University of Engineering and Management
Institute of Engineering & Management, Salt Lake
CampusInstitute of Engineering & Management, New Town
Campus University of Engineering & Management, Jaipur

Syllabus for B.Tech Admission Batch 2022

Subject Name: Microbiology

Credit: 2+1 **Lecture Hours: 36**

Subject Code: BSBT302

Study Material: Microbiology.docx

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to microbiology	Cell structure and sub cellular organelles of bacteria– Slime layer, capsule, cell wall, flagella, pili, fimbriae, nucleoid, plasmid and episome (F, R, Ti as example) ribosome, cytoplasmic inclusions (inorganic and organic), endospores. Archibacteria (importance- structure-reproduction), Moulds (importance-structure- reproduction), yeast (structurereproduction), algae (importance-structure-reproduction). Virology- General classification of virus, (structure, nucleic acid, cultivation of bacteriophage, coliphage), animal viruses plant viruses, TMV). Importance of viruses, life cycle of viruses, lytic cycle (T4) and lysogenic (lambda). Taxonomy- The five kingdom classification, criteria for classification,	**International standard** https://www.coursera.org/learn/bacterial-infections ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**5**	1. Protein concentration determination using spectroscopy 2. Nucleic Acid Denaturation

		bacterial phylogeny, numerical approach, new approaches – taxonomic implications of DNA base composition.			
2	**Basic Principles of Microbiology**	Microscopy- Principles and applications, dark field, bright field, resolving power, numerical aperture, chromatic aberration, phase contrast microscopy, fluorescent microscopy, inverted microscopy, stereo microscopy, electron microscopy, TEM and SEM. Cultivation of bacteria– Types of growth media (natural, synthetic, complex, enriched, selective- definition with example), pure culture methods (streak plate, spread plate, pour plate, stab culture, slant culture). Anaerobic (thioglycolate, anaerobic chamber, Robertson's media, microaerophilic), liquid shake culture of aerobic bacteria. Growth of bacteria- Definition, growth phases, kinetics of growth, direct and indirect measurement of growth, The mathematical nature and expression of growth, growth principles of nutrition, influence of environmental factors-pH, temperature, oxygen, Heavy metals and Other compounds.Control of microbes- Sterilisation, disinfection, antiseptic, tyndallisation, pasteurization: Physical- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical compounds, anionic and cationic detergents. Antibiotics and Antibiotic related resistances.	**International standard https://www.coursera.org/learn/bacterial-infections** ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**5**	Determination of protein mis-folding by bioinformatics tool
3	**Microbial Growth and Metabolism**	Foam-fractionation; Solvent extraction of bio-processes, aqueous two-phase extraction, adsorption-desorption process; Salt precipitation; Chromatographic separation based on size, charge hydrophobic interactions and metal ion affinity. HPLC, Affinity chromatography,	**International standard** https://www.coursera.org/learn/bacterial-infections ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/***	**8**	Chromatographic separation of plant compounds

		inhibitors: their preparation and uses, method of linkages, Protein Precipitatio Bacterial photosynthesis (green and purple bacteria), biochemical nitrogen fixation– non-symbiotic, symbiotic (definition and examples), basic concept of nif –genes. Mod genes, nitrogenase complex, legheamoglobin. .	***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html		
4	**Microbiology of Air, Water and Soi**	Air microbiology- Microorganisms in the air, sampling techniques, air borne pathogens. Microbiology of water- Microbiology of fresh water and wastewater (sewage), Important water borne diseases– cholera, typhoid, (name of pathogen, preventive measures). Outlines of method for detection of microorganisms in drinking water (presumptive, confirmatory and completed tests). Distinction between fecal and non-fecal coliforms. Soil microbiology- Soil microorganisms, different kinds of association between soil microflora, between micro and macro organisms..	***International Standards:*** https://www.coursera.org/learn/bacterial-infections ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**6**	Determination of filtration coefficient
5	**Medical Microbilogy**	Classification of medically important viruses, virus cultivation & demonstration;Viral multiplication, Bacteriophage & its application in medicine; Poxviridae,Adenoviridae, Herpesviridae; Hepatitis viruses; Picornaviridae, Rhabdoviridae;Retroviridae; Arboviruses; Oncogenic viruses, Preperation & standardizatiion of viral vaccine Gram-positive cocci, disease produced by them and diagnostic approach; Gram-negative cocci, disease produced by them and diagnostic approach; Mycobacteriaceae, Actinomycetaceae and Corynebacteriaceae; Spore bearing and non-spore bearing anaerobes; Enterobacteriaceae including E coli, Salmonella, Shigella; Vibrio; Pseudomonas; Haemophilus, Bordetella,	***International Standards:*** https://www.coursera.org/learn/bacterial-infections ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html		

