BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
SECOND SEMESTER 2019-2020
Course Handout (Part II)

Date: 03/04/20

In addition to part -I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. **: BIO G542**
Course Title **: Advanced Cell and Molecular Biology**
Instructor-in-charge **: VIDYA RAJESH,**
Lab Instructors **: Dhansri Krishnamurthy, R. Karthiya.**

1. **Course Description :** Covers the cellular and molecular details of Eukaryotic cell cycle: restriction point G1 phase progression, role of cyclin and CKIs, cytokinesis in pro and eukaryotes, cell cycle & cancer, metastasis, growth factors and their interaction with receptors: PDGF, EGF, VEGF, FGF, TGF; extra cellular matrix & adhesion, molecular chaperones, cytokines & their sources and signal transduction, apoptosis and necrosis, Hypoxia and its regulation, Angiogenesis, Nuclear cytoplasmic transport.

2. **Scope and Objective of the Course**:
   This course will give insights to the students into some frontier areas in cell and molecular biology like control of cell division, cell - cell recognition, basis of receptors & signal transduction, cytokines, antigen presentation & programmed cell death.

3. **Learning Outcomes:** After completing this course students should be able to
   - Understand and appreciate the complexities of molecular signaling mechanisms of Eukaryotic mammalian systems – especially Humans.
   - Design and execute experiments for hypothesis validation independently
   - Perform all basic measurement experiments for cell growth, division, cell death, cytotoxicity and protein folding

4. **Text Book:**
   T1. Molecular Biology of the Cell (5th edition), Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter. Garland Publishing Inc., New York and London, 2008.

5. **Reference Books:**
   R1. Molecular Cell Biology, (Fourth Edition), Lodish, Berk, Zipursky, Matsudaira, Baltimore and Darrell. Freeman, 2000.
   R2. Cell and Molecular Biology: Concepts and Experiments (3rd edition), Gerald Karp. John Wiley and Sons, 2001.

6. Course Plan:

Lec. No.	Learning Objectives	Topics to be covered	Ref.* Chap./Sec.# (Book)
1	Introduction	Handout and basic cell biology	
2 - 12	Cell division control in multicellular organisms	Overview of cell cycle, different phases, cell cycle control in eukaryotes, components of cell cycle control system, intracellular control of cell cycle events, role of Rb and p53 in cell cycle control.	T1 Chapter 17 Pg 1053 - 1113
13 - 15	Cell cycle and cancer	Cancer as multievolutionary process, cancer critical genes, molecular basis of cancer – cell behaviour.	T1 Chapter 20 Pg 1205-1267
16-18	Apoptosis or programmed cell death	Mechanism of cell death with special reference to apoptosis and necrosis, cascade of apoptosis implications	T1 Chapter 18 Pg 1115 – 1129 Additional references will be given
19 - 20	Cell – cell recognition and cell - cell adhesion	Cell junctions and gap junctions, Role of CAMs in cell attachment,	T1Chapter 19 Pg 1131 - 1178
21 – 22	Extra Cellular Matrix of animals	Components of ECM , role of ECM in bi-directional signaling, integrins	T1 Chapter 19 Pg 1179 - 1204
23 – 32	Signal transduction and cell communication	Mechanisms of signal transduction by cell surface receptor proteins, growth factors and their interaction with receptors in cell proliferation and its regulation	T1 Chapter 15 Pg 879 – 964 additional material will be provided
33-34	Signal transduction pathway by various cytokines	Cytokine sources, molecular structures, JAK STAT pathway	T1 Chapter 15 Pg 879 – 964 additional material will be provided
35 – 36	Oxygen regulated gene expression and Angiogenesis	Hypoxia – pathways and regulation; angiogenesis control	References will be given – Journal articles and reviews
37 - 39	Signal – mediated transport through nuclear pore complex	Mechanism for the transport of "Cargo" proteins, mechanism for hn RNP protein mediated export of RNA from the nucleus	T1 Chapter 12 Pg 695 -712
40 - 42	Protein folding & Correction of misfolded protein	Mechanism of protein folding in *E.coli* and mammalian systems Molecular chaperones	References will be given – Journal articles and reveiws

Laboratory Component: Weekly once 4 hrs

1. MTT assay for cell viability
2. Synchronization of cell cycle in yeast
3. Telomerase detection by ELISA
4. Study of cellular apoptosis using different methods and reagents
5. Monitoring the denaturant induced unfolding of proteins
6. Comparative study of normal and transformed cell lines
7. Creating a signal transduction base chart and understanding of pathways
8. Induction of cell cycle arrest and its study in human cell lines
9. Confocal Microscopy : Principle and Instrumentation – Demo.

Lab work will start from last week of Feb any 6 experiments out of the listed experiments will be conducted based on feasibility depending on availability of resources and infrastructure.

7. **Evaluation Scheme:**

Component	Duration	Weightage(%) and marks	Date, & Time	Remarks
Mid semester Test	90 mts	30% (90)		Open Book
Lab Assignments	6 experiments (Day to day experiments /observation)	10% (30)		Open book
Surprise quizzes/One page written assignments	4 (10 marks each)	10% (30) Best 3 out of 4		Closed Book
Poster/presentation assignment	1	10% (30)		Open Book
Comp. Exam.	3 hrs.	40 % (120)		Closed book

8. **Chamber Consultation Hours:** To be announced in the class.

9. **Notice:** Notice for tests and quiz will be displayed on CMS only.

10. **Grading policy:** Award of grades will be guided in general by the histogram of marks. Decision on border line cases will be taken based on individual's sincerity, attendance in classes, and the section instructor's assessment of the student. Students missing one or more component of evaluation completely may be given NC.

11. **Make Up Policy:** No make-up will be given for Surprise quizzes and lab components; For mid semester test, Make up will be given only on medical grounds or with prior permission of the I/C.

12. **Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
BIO G542