



University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22 (Odd Semester)

Program B.Sc Microbiology

Semester: Third

Name of the Course: Cell Biology

Course Code: BMB 302

Name of the Faculty: Dr. Madhusmita Borthakur

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy
Unit I Introduction to cell	Cell theory	1		Discussion
	Cell theory contd.	2		PPT
	Structural organization of prokaryotic cell	3		PPT
	Structural organization of prokaryotic cell	4		Discussions
	Structural organization of prokaryotic cell	5		PPT
	Function of cell organelles	6		PDF
	Function of cell organelles	7		Discussion
	Function of cell organelles	8		Discussions
	Structural organization of eukaryotic cell	9		PPT
	Structural organization of eukaryotic cell	10		PPT and PDF
	Structural organization of eukaryotic cell	11		PPT
	Structural organization of eukaryotic cell	12		PPT and PDF
	Function of eukaryotic cell	13		PPT
	Function of eukaryotic cell	14		Discussion and PDF
	Function of eukaryotic cell	15		PPT
	Comparative characters of prokaryotes and eukaryotes	16		PPT
	Comparative characters of prokaryotes and eukaryotes	17		PPT
Unit II Plasma membrane	Structural organization of cell membrane and their function	18		PDF
	Structural organization of cell membrane and their function	19		Discussions
	Structural organization of cell membrane and their function	20		PDF
	Structural organization of cell membrane and their function	21		PDF

	Structural organization of plasma membrane and their function	22		PPT
	Structural organization of plasma membrane and their function	23		PPT
	Structural organization of plasma membrane and their function	24		Link and Discussions
	Sodium pump	25		PPT and notes
	Potassium pump	26		PPT and notes
	Glucose transport	27		PPT and notes
	Glucose transport	28		PPT and notes
	Transport of ions in neuron	29		PPT and notes
	Transport of ions in neuron	30		PPT and notes
Unit III Cell organelle structure & function	Endoplasmic reticulum	31		Books and discussion
	Endoplasmic reticulum	32		PPT
	Golgi complex	33		PPT and Discussions
	Golgi complex	34		PPT and Discussions
	lysosome	35		PPT and Discussions
	lysosome	36		PDF
	peroxisome	37		Discussions
	peroxisome	38		PDF
	vacuoles	39		PDF
	mitochondria	40		PPT
	mitochondria	41		PPT
	Role of mitochondria in oxidative reaction and electron transport chain	42		Link and Discussions
	Role of mitochondria in oxidative reaction and electron transport chain	43		PPT and notes
	Role of mitochondria in oxidative reaction and electron transport chain	44		PPT and notes
	Role of mitochondria in oxidative reaction and electron transport chain	45		PPT and notes
	Role of mitochondria in oxidative reaction and electron transport chain	46		PPT and notes
	Chloroplast and its role in photosynthesis	47		PPT and notes
	Chloroplast and its role in photosynthesis	48		PPT and notes
	Chloroplast and its role in photosynthesis	49		PPT
	Chloroplast and its role in photosynthesis	50		Notes

Unit IV Nucleus	Structure	51		PPT and notes
	Organization and function	52		
	Nuclear envelop	53		Books and discussion
	Role of nuclear pore in transport across the envelop	54		PPT
	Role of nuclear pore in transport across the envelop	55		PPT and Discussions
	Nucleoplasm and nucleolus	56		PPT and Discussions
	Nucleoplasm and nucleolus	57		PPT and Discussions
	Chromatin structure and organization	58		PPT and Discussions
	Chromatin structure and organization	59		PPT and Discussions
Unit V Cytoskeleton	Microtubule	60		PPT and Discussions
	Microtubule	61		PDF
	Microtubule	62		Discussion
	Microfilaments	63		Discussions
	Microfilaments	64		PPT
	Microfilaments	65		PPT and PDF
	Intermediate filaments	66		PPT
	Intermediate filaments	67		PPT and PDF
	Extra cellular matrix	68		PPT
	Extra cellular matrix	69		Discussion and PDF
	Extra cellular matrix	70		PPT
Unit VI Cell cycle & cell division	Cell cycle and its phase	71		PPT
	Cell cycle and its phase	72		PPT
	Cell division	73		PDF
	Cell division	74		Discussions
	Cell death	75		PDF
	Cell cycle control and regulation	76		PPT and PDF
	Cell cycle control and regulation	77		PPT
	Cell cycle control and regulation	78		PPT and PDF
	Cancer	79		PPT
	Cancer	80		Discussion and PDF

Suggested Books:

1. Molecular Biology of the Cell
2. Cell Biology : CB Powar

3. Cell and Molecular Biology: SC Rastogi

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...Dr. Madhusmita

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University
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Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22 (Odd Semester)

Program M.Sc Biotechnology

Semester: Third

Name of the Course Food and Industrial Biotechnology

Course Code: MBT 304

Name of the Faculty: Dr. Madhusmita Borthakur

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy
Unit I Fundamentals of food	Basics of food	1		Discussion
	Basics of food	2		PPT
	Types of food	3		PPT
	Types of food	4		Discussions
	Types of food	5		PPT
	Classification of food	6		PDF
	Classification of food	7		Discussion
	Classification of food	8		Discussions
	Microbes involved in food spoilage	9		PPT
	Microbes involved in food spoilage	10		PPT and PDF
	Food preservation- Physical methods	11		PPT
	Food preservation- Physical methods	12		PPT and PDF
	Food preservation- Chemical methods	13		PPT
	Food preservation- Chemical methods	14		Discussion and PDF
	Food preservation- Biological methods	15		PPT
	Food preservation- Biological methods	16		PPT
	Food preservation- Biological methods	17		PPT
	Merits and drawbacks of different methods of food preservation	18		PDF
	Merits and drawbacks of different methods of food preservation	19		Discussions

