmacogenomics<br/> Gene mapping and cloning of disease gene.<br/> Genetic variation and its role in health/ pharmacology<br/> Polymorphisms affecting drug metabolism<br/> Genetic variation in drug transporters<br/> Genetic variation in G protein coupled receptors<br/> Applications of proteomics science: Genomics, proteomics,<br/> metabolomics, functionomics, nutrigenomics<br/> Immunotherapeutics<br/> Types of immunotherapeutics, humanisation antibody therapy,<br/> Immunotherapeutics in clinical practice</p>                                 | 12<br>Hrs |
| 5 | <p>a. Cell culture techniques<br/> Basic equipments used in cell culture lab. Cell culture media,<br/> various types of cell culture, general procedure for cell cultures;<br/> isolation of cells, subculture, cryopreservation, characterization of<br/> cells and their application.<br/> Principles and applications of cell viability assays, glucose uptake<br/> assay, Calcium influx assays<br/> Principles and applications of flow cytometry</p> <p>b. Biosimilars</p>   | 12<br>Hrs |

**REFERENCES:**

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
6. Basic Cell Culture (Practical Approach ) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current porotocols in molecular biology vol I to VI edited by Frederick M.Ausuvel et la.