Birla Institute of Technology & Science, Pilani
Hyderabad Campus

INSTRUCTION DIVISION
FIRST SEMESTER 2016-2017
Course Handout (Part II)

Date: 01.08.2016

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

Course No. : **BIO G512**
Course Title : **MOLECULAR MECHANISM OF GENE EXPRESSION**
Instructor-in-Charge : **NAGA MOHAN K**
Lab Instructor : **SONAL SAXENA**

1. Course Description:
Prokaryotic and Eukaryotic genomes and their topology; DNA protein-interaction, RNA transcription and transcriptional control, Translation, RNA processing, Post-transcriptional control and other mechanisms of gene expression, Gene rearrangement, Epigenetics, nucleic acids as Biomarkers.

2. Scope & Objective:
This course is designed to impart knowledge of molecular genetics, which is one of the fundamental requirements for the biotechnology. This course is designed to make the student understand the various mechanisms, which regulate the biological processes at genetic level including transcriptional and post transcriptional regulation of gene.

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3. Text Books:
Gene X by Benjamin Lewin; Pearson Education, 2011 and additional material given in the slides/ class room.

Reference Book:
Molecular Biology of Gene: Watson, Baker, Bell, Gann, Lavine & Losick (5th Ed).

4. Course Plan:

Lect No	Learning Objective	Topics to be covered	Chap/Sec
1-3	**Molecular genetic mechanisms**	Nature of genetic material: DNA, RNA and their properties as hereditary material in different organisms.	Text Book Chap. 1, 2
4-7	**Organization of genes and genomes -1**	Prokaryotic genomes: Organization of genes in bacterial and viral genomes. Eukaryotic genomes: Organization of genes in yeast and higher eukaryotes, non-coding sequences and their importance.	Text Book Chap. 4-8

8-11	**Organization of genes and genomes -2**	Organization of bacterial and viral genomes Eukaryotic chromatin: Nucleosomes-10nm and 30nm structures, histone variants and their functional role, organization into mitotic chromosomes and banding patterns, Centromere and telomeres.	Text Book Chap. 9 & 10
12-18	**Maintenance of the genome**	DNA replication, recombination, repair and transposition	Text Book Chap. 11-17
19-28	**Transcriptional mechanisms**	Prokaryotes: Transcriptional initiation, elongation and termination. Eukaryotes: Transcriptional initiation, elongation, termination, RNA splicing and processing, mRNA stability, catalytic RNA	Text Book Chap. 19-23
29-31	**Translation and genetic code**	Translational mechanisms in prokaryotes and eukaryotes, nature of the genetic code	Text Book Chap. 24-25
32-37	**Regulation of gene expression-1**	Prokaryotes: Regulation of *lac* operon, regulation of *trp* operon, regulation of lytic and lysogenic phases in bacteriophages	Text Book Chap. 26-27
38-42	**Regulation of gene expression-2**	Eukaryotes: mechanisms transcriptional activation, epigenetic regulation and regulatory RNA	Text Book Chap. 28-30.
	Topics for reading assignments	Protein localization on subcellular compartments of prokaryotic and eukaryotic cells, vesicular trafficking and protein secretion.	

List of Experiments to be completed:

i. Reagent preparation for DNA and bacterial work
ii. Reagent preparation for RNA work
iii. Isolation of human genomic DNA
iv. Dinucleotide distribution by restriction enzyme digestion
v. Analysis of DNA methylation in target sequences: I
vi. Analysis of DNA methylation in target sequences: II
vii. Effect of mutagens on bacterial growth: I
viii. Effect of mutagens on bacterial growth: II
ix. Isolation of total RNA from eukaryotic cells
x. Synthesis of cDNA from total RNA
xi. Reverse transcription PCR
xii. Analysis of differences in gene expression by real time PCR
xiii. Regulation of Gene Expression in lac Operon-I
xiv. Regulation of Gene Expression in lac Operon-II

5. Examination Scheme:

No	Evaluation Component	Duration	Date and Time	Weightage (%)	Remarks
1	Test-1	60 Min	08/09/2016; 2:30-3:30 PM	15	CB
2.	Test-2	60 Min	25/10/2016; 2:30-3:30 PM	15	CB
3.	Laboratory components (experimental design, data analysis, questions on experimental designs, Laboratory Record)			40	OB
5.	Comprehensive Examination	3 Hrs.	12/12/2016; FN	30	CB

6. Chamber Consultation Hour: To be announced in class

7. Notices: Notices will be displayed on the CMS

8. Make-up Policy: Make up will not be granted under any circumstance, barring hospitalization of the student himself/herself and that too with prior permission from the Instructor In-charge.

INSTRUCTOR-IN-CHARGE
BIO G512