	Food packaging	20		PDF
	Food packaging	21		PDF
Unit II Fermented Food	Fermentation of cabbage	22		Books and discussion
	Fermentation of cabbage	23		PPT
	Fermentation of soybean	24		PPT and Discussions
	Miso	25		PPT and Discussions
	Soyu	26		PPT and Discussions
	Nato	27		PDF
	Sofu	28		Discussions
	fermentation of milk	29		PDF
	Kumiss	30		PDF
	Yogurt	31		PPT
	Kefir	32		PPT
	fermentation of fish	33		Link and Discussions
	fermentation of fish	34		PPT and notes
	fermentation of fish	35		PPT and notes
	fermentation of meat	36		PPT and notes
	fermentation of meat	37		PPT and notes
	Pre and pro- biotic microorganisms	38		PPT and notes
	Pre and pro- biotic microorganisms	39		PPT and notes
	GRAS microorganisms	40		PPT
	GRAS microorganisms	41		Notes
	Starter culture	42		PPT and notes
	Industrial production of alcohols and organic acids	43		Discussion and PDF
	Acetic acid	44		Books and discussion
	Citric acid	45		PPT
	Lactic acid	46		PPT and Discussions
	SCP	47		PPT and Discussions
	SCP	48		PPT and Discussions
Unit III Commercialization of fermented food and food laws	Commercialization of fermented food	49		PPT and Discussions
	Commercialization of fermented food	50		PDF
	Benefits of fermented food products	51		Discussion
	Benefits of fermented food products	52		Discussions

	Nutritional values and safety aspects	53		PPT
	Nutritional values and safety aspects	54		PPT and PDF
	Nutritional values and safety aspects	55		PPT
	Enzymes in food processing industries	56		PPT and PDF
	Enzymes in food processing industries	57		PPT
	Enzymes in food processing industries	58		Discussion and PDF
	Enzymes in food processing industries	59		PPT
	Immobilized enzymes and their applications	60		Discussion
	Immobilized enzymes and their applications	61		PPT
	Immobilized enzymes and their applications	62		PPT
	Immobilized enzymes and their applications	63		Discussions
	Genetic improvement of industrially important microorganisms	64		PPT
	Genetic improvement of industrially important microorganisms	65		PDF
	Genetic improvement of industrially important microorganisms	66		Discussion
	Genetic improvement of industrially important microorganisms	67		Discussions
	Genetic improvement of industrially important microorganisms	68		PPT
Unit IV Bioreactor	Types of bioreactor	69		PPT and PDF
	Types of bioreactor	70		PPT
	Structure and design of bioreactor	71		PPT and PDF
	Structure and design of bioreactor	72		PPT
	Structure and design of bioreactor	73		Discussion and PDF
	Structure and design of bioreactor	74		PPT
	Automation in bioreactor	75		PPT
	Automation in bioreactor	76		PPT
	Automation in bioreactor	77		PDF
	Bioreactor for animal cell culture	78		Discussion and PDF
	Bioreactor for animal cell culture	79		Discussion and PDF

Suggested Books:

1. Biotechnology: Food Fermentation: V.K. Joshi and A Pandey

2. Microbiology and Technology of Fermented Foods: R.W Hutkins

3. Biotechnology: U Satyanarayana

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Dr. Madhusmita Borthakur...

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University of Science & Technology, Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22

Program B.Sc. Food Science & Technology

Semester: III

Name of the Course DAIRY TECHNOLOGY

Course Code: BFST-303

Name of the Faculty: Dr. Saiyyad Alamdar Husain

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
1	Milk: production statistics, importance, standards, Definition,	2				
	Composition and nutritive value of milk,	2				
	Factors affecting composition of milk; buying and collection of milk;	2				
	Cooling and transportation of milk;	1				
	Analyses at different levels;	2				
	Transportation.	1				
	Physico-chemical properties of milk;	2				
	Microbiology of milk; milk and public health;	2				
	Clean milk production;	2				
	Special milks.	3				
2	Unit operations in milk processing: cream separation, Bactofugation, Filtration,	2				
	Thermization,	1				
	Standardization,	2				
	Homogenization,	2				
		2				

	Pasteurization,	2	Industries/Laboratories		
	Sterilization,	1			
	UHT, aseptic packaging,	1			
	Storage, distribution,	2			
	Effect on milk constituents.	1			
3	Technology, composition, nutritive value, process of manufacture, defects - their causes and prevention of Milk products: evaporated,	3		II	
	Condensed and	2			
	Powder milks,	3			
	Butter,	3			
	Yogurt,	2			
	Cheese,	3			
	Ice cream.	2			
4	Indigenous milk products: <i>khoa</i> ,	2		III	
	<i>Gulabjamun, burfi</i> ,	2			
	<i>Rabri, paneer</i> ,	1			
	<i>Dahi, lassi</i> ,	2			
	<i>Kheer, desi ghee</i> etc.				
	Milk by-products: Definition; classification; composition;	1			
	Principle of utilization;	1			
	Methods of utilization.	1			

Suggested Books:

- ❖ De S.1980. Outlines of Dairy Technology. Oxford Univ. Press. Henderson JL. 1971. Fluid Milk Industry. A VI Publ.
- ❖ Aneja RP, Mathur BN, Chandan RC & Banerjee AK. 2002. Technology of Indian Milk Products. Dairy India Publ.
- ❖ Rathore NS et al. 2008. Fundamentals of Dairy Technology - Theory & Practices. Himanshu Publ Spreer E. 1993. Milk and Dairy Products. Marcel Dekker.
- ❖ Walstra P. (Ed.). 2006. Dairy Science and Technology. 2nd Ed. Taylor & Francis.
- ❖ Web BH, Johnson AH & Lford JA. 1987. Fundamental of Dairy Chemistry. 3rd Ed. AVI Publ.

