



Master of Science (Biochemistry)  
M. Sc Biochemistry Semester I

|                             |            |                     |              |
|-----------------------------|------------|---------------------|--------------|
| Course Code                 | PS01CBIC53 | Title of the Course | Cell Biology |
| Total Credits of the Course | 04         | Hours per Week      | 04           |

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| Course Objectives: | To expose the students to various microscopy techniques used for cell studies with details understanding of the structure and function of various cell organelles, their organization and interaction with the environment. This will also enlighten them on the regulation of cell cycle and programmed cell death explaining the bases of cancer. |
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| Course Content |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |
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| Unit           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Weightage* (%) |
| 1.             | Microscopy in cell studies:<br><br>Principle of working and applications of bright field microscopy, dark field microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy. Principle and applications of cytophotometry and flow cytometry. Principles of ultra resolved fluorescence microscope.                                                                   | 25%            |
| 2.             | Cell walls and extracellular matrix.<br><br>Nucleus, Nuclear pore complex and transport across nuclear envelope.<br><br>Structure and functions of Endoplasmic reticulum, Golgi complex and lysosomes (Protein sorting and transport, Types of vesicular transport and their functions).<br><br>Structure and function of Mitochondria, Chloroplasts and Peroxisomes.<br><br>Cell-Cell interactions (Cell adhesion proteins, Tight junctions, gap junctions, plant cell adhesion and plasmodesmata). | 25%            |
| 3.             | Structure of Plasma membrane, Transport across plasma membrane.<br><br>Endocytosis (Phagocytosis, Receptor mediated endocytosis)<br><br>Cytoskeleton and cell movement (Structure and organization of actin                                                                                                                                                                                                                                                                                          | 25%            |





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|           | <p>filaments; Actin, myosin and cell movement; Intermediate filaments; Microtubules and microtubule motors and movements); cilia and flagella: structure and function.</p> <p>Cell signalling: Signalling molecules and their receptors, Functions of cell surface receptors, pathways of intracellular signal transduction, signal transduction and cytoskeleton, signalling in development and differentiation.</p>                                                                                                                                                                     |            |
| <b>4.</b> | <p>Cell division cycle (phases of CDC; Regulation by cell growth and extracellular signals; cell cycle check points; regulators of cell cycle progression-MPF, cyclins and CDKs, Inhibitors of cell cycle progression; M-phase and cytokinesis.</p> <p>Programmed Cell Death: Difference between necrosis, apoptosis and necroptosis, Caspases, Central regulators of apoptosis (Bcl-2 family), signalling pathways that regulate apoptosis.</p> <p>Cancer: Types of cancer, development and causes of cancer, properties of transformed cells, oncogenes and tumor suppressor genes.</p> | <b>25%</b> |

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| <b>Teaching-Learning Methodology</b> | <p>Topics will be taught and discussed in interactive sessions using conventional black board and chalk as well as ICT tools such as power point presentations and videos. Practical sessions will be conducted in a suitably equipped laboratory either individually or in groups depending on the nature of exercise as well as availability of infrastructure. Course materials will be provided from primary and secondary sources of information.</p> |
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| <b>Evaluation Pattern</b> |                                                                                                                                      |           |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Sr. No.                   | Details of the Evaluation                                                                                                            | Weightage |
| 1.                        | Internal Written / Practical Examination (As per CBCS R.6.8.3)                                                                       | 15%       |
| 2.                        | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15%       |
| 3.                        | University Examination                                                                                                               | 70%       |

| <b>Course Outcomes: Having completed this course, the learner will be able to</b> |                                                                                                     |
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| 1.                                                                                | Understand various techniques for observing cells, cell organelles and the functioning of the cell. |





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| 2. | Explain various cell organelles with their function and importance for the cell in its physiology.                                                                    |
| 3. | Understand how cell interacts with outside environment especially for its energy need, energy generation and interaction with the environment and other cells.        |
| 4  | Understand how growth of the cell is regulated, factors and process leading to its death and generation of cancerous condition upon failure of cell cycle regulation. |

**Suggested References:**

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|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Krebs, J. E., (2009). Lewin's Genes X. 10 <sup>th</sup> Edn. Jones & Bartlett Learning Publications, United States                                               |
| 2 | Cooper, G., M., Hausman, R. E., (2015). The Cell: A Molecular Approach. 7 <sup>th</sup> Edn. Sinauer Associates Inc, United States                               |
| 3 | Carp, G., (2013). Cell Biology. 7 <sup>th</sup> Edn. Wiley, United States                                                                                        |
| 4 | Albert, B., Johnson, A., Lewis, J., Raff, M., Robert, K., Walter, P., (2014). Molecular Biology of the Cell. 6 <sup>th</sup> Edn. Garland Science, United States |
| 5 | Lodish, H., Berk, A., Kaiser, C., A., (2007). Molecular Cell Biology. 6 <sup>th</sup> Edn. W. H. Freeman & Co Ltd, South Asia                                    |

On-line resources to be used if available as reference material

Relevant review articles / research papers / handouts of latest development in the subject.