		Brucella, etc			

Submitted by Dr. Moupriya Nag (Module1 and Module 2); Dr.Dibyajit Lahiri (Module 3 and Module 4)

University of Engineering and Management
Institute of Engineering & Management, Salt Lake CampusInstitute of Engineering & Management, New Town Campus University of Engineering & Management, Jaipur

Subject Name: Biochemistry Credit: 2

Subject Code: BSBT301 **Lecture Hours: 24**

Pre-requisite: Chemistry

Relevant links: https://uemeduin-my.sharepoint.com/:b:/g/personal/sonali_paul_uem_edu_in/EZTVu60Usj1GqrOuQbGjt8oBfT17-rM7wupxQ63jGIlBuQ?e=Cv7PhG
https://nptel.ac.in/courses/102105034
https://in.linkedin.com/company/biochemistry-guide?trk=similar-pages
https://www.coursera.org/learn/energy-metabolism

Course objective:

1. To understand the functioning of biomolecules
2. To study the process of cell signalling

Course Outcome:

CO1	To recognize the significance of enzymes in metabolic functions.
CO2	To explain the mechanism of metabolic pathways of carbohydrates
CO3	To illustrate the detailed mechanism of metabolic pathways of protein
CO4	To analyze the mechanism of metabolic pathways of lipid
CO5	To evaluate the mechanism of metabolic pathways of nucleic acid

CO6	To design the pathways of cell communication and signalling of biochemical molecules

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction to Enzyme & Carbohydrate Metabolism	Enzymes: Basic concept of enzyme-substrate reaction, Classification and nomenclature, Enzyme active site, Regulation of enzyme activity, allosteric regulation. Generation and utilization of ATP. Metabolic pathways of carbohydrates andtheir regulation: glycolysis, TCA cycle, pentose phosphate pathway, Entner-Doudoroff pathway and Cori cycle. Oxidative phosphorylation: electron transport chain, ATP synthesis, regulation of oxidative phosphorylation; gluconeogenesis, glycogen (glycogenolysis and glycogenesis). Photosynthesis: Photophosrylation, Calvin cycle. Disorder/ diseases of carbohydrate metabolism	International academia: https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://www.himedialabs.com/in/cell-biology/cell-analysis-and-detection-solution/enzyme-assay-kits.html	6	1. Effect of temperature on enzyme activity 2. Effect of pH on enzyme activity 3. Study of enzyme inhibition 4. Estimation of sugars
2	Metabolism of Amino acid, Protein	Catabolism and Anabolism, Catabolism of amino acids, general metabolism of amino acids. catabolism of Tyrosine, Leucine, Glutamic acid and	International academia: https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/ AICTE – prescribed syllabus:	6	1. Estimation of protein