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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22

Program B.Sc. Food Science & Technology

Semester: First

Name of the Course INTRODUCTION TO FOOD SCIENCE AND TECHNOLOGY

Course Code: BFST-101

Name of the Faculty: Dr. Saiyyad Alamdar Husain

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
1	Food industry: History and developments of important food industries in India.	3				
	Introduction: Basics of food science & technology; relationship with other disciplines; career opportunities.	2				
	Significance of food science and technology.	1				
	Global and national food and nutrition situation	3				
2	Food from Plant Sources	3		Online Classes, Classroom Teaching, Power Point slides, Classroom Discussions, Assignment, Video Displaying, Model Making, Problem Solving, Group Activity,	Test-I	
	Food grains: cereals; structure and composition of cereals,					
	post harvest processing, foods from cereals.	2				
	Grain legumes; composition of legumes, processing pulses.	2				
	Oilseeds: characteristics, processing of oilseeds.	3				
	Horticultural crops: structure and composition, post harvest technology	3				
	Foods of Animal Origin	3				
	Meat and meat products: livestock, poultry and meat production,					
	wholesome meat production, processed meats,	3				

3	Eggs and egg products,		2	Presentations, Interaction, Visit to Industries/Laboratories	Test-II	
	egg quality, shell egg processing,		3			
	spoilage and preservation of shell egg,		1			
	Packaging and transport of shell eggs, egg products.		2			
	Milk and milk products;		2			
	clean production of market milk, milk processing.		4			
	Fish and fishery products; aquatic animal production, processing,		3			
	deterioration of fish and shellfish.		2			
	Other Foods		3			
	Traditional Indian foods; honey; composition, uses and health benefits, safety concerns.					
4	Genetically modified foods; technology, benefits, risks, regulations.		3		Test-III	
	Infant foods; traditional infant foods, commercial infant foods and formulae, concerns, regulations.		3			
	Organic foods; advantages, concerns, regulations.		3			

uggested Books:

1. Thompson, A.K. 2003. **Fruit and vegetables harvesting, handling and storage**. Blackwell Science Pub, Cambridge, UK.
2. Chakraverty, A., Mujumdar, A.S., Raghavan, G.S.V., Ramaswamy, H.S. 2003. **Handbook of postharvest technology: cereals, fruits, vegetables, tea, and spices**, Marcel Dekker, Inc., New York, USA.
3. Sirivastava, R.P. and Sanjeev, K. 2002. **Fruit and vegetable preservation: principles and practices**. International Book Distributing Co., Lucknow, India.
4. Dauty, M.E. 1995. **Fruit and vegetable processing**. FAO Agricultural Services Bulletin No. 119. Food and Agriculture Organization of the United Nations, Rome, Italy.

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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22(Odd Semester)

Program B.Sc. Biotechnology

Semester: 5th

Name of the Course Recombinant DNA technology

Course Code: BBT 502

Name of the Faculty: Dr. Ishani Chakrabartty

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	Molecular tools and applications -restriction enzymes	3		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS	Test-I	
	Ligases, polymerases, alkaline phosphatase	3			Unit I	
	Transformation, Episomes, Plasmids and other cloning vectors	4				
	Bacteriophage-derived vectors, artificial chromosomes	4				
	Principle and applications of Polymerase chain reaction (PCR)	2				
	Primer-design, and RT-(Reverse transcription) PCR	4				
	Restriction and modification system,	3			Test-II	9

	restriction mapping				Topic 3,4,7 from Unit I and Topic 2, 5 from Unit II	
	Southern and Northern hybridization	4				
	Preparation and comparison of Genomic and cDNA library, screening of recombinants	3				
	Reverse transcription	3				
	DNA fingerprinting	2		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS		
	Production and applications of transgenic mice	4				
	Role of ES cells in gene targeting in mice	3				
	Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines	6				
Unit III	Random and site-directed mutagenesis: Primer extension and PCR based methods of site directed mutagenesis, Random mutagenesis	4		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS		
	Production of chimeric proteins	3				
	Protein engineering concepts and examples	4				
Unit IV	Genetic engineering in plants: Use of Agrobacterium tumefaciens and Arhizogenes, Ti plasmids	5		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS		
	Strategies for gene transfer to plant cells, Direct DNA transfer to plants, Gene targeting in plants	5				
	Use of plant viruses as episomal expression vectors	4				

Suggested Books:

1. B.D. Singh Fundamentals of Genetics, Kalyani publishers, Ludhiana, ed 6th (2002)
2. Gardner, Principle of Genetics
3. Different PDFs and links will be provided to the students

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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2021-22(Odd Semester)

