SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Biotechnology	LP: BT18602 Rev. No: 00 Date:20.01.2023
~~B.E/~~B.Tech~~/M.E/M.Tech~~ : Biotechnology Regulation: 2018 PG Specialisation : Not Applicable Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics Unit : 1	

Unit Syllabus: BASICS OF RECOMBINANT DNA TECHNOLOGY 12

Manipulation of DNA – Restriction and Modification enzymes, Design of linkers and adaptors. Characteristics of cloning and expression vectors based on plasmid and bacteriophage, Vectors for yeast, insect and mammalian systems, Prokaryotic and eukaryotic expression host systems, Introduction of recombinant DNA in to host cells andselection methods.

Objective:To study about the basics of Recombinant DNA Technology

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Manipulation of DNA – Restriction and Modification enzymes	TB1; Pg. (26-37)	LCD/BB
2.	Design of linkers and adaptors	TB1; Pg. (38-40)	LCD/BB
3.	Characteristics of cloning and expression vectors based on plasmid	TB1; Pg. (43-53)	LCD/BB
4.	Characteristics of cloning and expression vectors based on bacteriophage	TB1; Pg. (53-63)	LCD/BB
5.	Vectors for yeast	TB1; Pg. (158-160)	LCD/BB
6.	Vectors for insect cell	RB4; Pg. (269-272)	LCD/BB
7.	Vectors for mammalian systems	TB1;Pg.(186-201)	LCD/BB
8.	Eukaryotic expression host systems	TB3; Pg. (163-189)	LCD/BB
9.	Introduction of recombinant DNA in to host cells and selection methods.	TB1; Pg. (17-19) TB1; Pg.(174-186)	LCD/BB
10-12.	Tutorial on Using NCBI Website	Weblink -1	LCD

Content beyond syllabus covered (if any): Gene Editing

* Session duration: 50 minutes

Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics
Unit : 2

Unit Syllabus : DNA LIBRARIES 12

Construction of genomic and cDNA libraries, Artificial chromosomes – BACs and YACs, Chromosome walking, Screening of DNA libraries using nucleic acid probes and antisera.

Objective: To study about the construction of DNA library and Screening them.

Session No *	Topics to be covered	Ref	Teaching Aids
13.	Introduction to DNA library construction	TB2; Pg. (96-97)	LCD/BB
14.	Construction of genomic DNA libraries	TB2; Pg. (97-101)	LCD/BB
15.	Construction of cDNA libraries	TB2; Pg. (102-110)	LCD/BB
16.	Artificial chromosomes – BACs	RB4; Pg. (148-149)	LCD/BB
17.	Artificial chromosomes – YACs	RB4; Pg. (143-144)	LCD/BB
18.	Chromosome walking	TB2; Pg. (121)	LCD/BB
19.	Screening of DNA libraries using nucleic acid probes	TB2; Pg. (111-116)	LCD/BB
20.	Screening of DNA libraries using antisera	TB2; Pg. (116-119)	LCD/BB
21.	Functional complementation	TB2; Pg. (119-120)	LCD/BB
22-24.	Tutorial on Using NebCutter	Weblink - 2	LCD

Content beyond syllabus covered (if any): Restriction mapping of vectors

* Session duration: 50 mins

Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics
Unit : 3

Unit Syllabus : **SEQUENCING AND AMPLIFICATION OF DNA 12**
Maxam Gilbert's and Sanger Coulson's and automated methods of DNA sequencing, Inverse PCR, Nested PCR, AFLP-PCR, Allele specific PCR, Assembly PCR, Asymmetric PCR, Hot start PCR, Colony PCR, single cell PCR, Real-time PCR/qPCR – SYBR green assay, Taqman assay, Molecular beacons, Site directed mutagenesis.
Objective: To study about the different methods of sequencing and Amplification of DNA

Session No *	Topics to be covered	Ref	Teaching Aids
25.	Maxam Gilbert's method of DNA sequencing	Journal Reference-2	LCD
26.	Sanger Coulson's method of DNA sequencing	TB2; Pg. (126-129)	LCD
27.	Automated methods of DNA sequencing	TB2; Pg. (130-132)	LCD
28.	Inverse PCR, Nested PCR, AFLP-PCR	Weblink – 3	LCD
29.	Allele Specific PCR, Assembly PCR	Weblink – 3	LCD
30.	Asymmetric PCR, Hot start PCR	Weblink – 3	LCD
31.	Colony PCR, single cell PCR	Weblink - 3	LCD
32.	Real-time PCR/qPCR – SYBR green assay, Taqman assay, Molecular beacons,	TB2; Pg. (30-35)	LCD
33.	Site directed mutagenesis	TB1; Pg. (132-138)	LCD/BB
34-36.	Tutorial on Primer Designing, DNA sequencing trouble shooting and PCR Reaction calculation	Weblink – 4&5	LCD
Content beyond syllabus covered (if any): Scorpion Probes and gene expression quantification			

* Session duration: 50 mins

Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics
Unit : 4

Unit Syllabus : **WHOLE GENOME SEQUENCING 12**

Organization and structure of genomes, Genome sequencing methods, Conventional and shotgun genome sequencing methods, Next generation sequencing technologies, Ordering the genome sequence, Chromosome walking, Genetic maps and Physical maps, STS content based mapping, Restriction Enzyme Finger Printing, Hybridization mapping, Radiation Hybrid Maps, Optical mapping.