		Arginine Glucogenic amino acids, ketogenic amino acids. Urea cycle and its regulation, protein degradation and turnover. Disorder/ diseases of amino acids metabolism.	https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://bitesizebio.com/23824/top-5-protein-quantification-assays/		
3	Metabolism of lipid, nucleic acid and vitamin	Oxidation of Fatty acid: Beta oxidation and omega oxidation of fatty acids – saturated and unsaturated fatty acids –even and odd numbered. Catabolism of phospholipids. Biosynthesis of fatty acids, phospholipids, cholesterol and steroid, Disorder/ diseases of lipid metabolism. Nucleic acid metabolism: nucleotide metabolism, purine and pyrimidine degradation, De Novo and Salvage Pathways. Disorder of purines and pyrimidines metabolism. Metabolism of Vitamins, Brief description of animal and plant hormones	International academia: https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20Course%20in%20Biotechnology.pdf Industry mapping: https://www.sigmaaldrich.com/IN/en/search/lipid-assay-kit?focus=products&page=1&perpage=30&sort=relevance&term=lipid%20assay%20kit&type=product_name	6	1. Separation of amino acids/ sugars/ steroids/ vitamins/ alkaloids/antibiotics by paper chromatography
4	Cell Signaling	Cell signaling and signal transduction pathways: Hormones and their receptors, cell surface receptor, signalingthroughG-protein coupled receptors, second messengers, regulation of signaling pathways, general principles of cell communication, cell	International academia: https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/ AICTE – prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model%20Curriculum%20for%20UG%20Degree%20C	6	1. Verification of Lambert-Beer's Law

		adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins	ourse%20in%20Biotechnology.pdf Industry mapping: https://atlas-medical.com/product/209001/Hormone-Elisa-Kits		

Text Books/References:

1. Principles of Biochemistry by David L.Nelson and MichaelM.Cox
2. Biochemistry by Geoffrey Zubey
3. Biochemistry.5thedition.BergJM,TymoczkoJL,StryerL.NewYork:WHFreeman; 2002.
4. EssentialsofGlycobiology[Internet].3rdedition.VarkiA,CummingsRD,EskoJD,et al., editors. Cold Spring Harbor (NY): Cold Spring Harbor Laboratory Press; 2015- 2017.
5. BasicNeurochemistry:Molecular,CellularandMedicalAspects.6thedition.SiegelGJ, AgranoffBW,AlbersRW,etal,editors.Philadelphia:Lippincott-Raven;1999.

University of Engineering and Management

Institute of Engineering & Management, New Town

Syllabus for B. Tech Admission Batch 2022

Subject Name: Genetics **Credit: 2**
Subject Code: BSBT303 **Lecture Hours: 24**

Prerequisite: Basic Knowledge of chemistry, genetics and biochemistry

Relevant Links:
Study material: https://uemeduin-my.sharepoint.com/:w:/g/personal/pratik_talukder_uem_edu_in/Ea9FuTUx_0RHgJK53ziiDW8BUjD8SQMvT0XnOutm9xaVTA?e=CiJM7w
https://ocw.mit.edu/courses/7-03-genetics-fall-2004/
https://www.coursera.org/learn/genetics-evolution

Basics of Molecular Biology and Genetics
https://www.onlinetutorials.org/teaching-academics/basics-of-molecular-biology-and-genetics/

Course Objective

1. The course acquaints the students with concepts of genetics as well as biostatistics and is so designed as to make students aware about the applied fields of genetics
2. Also students will learn about the vast scope of the subject and will acquaint with applications of microbial genetics, population genetics and biostatistics.

Course Outcomes

On completion of this course, the students will be able to:

CO1- To recognize and identify the concept of gene expression, DNA, RNA structure & function
CO2- To understand the concept and organization of Mendelian and non Mendelian genetics
CO3- To be able to illustrate the biochemical and molecular features of genetic disorders, application of pedigree analysis of traits & diseases
CO4- To be able to analyse the concepts of population genetics and evolution: the diversity of life as it evolved over time by processes of mutation, selection and genetic change
CO5- To be able to evaluate the concept and application of microbial genetics
CO6- To be able to design the solutions to problems on genetics, population biology and biostatistics.

