ST. ALOYSIUS COLLEGE (AUTONOMOUS), JABALPUR

Reaccredited 'A+ 'Grade by NAAC (CGPA:3.68/4.00)
College with Potential for Excellence by UGC
DST-FIST Supported & STAR College Scheme by DBT

Faculty of Science

Master of Science (M.Sc.)

SUBJECT: MICROBIOLOGY

M.Sc. II Semester

Paper-I

Core Paper

Paper I: Molecular Biology and Recombinant DNA Technology

Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Students will be able to understand basics of Nucleic acid (DNA and RNA), DNA replication, reverse transcription, transcription, gene expression in prokaryotes and eukaryotes.	U, K
CO2	Students will get the knowledge of global regulatory responses.	U, K
CO3	Students will be able to understand fundamentals of recombinant DNA technology.	U, K
CO4	Students will be equipped with the knowledge of important molecular techniques	U,A

Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	10	40 (Minimum Passing marks 13)	**50**
Practical	2	5	20	**25**
Total	**6**	**75**		

Evaluation Scheme

	Marks	
	Internal	**External**
Theory	1 Internal Exams of 10 Marks	1 External Exams (At the End of Semester)
Practical	Sessional (5 marks)	1 External Exams (At the End of Semester)

Content of the Course

Theory

No. of Lectures (in hours per week): 5 Hrs. per week
Total No. of Lectures: 60 Hrs. **Maximum Marks: 40**

Units	Topics	No. of Lectures
I	Nucleic acids as genetic information carriers: DNA structure, melting of DNA; superhelicity in DNA, linking number and topological properties; DNA replication., general principle, various modes of reading, continuous and discontinuous synthesis, asymmetric & dimeric nature of DNA polymerase III & simultaneous synthesis of DNA leading and lagging strands, polymerase and exonuclease activities, eukaryotic DNA polymerases; Mechanism of action of topoisomerases, ligases.	12
II	Initiation of replication and construction of replication fork in test tube; retroviruses and their unique mode of DNA synthesis; relationship between replication and cell cycle in prokaryotes and eukaryotes; inhibitors of DNA replication (blocking precursor synthesis, nucleotide polymerization altering DNA structure).	12
III	Transcription: general principles, basic apparatus types of RNA polymerase; steps: initiation, elongation and termination, inhibitors of RNA synthesis, polycistronic and monocistronic RNA's; control of transcription by interaction by interaction between RNA polymerases and promoter regions, role of alternate sigma factors; regulation of rRNA and tRNA synthesis; maturation and splicing of mRNA, cutting and modification of tRNA: catalytic RNA, group I and group II splicing.	12
IV	Gene expression in prokaryotes: induction and repression operon concept, regulatory and structural genes, operator, promoter, repressor and co-repressor, catabolite repression, cyclic AMP, CRP/CAP protein, regulation of lactose, tryptophan, histidine and arabinose operons, attenuation regulation. Gene expression in eukaryotes, Britton and Davidson's model of regulation involvement of HCP, NHCP and hormones. Regulation by N protein and nut sites in DNA binding proteins, enhancer sequences and control of transcription. Global regulatory responses: heat shock response, stringent response and regulation by small molecules such as ppGpp.	12
V	Basic principle of gene cloning, genomic libraries, vectors, strategies of gene cloning using DNA or cDNA inserts, gene expression in recombinants, screening method for recombinant clones, important molecular techniques like Southern Blotting, PCR, RAPD, RFLP, DNA sequencing, and probe hybridization.	12

List of recommended books

1. Molecular cloning: A Laboratory Manual, J. Sambrook; Fritsch and T. Maniatis Cold Spring Harbor Laboratory Press, New York, 2000
2. Introduction to practical molecular biology P.D. Dabre, John Wiley & sons Ltd. New York 1988
3. Molecular Biology LabFax, T.A. Brown (Ed) Bios Scientific Publishers Ltd. Oxford, 1991
4. Molecular Biology of the Gene (4th edition), J.D. Watson N.H. Hopkins, J.W. Roberts J.A. Steitz and A.M. Weiner, The Benjamin/ Cummlngs Publ Co. Inc. California, 1987.
5. Molecular Cell Biology (2nd Edition) J. Darnell, H. Lodish and D. Baltimore, Scientist American Books, Inc., USA, 1994.
6. Molecular Biology of the Cell (2nd Edition) B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts, and J. D. Watson, Garland Publishing, Inc., New York, 1994.
7. Gene VI (6th Edition) Benjamin Lewin, Oxford University press, U.K., 1998.
8. Molecular Biology and biotechnology; a comprehensive desk reference, R.A. Meyers (Ed.) VCH Publishers, Inc, New York, 1995
9. Genomes, T.S. Brown.