Program: B.Sc. Biotechnology

Semester: 3rd

Name of the Course Genetics

Course Code: BBT 301

Name of the Faculty: Dr. Ishani Chakrabartty

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	Introduction to genetics, Mendel's laws of inheritance, Law of dominance	3		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS	Test-I	
	Law of segregation, Law of independent assortment-dihybrid cross	2			Topic 1,2 from Unit I and Topic 1 from Unit II	
	Mechanism of independent assortment	1				
	Drosophila as a model in genetics	4				
II	Phenomenon of dominance, phenomenon of dominance in plants, application of phenomenon of dominance in animals, Mechanism of dominance	3			Test-II	9
	Variation in dominance relation-incomplete	6			Topic 3,4,7 from Unit I and Topic	

	dominance, codominance, pleiotropy, multiple allelism, complementation and epistasis				2, 5 from Unit II	
	Back cross, test cross, monohybrid and dihybrid test cross, multihybrid cross	2		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS		
	Deviations from Mendal's dihybrid phenotypic ratio.	5				
Unit III	Genetic interaction- types of interaction	3			E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS	
	Lethal genes	2				
	Linkage and crossing over	10				
	Sex determination and sex linked inheritance, Genetically inherited disorders	7				
Unit IV	Numerical and structural changes in chromosomes	8		E-Books, PDF, PPT, VIDEOS, POLLS, MCQS, REVISION, TUTORIALS		
	Mutation and mutagenesis, mutagens (chemical and biological)	12				
Unit V	Concept of Extra-nuclear inheritance, Cytoplasmic and mitochondrial mode of inheritance	8				
Unit VI	Population genetics- Hardy-Weinberg equilibrium	3				
	Genetic drift	3				

Suggested Books:

1. E.J.Gardener, M.J.Simmons and D.P.Snustad Principles of Genetics, John Wiley and Sons Publications.
2. B.D. Singh Fundamentals of Genetics, Kalyani publishers, Ludhiana, ed 6th (2002)
3. Gardner, Principle of Genetics Different PDFs and links will be provided to the students

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University of Science & Technology Meghalaya

Department of...Applied Biology

Lesson Plan

Session: 2021-22(odd Semester)

Program ... BMB..... Semester:.....3RD
 Name of the Course Molecular Biology Course Code:...BMB 303.....
 Name of the Faculty: Dr. Sony Kumari.....

Details Plan

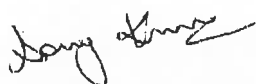
Unit	Topic	Target ed No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
Unit I	Basic concepts of Genetic Information Introduction	1		PPT/PDF/Discussion/ Remedial/Problem solving tasks/ links /notes from books/ Seminar etc. which will followed for whole paper till completion of the syllabus.	Test-I Unit I	
	Nucleic acids as genetic information carriers, experimental evidences.	3				
	Primary structure of nucleic acids and their properties. Highly repetitive, moderately repetitive and unique DNA sequences,	8				
	Classes of RNA, secondary and tertiary structure.	5				
	Secondary structures of nucleic acids, anti-parallel strands, base composition, base equivalence, base pairing and base stacking, types of	10				

	DNA, structural characteristics, chirality and cot curve.					
	TEST	1				
Unit II	DNA Replication Introduction	1				
	DNA replication in prokaryotes: Conservative, semiconservative and dispersive types, DNA polymerases, enzymes and protein factors involved in replication.	5				
	Mechanism of replication in eukaryotes, inhibitors of replication.	3				
	TEST	1				
Unit III	Transcription, Translation and Regulation of Gene Expression Introduction	1			Test-II Unit II And some portions of Unit III	
	Transcription in prokaryotes and eukaryotes, RNA polymerases; promoters, differences in transcription termination, post transcriptional modifications.	10				
	Genetic code: Basic features of genetic code, biological significance of degeneracy, Wobble hypothesis; gene within genes and overlapping genes	7				
	Mechanism of translation in prokaryotes and eukaryotes, ribosome assembly.	6				
	Regulation of Gene Expression in Prokaryotes and	10				

	eukaryotes, Enzyme induction and repression, operon concept, Lac operon, Trp operon, eukaryotic gene arrangements.					
	TEST	1				
Unit IV	Mutation and Repair Introduction	1				
	Mutation: molecular basis of mutation, types of mutation, dominant and recessive mutations, spontaneous and induced mutations.	5				
	Mutagenicity testing: Correlation of mutagenicity and carcinogenicity: Ames testing, Random and site directed mutagenesis.	5				
	DNA Repair- Types and evidences	6				
	TEST	1				

Suggested Books:

1. Glick, B.T and Pasternak J.J (1998) Molecular Biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press.
2. Sambrook et al (2000) Molecular Cloning Volumes I, II, & III Cold Spring Harbor Lab. Press, New York, USA
3. Walker J.M. and Gingold, E.B. (1983) Molecular Biology and Biotechnology (Indian Edition) Royal Society of Chemistry U.K
4. Lewin, B., Gene VI New York, Oxford University Press.



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University of Science & Technology Meghalaya

Department of...Applied Biology

Lesson Plan

Session: 2021-22(odd Semester)

Program : ...

BBT.....

Semester:.....3RD

Name of the Course

Molecular Diagnostics

Course Code:...BBT 304.....

Name of the Faculty:

Dr. Sony Kumari.....

Details Plan

Unit	Topic	Target ed No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
UNIT II	Molecular methods in clinical microbiology INTRODUCTION	1		PPT/PDF/Discussion/ Remedial/Problem solving tasks/ links /notes from books/ Seminar etc. which will followed for whole paper till completion of the syllabus.	Test-I Unit II	
	Applications of PCR	3				
	RFLP	2				
	Nuclear hybridization methods	2				
	Single nucleotide polymorphism	1				
	plasmid finger printing in clinical microbiology	3				
	Laboratory tests in chemotherapy : Susceptibility tests:Micro-dilution and macro-dilution	3				

	broth procedures.					
	Susceptibility tests Diffusion test procedures.	3				
	Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests	3				
	Test I					
Unit III	Automation in microbial diagnosis	2			Test-II Unit III And some portions of Unit III	
	Rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies.	3				
	Concepts and methods in idiotypes.	2				
	Antidiotypes and molecular mimicry and receptors. Epitope design and applications.	3				
	TEST	2				

Suggested Readings:

1. Principles and Techniques of Biochemistry and Molecular Biology: - Ed. K. Wilson and J. Walker, Cambridge University Press.