Objective: To study about the genome sequencing and genome sequence assembly

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Organization and structure of genomes	RB5; Pg. (3.1-3.24)	LCD/BB
38.	Genome sequencing methods: Conventional and shotgun genome sequencing methods	TB2; Pg. (363-367)	LCD/BB
39.	Next generation sequencing technologies	Weblink - 6	LCD/BB
40.	Ordering the genome sequence	RB5; Pg. (246-250)	LCD/BB
41.	Genetic maps and Physical maps	TB2; Pg. (353) TB2; Pg. (368-370)	LCD/BB
42.	STS content based mapping	TB2; Pg. (348-349)	LCD/BB
43.	Restriction Enzyme Finger Printing	TB2; Pg. (346-348)	LCD/BB
44.	Hybridization mapping, Radiation Hybrid Maps	TB2; Pg. (358-360)	LCD/BB
45.	Optical mapping	RB3; Pg. (239-243)	LCD/BB
46-48.	Tutorial on the Restriction mapping and RFLP	Weblink - 7	LCD

Content beyond syllabus covered (if any): Pyrosequencing

* Session duration: 50 mins

Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics
Unit : 5

Unit Syllabus: **GENOMICS 12**

Introduction to Functional genomics, ORF finding and functional annotation, Microarrays, Serial Analysis of Gene expression (SAGE), Subtractive hybridization, DIGE, TOGA, Yeast Two hybrid System, Comparative Genomics, Proteogenomics.

Objective: To understand the various applications of plant biotechnology

Session No *	Topics to be covered	Ref	Teaching Aids
49.	Current status of genome sequencing projects	Weblink - 8	LCD/BB
50.	Introduction to Functional genomics	Journal Reference - 1	LCD/BB
51.	Microarrays	TB2; Pg. (134, 136–40, 413–18)	LCD/BB
52.	Analysis of Gene expression (SAGE)	TB2; Pg. (410-411)	LCD/BB
53.	Subtractive hybridization	TB2; Pg. (122-123)	LCD/BB
54.	DIGE, TOGA, Yeast Two hybrid System	TB2; Pg. (428-429) TB2; Pg. (458-465)	LCD/BB
55.	Comparative Genomics, Proteogenomics	RB3; Pg. (279-282)	LCD/BB
56.	Web resources for Genomics	TB2; Pg. (515-519) RB3; Pg. (288-298)	LCD/BB
57.	Applications of genome analysis and genomics	RB3; Pg. (238-279)	LCD/BB
58-60.	Tutorial on web resources for Genomics	Weblink - 9	LCD

Content beyond syllabus covered (if any): Phage Display

* Session duration: 50 mins

Sub. Code / Sub. Name : BT18602/Genetic Engineering and Genomics

TEXT BOOKS:

1. Primrose SB and R. Twyman, "Principles of Gene Manipulation & Genomics", Blackwell Science Publications, 2006.
2. S.B. Primrose and R.M. Twyman, "Principles of Genome Analysis and Genomics", 3rd Edition Blackwell Publishing, 2003.
3. Bernard J. Glick, Jack J. Pasternak, Cheryl L. Patten, "Molecular Biotechnology: Principles and Applications of Recombinant DNA", 4th Edition, ASM Press, 2010.

REFERENCES:

1. Ansubel FM, Brent R, Kingston RE, Moore DD, "Current Protocols In Molecular Biology", Greene Publishing Associates, 1988.
2. Berger Sl, Kimmer AR, "Methods In Enzymology", Vol 152, Academic Press, 1987.
3. T.A. Brown, "Genomes 3", 3rd Edition, Garland Science Publishing, 2007.
4. Analysis of Genes and Genomes – Richard J Reece, John Wiley and Sons Ltd.
5. Genes VIII – Benjamin Lewis

JOURNAL PUBLICATION REFERENCE (JPR)

1. Advances In Wound Care, Volume 2, Number 9, Pg 490-498
2. Heather JM, Chain B. The sequence of sequencers: The history of sequencing DNA. Genomics. 2016;107(1):1-8. doi:10.1016/j.ygeno.2015.11.003

WEBLINK (WL)

1. http://www.ncbi.nlm.nih.gov/
2. http://nc2.neb.com/NEBcutter2/
3. http://nptel.ac.in/courses/102103013/13
4. http://bioinfo.ut.ee/primer3-0.4.0/primer3/
   https://www.nucleics.com/DNA_sequencing_support/DNA-sequencing-troubleshooting.html
5. http://www.mcb.uct.ac.za/mcb/resources/pcr/concentrations
6. https://www.ebi.ac.uk/training/online/course/ebi-next-generation-sequencing-practical-course/what-you-will-learn/what-next-generation-dna-
7. http://science.holeintheground.net/events/DesGene/restriction_mapping.pdf
8. https://gold.jgi.doe.gov/
9. http://genome.cshlp.org/site/misc/ifora_weblinks.xhtml

	Prepared by	Approved by
Signature		23/11/23
Name	J. Hariharan	Dr. E.Nakkeeran
Designation	Assistant Professor	HOD
Date	20.01.2023	20.01.2023

Remarks *:
The same lesson plan will be followed in the subsequent semester/year.