



FIRST SEMESTER 2015-16

COURSE HANDOUT (PART II)

In addition to part-I (General Handout for all courses) printed on page 1 of the Time Table booklet, this portion gives further specific details regarding the course.

Course No.	: BIO G512
Course Title	: Molecular Mechanism of Gene Expression
Instructor- in Charge	: LALITA GUPTA
Instructor	: S. K. Verma

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

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.

3. Text Books:

Lewin's Genes XI: Jocelyn Krebs, Elliott Goldstein and Stephen Kilpatrick; (11th Ed), Jones & Bartlett Learning Publication, 2014

Reference Book:

Molecular Biology of Gene: Watson, Baker, Bell, Gann, Lavine & Losick (5th Ed)
Pearson Education





4. Course Plan:

Lecture No.	Learning Objective	Topics to be covered	Reference Chap/Sec(Books)
1-5	Overview of Molecular Genetics	Basics of genomics Genes are DNA, The Interrupted Gene, The Content of Genome, Clusters and repeats	Lecture Notes
6-8	Chromatin	Controlling chromatin structure: Alternative states of chromatin, chromatin remodeling, Alteration of nucleosome organization at promoter. Histone acetylation & modification, Histone methylation & phosphorylation.	Chap 10
9-10	Transcription	Prokaryotic Transcription: Three stage of Transcription, RNA Polymerase structure, Promoter recognition, and efficiencies, Sigma factor, alternate sigma factors and its binding with DNA, termination of transcription; Intrinsic and rho-dependent	Chap 19.
11-13	Eukaryotic Transcription	Polymerases: RNA polymerase I,II, III & Types of Promoters, Enhancers, Demethylation. CpG islands. nscription factors, Assembly of basal apparatus, , Insulation block	Chap 20
14-16	Post-Transcription mechanism	RNA Splicing and Processing: 5' Cap, Nuclear Splicing, Splice junctions, lariat formation and spliceosome, Splicing of group I & II introns, Splicing & gene Expression, Alternative splicing, Trans-splicing, 3' End Processing, tRNA & rRNA splicing	Chap.21
17-20	mRNA stability and Localization	Messenger RNA: Formation, structure and function of Messenger RNA & transfer RNA, Modifications at 3' and 5' end of mRNA in eukaryotes, Degradation pathways in bacteria and eukaryotes,	Chap.22



		Nuclear & Cytoplasmic Surveillance system	
21-23	Catalytic RNA	Role of catalytic RNA: Group I intron removal, Group II Introns and reverse transcriptase, ribozyme, Ribonuclease activities and RNA editing, Guide RNA	Chap.23
24-26	Translation and Genetic Code	Protein Synthesis: Stages in protein synthesis, Initiation of translation in bacteria, Elongation, Termination Genetic code: Structure and wobbling in codons, anticodones, Mitochondrial and archetypal code, mutated anticodones, Accuracy of translation	Chap.24-25
27-30	Gene Regulation	Operon Circuits: Structural gene clusters, Operator and regulator gene, Repressor protein structure, Specificity of protein-DNA interaction, binding of repressor with operator and inducer. Allosteric changes in repressor. <i>lac</i> and <i>trp</i> operon	Chap.26
31-32	Phage Strategies	Lysogeny and lytic cycle: Control of lytic cascades in T4, T7 and lambda phage, Maintenance of lysogeny, Repressor synthesis and binding, Balance between lysogeny and lytic cycle	Chap.27
33-36	Eukaryotic Transcription Regulation and Epigenetic Effects	Mechanism of action of activators and repressor: Interaction of activators with basal apparatus, Methylation of histones and DNA, DNA binding domains, Zinc fingers, steroid receptors, leucine zipper, Histone acetylation and modification, Yeast <i>GAL</i> genes, Histone methylation and phosphorylation, Epigenetic effects	Chap 28- 29
37-40	Regulatory RNA	Regulation of noncoding RNA: Riboswitch, Regulate gene expression by noncoding RNA, Attenuation and regulation by small RNA molecules, Gene silencing and RNA interference, antisense RNA	Chap 30



5. Examination Scheme:

EC No	Evaluation Component	Duration	Date	Weightage (%)	Remarks
1	Mid- Sem Test	1 ½ Hrs	9/10 4:00 - 5:30 PM	30	CB
3.	Quiz (multiple)	-		15	CB
4.	Seminar + Report	-		15	OB
5.	Comprehensive Examination	3 Hrs.	11/12 AN	40	OB+CB

6. Chamber Consultation Hour: Lalita Gupta: Room No: (3222 H), any time

S. K. Verma:

7. Notices: Notices will be displayed on **Biological Science Dept.** Notice Board

8. Make-up Policy: Prior Permission has to be obtained from the Instructor-In-Charge, No make-up will be granted for surprise evaluation component.

Instructor-in-Charge
BIO G512