2. The Tools of Biochemistry: Cooper T.G., John Wiley and Sons Publication.

3. Biophysical chemistry. Principles and Techniques: Upadhayay A, Upadhayay K and Nath N, Himalaya publishing house.

4. Experimental Biochemistry. Cark Jr J. M. and Switzer R.L., W.H. Freeman and Company.

5. Instrumental Methods of Chemical Analysis: Chatwal. G and Anand.S., Himalaya Pub. House, Mumbai.

6. A Biologist's Guide to Principles and Techniques of Practical Biochemistry: Williams. B.L. and Wilson. K. (ed.) Edward Arnold Ltd. London



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Department of Applied Biology

Lesson Plan

Session: 2020-21(Even Semester)

Program BSc Biotechnology

Semester: 5.....

Name of the Course Bioinformatics and Biostatistics

Course Code:BBT-504

Name of the Faculty: Dr Priyanka Kashyap

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	History of Bioinformatics	4		Explanation , slide show, notes	Test-I- unit 1	
	Sequence Information Sources,	4		PPT		
	EMBL, GENBANK, Entrez,	7		Explanation on board		
	Unigene,	2		-do-		
	Understanding the structure of each source and using it on the web.	8		ppt		
II	Protein Information Sources,	3			Test-II-unit 2,3	
	PDB, SWISSPROT, TREMBL,	6				
	Understanding the structure of each source and using it on the web	4				
	Introduction of Data Generating Techniques	2				
	Bioinformatics problem posed by them-	4				

	Restriction Digestion					
	Chromatograms, Blots,	4				
	PCR, Microarrays, Mass Spectrometry	6				
III	Sequence and Phylogeny analysis	4				
	Detecting Open Reading Frames	4				
	Outline of sequence Assembly	3				
	Pairwise Alignments,	2				
	Introduction to BLAST	3				
	Multiple Sequence Alignment, Phylogenetic Analysis.	6				
IV	SRS, Entrez,	4				
	BLAST, FASTA	4				
	Data Submission.	2				
	Genome annotation	4				
	Pattern and repeat finding	2				
	Gene identification tools	4				

Suggested Books:

1. Genomes by TA Brown
2. Bioinformatics by Ghosh and Mallick

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Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Program BSc Microbiology

Semester: 5.....

Name of the Course Bioinformatics and Biostatistics

Course Code:BMB-503

Name of the Faculty: Dr Priyanka Kashyap

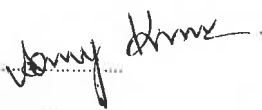
Details Plan

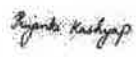
Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	RDBMS - Definition of relational database	4		Explanation , slide show, notes	Test-I- unit 1	
	FTP, SFTP, SCP	4		PPT		
	advantage of encrypted data transfer	2		Explanation on board		
II	Biological databases	6			Test-II-unit 2,3	
	File formats - FASTA, Genbank and Uniprot	6				
	Data submission & retrieval from NCBI, EMBL, DDBJ, Uniprot, PDB	6				
III	Local and Global Sequence alignment	4				
	pairwise and multiple sequence alignment	4				
	PAM and BLOSUM	2				
	Types of phylogenetic trees	6				
IV	Diversity of Genomes:	6				
	Genome,	6				

	transcriptome, proteome, 2-D gel electrophoresis, Maldi Toff spectroscopy					
	2-D gel electrophoresis, Maldi Toff spectroscopy	6				
V	Hierarchy of protein structure - primary, secondary and tertiary structures	6				
	Classes, Motifs, Folds and Domains	4				
	Ramachandran plot	4				

Suggested Books:

1. Genomes by TA Brown
2. Bioinformatics by Ghosh and Mallick


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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Program BSc Biotechnology

Semester: 3.....

Name of the Course Molecular diagnostics

Course Code:BBT-304

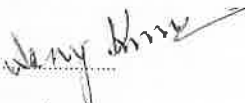
Name of the Faculty: Dr Priyanka Kashyap

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	Comparison of enzymes available for enzyme immunoassays	2		Explanation , slide show, notes	Test-I- unit 1	
	Homogeneous and heterogeneous enzyme immunoassays	4		PPT		
	Enzyme immunoassays after immuno blotting	4			Test-II-unit 2,3	
	Enzyme immuno histochemical techniques	4				
	Use of polyclonal or monoclonal antibodies in enzymes immuno assays.	4				
	Applications of enzyme immunoassays in diagnostic microbiology.	2				
IV	GLC	4				
	HPLC	4				
	Electron microscopy	6				
	flow cytometry	6				

Suggested Books:

Bioinstrumentation" by Reilly M J



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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Program MSc Biotechnology

Semester: 3.....

