Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020

Course Handout (Part-II)

01.08.2019

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 F311**
Course Title : **Recombinant DNA Technology**
Instructor In Charge : **VIDYA RAJESH**
Co-Instructor and Tutorial Instructor : **Vidya Rajesh**

1. **Course Description:** Recombinant DNA technology is an interdisciplinary field encompassing biochemistry, microbiology, immunology, molecular biology, genetic engineering, cell biology and chemical engineering. This course will deal with theoretical aspects underlying the practice of recombinant DNA technology. It will focus mainly on the tools and techniques available to create and manipulate chimeric DNA molecules.

2. **Scope and Objective:** This course intends to provide interested students an opportunity to gain basic theoretical understanding of recombinant technology through lectures, interactive tutorials, and quizzes. It aims to introduce the students to the versatile tools and techniques of genetic engineering and recombinant DNA technology that can be applied to virtually any research question that involves a molecular approach. The specific learning objectives are listed in the table below.

3. **Text Book (T1):** Gene Cloning & Manipulation, by Christopher Howe, 2nd Edition (First South Asia Edition, 2016), Cambridge University Press

4. **Reference Book (R1):** S. B. Primrose and R.M. Twyman Principles of Gene Manipulation and Genomics. 7th Edition, 2006; Blackwell Publishing;

Reference Book (R2: Sambrook and Russell. Molecular Cloning: A laboratory Manual. Vols 1-3, 2001; CSH Press.

Course Plan:

Lect.	Learning Objective	Topics to be covered	Chapter in the Text Book
1-2	Introductory concepts	Overview of rDNA technology	R1, Chapter 1
3	About DNA	Review of nucleic acid chemistry; Phosphodiester chemistry-based synthesis	Lecture notes
4-5	Basic tools & techniques	Cutting DNA; restriction endonucleases; other DNA modifying enzymes; joining DNA; ligases; Plasmid transformation, purification and electrophoresis; blotting techniques. Restriction mapping	T1, Chapter 1 R1, Chapter 2
6-8	Polymerase Chain Reaction	Principle of PCR; primer design; melting temperature; applications of PCR; modifications of PCR: inverse PCR; RNA-PCR; real-time PCR.	T1, Chapter 2 R1, Chapter 2
9-11	DNA sequencing	Principle of sequencing; Sanger sequencing; cycle sequencing; pyrosequencing; analysing DNA sequence data	Lecture notes R1, Chapter 7
12-17	Plasmid vectors	Plasmid biology; plasmid replicons & copy number; examples of common plasmids; selection markers; cloning and expression vectors; expression modules	T1, Chapter 3 R1, Chapter 4
18-21	Cloning: making	Basic cloning; sticky and blunt ends; ligation; linkers &	T1, Chapter 3

	recombinant DNA molecules	adaptors; homopolymer tailing; TA cloning for PCR products	R1, Chapter 3
22-23	Alternate vectors for *E. coli*	Bacteriophage and cosmid vectors; molecular aspects of lambda and M13 life cycle relevant to vector design; BACs and PACs	T1, Chapter 4 R1, Chapters 4, 5
24-29	Making libraries and Library screening	Library screening; screening by hybridization; PCR screening; expression screening; functional screening; Southwestern and Northwestern screening; screening for other functions	T1, Chapter 6 R1, Chapter 6
29-31	Modification & mutagenesis; protein engineering	Restriction enzyme-based and oligonucleotide-directed mutagenesis; The single primer method; PCR-based mutagenesis; gene inactivation techniques; creating chimeric proteins	T1, Chapter 7 R1, Chapter 8
32-35	Expression of cloned DNA	Expression of RNA and protein using cloned DNA; Expression strategies; purification of recombinant proteins; reporter genes and tags	T1, Chapter 8 R1, Chapter 6
36-38	Cloning in bacteria other than *E. coli*	Gram stain; bacterial transposons; IncP, IncQ and IncW plasmids for cloning in Gram negative (other than *E. coli*); cloning in Gram positive bacteria; multigene assembly using *B. subtilis*	Lecture notes R1, Chapter 10
39-42	Gene transfer into animal cells	Different methods of DNA transfection (physical and chemical); transient and stable transfection; selection markers (endogenous; dominant, amplifiable markers); viral vectors and introduction to their design	T1, Chapter 9 R1, Chapter 12

5. Evaluation Scheme:

Evaluation Component	Duration	Weightage (%)	Date & Time	Nature of the Component
Mid Sem examination	90 mins	30 (90)	03.10.19 (11.00 – 12.30 PM)	Closed Book
Assignment/GD/Seminars	1 each	30 (90)	During the semester	To be held in lecture and Tutorial classes
Comprehensive examination	3 hours	40 (120)	09.12.19 (AN)	Closed book (20%) + Open Book (20%)

6. Chamber Consultation Hour: Will be announced in the Class.

7. Notices: All notices, concerning the course will be displayed on CMS and/or the Biological Sciences Department Notice Board.

8. 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.

9. Make-up policy: For midsem and Compre, make-up will be granted only if candidate is sick and hospitalized. No make-up will be granted for surprise quizzes under any circumstances.

10. 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 F311