SEMESTER S7

CELL SIGNALING

Course Code	**PEBBT742**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Basics of cell biology	**Course Type**	Theory

Course Objectives:

1. To understand the process of cell signalling in normal physiological process
2. To understand the basic principles of signal transduction mechanisms
3. To study the different extracellular signals and receptors and their functional significance

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Protein targeting and membrane trafficking. Cytoskeletal organization and dynamics. Cell adhesion and extracellular matrix, Cell division cycle, Cell cycle and death	8
2	Two-component system (TCS) in procaryotes, Evolution and TCS in eukaryotes. Basic principles of cell signaling. Characterization of signaling components: signaling molecules, receptors, second messengers, effectors, signaling complexes. Integration and amplification of signals. Basic classification and characterization of membrane receptors.	9
3	Introduction to G Protein Coupled Receptor (GPCR) Signaling. Growth Factor/ Receptor Tyrosine Kinases (RTKs) and Wnt Receptors. Ras to Mitogen-Activated Protein Kinase (MAPK) Pathways. Protein Kinases. Protein Phosphatases. Domains in RTKs: Structural Aspects. Ligand-Gated Channels, Regulation of Ion Channels by G Proteins, Transient Receptor Protein (TRP) Channels	10

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4	Nuclear Transactivators and Repressors, Chromatin Remodeling, Nuclear Receptors Cell cycle control. Signaling defects. Examples of physiological roles (apoptosis, cell cycle regulation, gene transcription) and clinical significance (cancer, cardiovascular disease, learning and memory, immune responses).	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the components, principles and properties of major cell signalling pathways.	**K2**
CO2	Describe how cells exploit signalling components to assemble the specific signalling pathways, which they require to communicate which each other or to adapt to changes of external environment.	**K2**
CO3	Justify the role of signalling pathways in control of gene expression (transcription and translation) and cellular metabolism.	**K5**
CO4	Identify the clinical Significance of Cell signalling	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2						2		2
CO2	2									2		2
CO3		3		2						2		2
CO4		3		2				3		2		2

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Cell Biology	Rastogi	New Age international Publishers	2015
2	Textbook of Cell Signaling in Cancer	Jacques Robert	Springer	2019

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Molecular and Cellular Signaling	Martin Beckerman	Springer	**2017**

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/102/106/102106025/

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