Name of the Course OMics and Bioinformatics

Course Code:MBT-303

Name of the Faculty: Dr Priyanka Kashyap

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
I	History of Omics	2		Explanation , slide show, notes	Test-I- unit 1	
	Branches of Omics, Scope, Applications and Limitations	4		PPT		
II	Genome and genomics,	4			Test-II-unit 2,3	
	Genome sequencing projects, Genome sequencing technologies,	6				
	Genome annotation, Genome databases, Genome browsers and Data retrieval	6				
III	transcriptomics, Analysing gene expression	4				
	Northern blot, Real Time-PCR, subtractive hybridization, differential display, SAGE, Microarrays, NGS technologies	8				
	ORF, Exon-Intron boundaries,	7				


	Transcript assembly, BLAST, Gene ontologies (GO), Transcript databases-EST, SRA.					
IV	proteomics	4				
	Protein motif and conserved domain, Protein Information resources-PDB, Swissprot, pfam, Data retrieval and comparative proteomics	6				
V	Introduction to Metabolites	2				
	Nuclear Magnetic Resonance Spectroscopy and Mass Spectrometry in metabolomics.	6				
	Metabolic pathway resources: KEGG	2				
VI	sequence alignment, Pairwise and Multiple sequence	4				
	Phylogenetics analysis	4				
	Secondary structure prediction of nucleic acids and proteins	4				

Suggested Books:

1. Current Protocols in Bioinformatics, Edited by A.D. Baxevanis et al, Wiley Publishers, 2005.
2. Bioinformatics by David W. Mount, Cold Spring Harbor Laboratory Press, 2001.
3. Fundamental concepts of Bioinformatics by D.E. Krane and M.L Raymer, Pearson Education, 2003.
4. Metabolome Analysis: An Introduction. Silas G. Villas-Boas, Jens Nielsen, Jorn Smedsgaard, Michael A. E. Hansen, Ute Roessner-Tunali, John Wiley & Sons, 320 pages, 2007.
5. Handbook of Comparative Genomics: Principles and Methodology by Cecilia Saccone, Graziano Pesole. Wiley-LISS Publication, 2003.
6. Discovering Genomics, Proteomics & Bioinfo, A.M. Campbell, C.S.H. Press, 2003.

7. Comparative Genomics by Melody S. Clark. Kluwer Academic Publishers, 2001.


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University of Science & Technology Meghalaya

Department of APPLIED BIOLOGY

Lesson Plan

Session: 2020-21(Even Semester)

Program: B.ScMICROBIOLOGY

Semester: BMB 5th SEMESTER

Name of the Course **INSTRUMENTATION AND BIOTECHNIQUES** Course Code: BMB504

The paper Instrumentation and Biotechniques (Paper Code: BMB 504) is shared between Dr. Priyanka Shankarishan (Units allotted 2 and 3), Dr. Manjit Kumar Ray (Units allotted 4 and 5) and Dr. Jayabratha Saha (Units allotted 1 and 6)

Name of the Faculty: DR. PRIYANKA SHANKARISHAN

Classes per week: 2 classes

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
UNIT II	Introduction to radioisotopes	1		PDF, PPT, web resources, Notes		
	Types of radioisotopes used in Biochemistry,	2				
	Units of radioactivity measurements.	1				
	Techniques used to measure radioactivity - gas ionization	3				
	Techniques used to measure radioactivity- liquid scintillation counting	3				
	nuclear emulsions used in biological	2				

UNIT III	studies, ^{32}P , ^{36}S , ^{14}C and ^3H					
	Autoradiography	3				
	Biological hazards of radiations	2				
	Safety measures in handling radioisotopes,	2				
	Biological applications of radioisotopes	2				
	Introduction to chromatography	3				
	General principles and applications of: Adsorption and absorption chromatography	3				
	Ion exchange chromatography,	3				
	Thin layer chromatography	3				
	Molecular sieve	2				
	Gas liquid chromatography	2				
	HPLC	2				
	Affinity chromatography	2				
	Column chromatography	2				
	Paper chromatography	2				
				PDF, PPT, web resources, Notes		

Total no. of classes required to complete the topics allotted- 45 classes

SUGGESTED READINGS:

1. Bioinstrumentation and Biophysics, Pranab Kumar, Pathfinder Publications
2. Biotechniques Wilson and Walker. Cambrige Publications
3. Elements of Biotechnology- P.K. Gupta., Rastogi publishers, Meerut.
4. B.D.Singh, Biotechnology- Kalyani Publishers, Ludhiana

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University of Science & Technology Meghalaya

Department of APPLIED BIOLOGY

Lesson Plan

Session: 2020-21(Even Semester)

Program B.Sc BIOTECHNOLOGY Semester:BBT 3rd SEMESTER

Name of the Course BIOETHICS AND BIOSAFETY Course Code:BBT304

Name of the Faculty:DR. PRIYANKA SHANKARISHAN

Classes per week: 3 classes

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
UNIT I	Definition, historic evolution, codes and guidelines, universal principles	3		PPT, PDF, web resources, Notes		
	Bioethics: Necessity of Bioethics. Different paradigms of Bioethics- National & International	4				
UNIT II	Ethical issues against the molecular technologies	2		PPT, PDF, web resources, Notes		
	Sanctity of human life and the need to preserve human life;	1				
	issues related to prenatal screening,	5				
	clinical trials (Phase I/II/III/IV) studies	10				
	Medical error and medical	5				

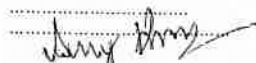
	negligence; remedies against medical negligence, protection and compensation related to it					
UNIT III	Ethical use of animals in the laboratory	3		PPT, PDF, web resources, Notes		
UNIT IV	Biosafety: · Introduction; biosafety issues in biotechnology	3		PPT, PDF, web resources, Notes		
	Biological Safety Cabinets & their types	4				
	Primary Containment for Biohazards	2				
	Biosafety Levels of Specific Microorganisms	3				
UNIT V	Biosafety Guidelines: Biosafety guidelines and regulations (National and International)	5		PPT, PDF, web resources, Notes		
	GMOs/LMOs- Concerns and Challenges	5				
	Role of Institutional Biosafety Committees (IBSC), RCGM, GEAC etc. for GMO applications in food and agriculture	3				
	Environmental release of GMOs	4				
	Risk Analysis; Risk Assessment; Risk management and communication	5				
	Overview of International	3				


	Agreements - Cartagena Protocol.					
UNIT VI	AERB/RSD/RES guidelines for using radioisotopes in laboratories and precautions.	3		PPT, PDF, web resources, Notes		


Total no. of classes required to complete the topics allotted- 82 classes

1. Suggested Readings:

2. 1. Bare Act, 2007. Indian Patent Act 1970 Acts & Rules, Universal Law Pub. Co. Pvt. Ltd., Delhi.
3. 2. Kankanala C (2007). Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd. New Delhi.
4. 3. Mittal, D.P. (1999). Indian Patents Law, Taxmann, Allied Services (p) Ltd.
5. 4. Singh K K (2015). Biotechnology and Intellectual Property Rights: Legal and Social Implications, Springer India.
6. 5. Goel D & Prashar S (2013). IPR, Biosafety and Bioethics. Pearson
7. 6. Senthil Kumar Sadhasivam and Mohammed Jaabir, M. S. 2008. IPR, Biosafety and biotechnology Management. Jasen Publications, Tiruchirappalli, India
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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Program M.Sc. Microbiology

Semester: 3rd Semester

Name of the Course: Industrial Microbiology and Fermentation Technology

Course Code: MMB 301

Name of the Faculty: Dr. Manjit Kumar Ray (Sharing paper)

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
Unit: 1	Brief History of Industrial Microbiology	2		White board PPT Notes PDF Book	Test-I	
	Microbes in industrial processes and their sources	2		Do		
	Types of fermentation and Bioreactors	3		Do		
	Recent development in industrial microbiology	2		Do		
	Structure of fermentor	2		Do		
	Economic aspects of fermentation processes.	1		Do		
	Summarized revision of Unit 1	2		do		
Unit: 2	Isolation, selection, improvement and maintenance of industrial important strain.	2		do		
	primary metabolites (alcohols, vitamins, enzymes and organic acids)	7		do		
	Metabolic pathways and metabolic control mechanisms: secondary metabolites (antibiotics and toxins)	5		Do		
	Substrates for industrial fermentation	2		Do		
	Summarised revision of unit 2	2		Do		
Unit: 3	Batch culture in fermentation,	2		Do	Test 2	
	growth kinetics of micro-organisms,	2		Do		



University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Program: B.Sc. Microbiology

Semester: 5th Semester

Name of the Course: Instrumentation and Biotechniques

Course: Code: BMB_504

Name of the Faculty: Dr. Manjit Kumar Ray (Sharing Paper)

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
Unit IV: (Spectroscopic techniques)	Introduction	1		White board teaching PPT PDF Notes books	Test-I	
	Beer-Lambert's law	1		Do		
	light absorption and its transmittance	1		Do		
	Determination and application of extinction coefficient,	1		Do		
	application of visible and UV spectroscopy,	1		Do		
	Principle and applications of Mass spectroscopy	2		Do		
	Summarized Revision of Unit IV (1)	1		Do		
	Summarized Revision of Unit IV (2)	1		Do		
Unit 5: (Electrophoresis)	Introduction to Gel electrophoresis	1		Do	Test-2	
	Basic principles of agarose electrophoresis	1		Do		
	PAGE	2		Do		

	One/Two dimensional electrophoresis	2		Do		
	Isoelectrofocussing	1		Do		
	Summarized Revision of Unit V (1)	1		Do		
	Summarized Revision of Unit V (2)	1		Do		

Suggested Books:

1. Abhilasha Shourie and Shilpa S Chapadgaonkar - "Bioanalytical Techniques"
2. Sabari and Ghoshal - "Fundamentals of Bioanalytical Techniques and Instrumentation"
3. Jeanette M van Emon - "Immunoassay and Other Bioanalytical Techniques"

Manjit Kumar Ray

Manjit Kumar Ray
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University of Science & Technology Meghalaya

Department of Applied Biology

Lesson Plan

Session: 2020-21(Odd Semester)

Course: B.Sc. Biotechnology

Semester: 3rd Semester

Name of the Course :General Microbiology

Course Code: BBT 302

Name of the Faculty: Dr. Manjit Kumar Ray

Details Plan

Unit	Topic	Targeted No. of classes	Tentative Schedule (DoC-DoE)	Tentative Pedagogy	Unit Allotted for Sessional Test	Remarks
Unit: 1 Introduction to microbial world	What is microbiology? Microbiology as a discipline	1		White board teaching PPT Notes Books		
	A brief history of microbiology	1		do		
	Spontaneous generation v/s biogenesis	1		Do		
	Microbes in nature	1		Do		
	Role of microbes in the fields of agriculture and environment, industry, medicine, astrobiology	1		Do		
	Brief introduction to the works of Anton Von Leeuwenhoek, Joseph Lister, Edward Jenner, Louis Pasteur, Robert Koch, M.W. Beijerinck, Sergei N Winogradsky, Alexander Flamming, Ellie Metchnikoff in the field of microbiology (contd.)	1		do		
	Brief introduction to the works	1		Do		

	of...(contd.)					
	Brief introduction to the works of	1		Do		
	Diversity of microbial world :Systems and approaches for microbial classification	1		Do		
	Binomial nomenclature	1		Do		
	Whittaker's five kingdom and Carl Woese's three domain system of classification and their utility	1		Do		
	Basics of Bergey's manual of systematic bacteriology	1		Do		
	Introduction to Acellular and cellular organisms	1		Do		
	General characteristics of acellulars (Viruses, viroids, virusoid and Prions)	2		Do		
	General characteristics of Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) (contd.)	2		Do		
	General characteristics of Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa)	4		Do		
	Economic importance	1		Do		
	Summarized revision of Unit I (1)	1		Do		
	Summarized revision of Unit I (2)	1		Do		
	Summarized revision of Unit I (3)	1		Do		
Unit 2: Methods of studying microorganisms	Methods of studying microorganisms	1		Do		
	Salient features of light microscope	1		Do		
	Principle and application of light (bright & dark field)	1		Do		
	Phase contrast microscope (Principle and application)	1		Do		
	Fluorescent microscope (Principle and application)	1		Do		
	Staining and fixation in microbiology(contd.)	1		Do		
	Staining and fixation in	1		Do		

Test 1

	microbiology				
	Preparation of culture media	1		Do	
	Physical method of sterilization	2		Do	
	Chemical method of sterilisation	2		Do	
	Pure culture methods	1		Do	
	Preservation techniques	2		Do	
	Summarised revision of Unit II (1)	1		Do	
	Summarised revision of Unit II (2)	1		Do	
Unit 3: Microbial ecology	An introduction to Microbial Ecology	1		Do	
	Microorganisms of soil	1		Do	
	Diversity of soil microflora and factors affecting their distribution	1		Do	
	Brief account of microbial interactions in soil-symbiosis, mutualism, commensalism, competition, and synergism and parasitism (contd.)	1		Do	
	Brief account of microbial interactions.	1		Do	
	Microbes in rhizosphere and their importance(contd.)	1		Do	
	Microbes in rhizosphere and their importance	1		Do	
	Microorganisms of water	1		Do	
	Microorganisms of air	1		Do	
	Source and distribution of airborne and waterborne microorganisms(contd.)	1		Do	
	Source and distribution of airborne and waterborne microorganisms	1		Do	
	Microbes in the Phyllosphere and their importance	1		Do	
	Summarized revision of Unit III	1		Do	

Test 2

	(1)					
	Summarized revision of Unit III	1		Do		
	(2)					
Unit 4: Microbial physiology and metabolism	Microbial physiology and metabolism	1		Do		
	Nutritional classification of microorganisms based on carbon sources(contd.)	1		Do		
	Nutritional classification of microorganisms based on carbon sources	1		Do		
	Microbial growth: growth curve, generation time , specific growth rate (contd.)	1		Do		
	Microbial growth and growth curve, generation time , specific growth rate	1		Do		
	Generation time and specific growth rate	1		Do		
	Concept of batch culture and continuous culture	1		Do		
	Synchronous growth	1		Do		
	Measurement of microbial growth	1		Do		
	Measurement of cell numbers, cell mass and metabolic activities	1		Do		
	Effect of environment on microbial growth	1		Do		
	Range of temperature and PH for microbial growth	1		Do		
	Range of oxygen concentration and pressure for microbial growth	1		Do		
	Summarized revision of Unit IV	1		Do		
	(1)					

	Summarized revision of Unit IV (2)	1		Do		
	Introduction to Food and dairy microbiology	1		Do		
	Common microorganisms in foods	1		Do		
	Microorganisms in milk and milk products	1		Do		
Unit 5: Food and dairy microbiology	Food preservation methods (chemical)	1		Do		
	Food preservation methods (Physical)	1		Do		
	Microbial deterioration of food products(contd.)	1		Do		
	Microbial deterioration of food products(contd.)	1		Do		
	Microbial deterioration of food products	1		Do		
	Introduction to Fermented food products	1		Do		
	Fermented food products of North-East India			Do		
	Application of bacteria, mold and yeast in food industry(contd.)	1		Do		
	Application of bacteria, mold and yeast in food industry	1		Do		
	Summarized revision of Unit V (1)	1		Do		
	Summarized revision of Unit V (2)	1		Do		

Test 3

Suggested Books:

1. 1.Adams MR and Moss MO. (1995). *Food Microbiology*. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
2. Alexopoulos CJ, Mims CW, and Blackwell M. (1996). *Introductory Mycology*. 4th edition. John and Sons, Inc.
3. Atlas RM. (2005). *Principles of Microbiology*. 4th edition. WMT.Brown Publishers.
4. Dimmock, NJ, Easton, AL, Leppard, KN (2007). *Introduction to Modern Virology*. 6th edition (First Indian reprint 2007), Blackwell Publishing Ltd.
5. Frazier WC and Westhoff DC. (1992). *Food Microbiology*. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
6. Maier RM, Pepper IL and Gerba CP. (2009). *Environmental Microbiology*. 2nd edition, Academic Press.
7. Martin A. (1977). *An Introduction to Soil Microbiology*. 2nd edition. John Wiley & Sons Inc. New York & London.
8. Madigan MT, Martinko JM and Parker J. (2009). *Brock Biology of Microorganisms*. 12th ed. Pearson/Benjamin Cummings.
9. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2009). *General Microbiology*. 7th ed. McMillan.
10. Stolp H. (1988). *Microbial Ecology: Organisms Habitats Activities*. Cambridge University Press, Cambridge, England.
11. Subba Rao NS. (1999). *Soil Microbiology*. 4th edition. Oxford & IBH Publishing Co. New Delhi.
12. Tortora GJ, Funke BR, and Case CL. (2013). *Microbiology: An Introduction*. 11th edition. Pearson Education.
13. Vashishta BR and Sinha AK. (2008). *Fungi*. 5th edition. S. Chand and Company Ltd.
14. Vashishta BR. (2008). *Algae*. 5th edition. S. Chand and Company Limited, New Delhi.

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