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Chemistry of Genetic Material**	Discovery of DNA as genetic material, Experiments of Griffith; A very, McCleodand;	***International academia***: https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/genetics/ ***AICTE prescribed syllabus***	8	Extraction of plasmid DNA from bacterial cells Extraction of genomic DNA from bacterial cells

		McCarthy,and Harshey and Chase. RNAasgenetic material Experiment of Fraenkel and Singer, Nucleic acids: structure of DNA, RNA, and Proteins	***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://www.sigmaaldrich.com/IN/en/product/sigma/tox1?utm_source=google&utm_medium=cpc&utm_campaign=15000382053&utm_content=128280893003&gclid=Cj0KCQjwztOwBhD7ARIsAPDKnkBTAbGnb83rGvnYsjWN67GNnw4D6t_Ohcp-uNJGiEQxiCZFnZ5CaRYaArHsEALw_wcB		
2	**Mendelian inheritance**	Multiple alleles, pseudoallele, gene interaction, complementation, Codominance, incomplete dominance, linkage, pleiotropy; recombination and chromosome mapping, sex determination; extrachromosomal inheritance, special types of chromosomes; Alterations of chromosomes: euploidy and aneuploidy,	***International academia***: https://ocw.mit.edu/courses/7-03-genetics-fall-2004/ https://online.stanford.edu/programs/genetics-and-genomics-program ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://www.bio-rad.com/en-in/category/dna-	8	Extraction of genomic DNA from plant tissues Extraction of RNA from animal tissues

		deletion, duplication, inversion and translocation their genetic implications; pedigree analysis, lod score for linkage testing, karyotypes. chromosomal abnormalities.	extraction-electrophoresis-kits?ID=16873535-f79b-4612-91ee-1ad8d93d26e4		
3	**Gene Mutation**	Mutagen, Induced and spontaneous mutation, mutation Types, causes and detection, mutant types. DNA repair mechanism (Mismatch repair photo reactivation, excision and SOS repair); Beneficial and harmful effects of mutations. Molecular basis of genetic diseases. Applications of genetic disorders: Cancer Genetics:	***International academia***: https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/resources/lecture-25-cancer-1/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://www.takarabio.com/products/mrna-and-cdna-synthesis/cdna-synthesis-kits/library-construction-kits	8	Barr body preparation from buccal smear. Study of mutation in onion root tip cell chromosome.

		Genetic rearrangements in progenitor cells, oncogenes; proto-oncogenes; tumour suppressor genes – p53, RB and others, virus-induced cancer, cancer and the cell cycle.			
4	**Microbial Genetics**	Transformation; Transductionand Conjugation: F factor-mediated, Hfr and F-duction; Introduction to Genomics and Proteomics.Transposable elements Maize and Drosophila; recombination and complementation analysis; gene mapping. Viral genetics: genetics of animal virus: polio, HIV and adenovirus, Bacteriophage: genetics of lambda phage	***International academia***: https://ocw.mit.edu/courses/7-014-introductory-biology-spring-2005/resources/15-bacterial-genetics/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: Provides a more accurate approach to genetic modification. Combat Agricultural challenges including biotic stress resistance, fungal and bacterial disease resistance, and viral resistance.	8	Calculation of concentration and purity of extracted DNA

			https://www.bio-rad.com/en-in/applications-technologies/crispr-cas-gene-editing-teaching-resources?ID=Q58I0DWDLBV5		
5.	**Population genetics**	Hardy Weinberg analysis, Population genetics: Hardy-Weinberg Law; factors disrupting H-W equilibrium-Genetic Drift, Migration and Mutation and Selection in changing allele, problems related to estimation of allelic and gene frequencies.Mean, median; mode, standard deviation, variance, discrete and continuous probability distributions, Correlation and regression analysis, T test, chisquare analysis	***International academia***: https://ocw.mit.edu/courses/7-014-introductory-biology-spring-2005/resources/31-population-genetics-and-evolution/ https://ocw.mit.edu/courses/8-592j-statistical-physics-in-biology-spring-2011/pages/lecture-notes/elements-of-population-genetics/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://sg.idtdna.com/pages/products/functional-genomics/antisense-oligos https://www.fullmoonbio.com/products/antibody-array/?gad_source=1&g		Student's t test analysis Chi-square analysis

			clid=Cj0KCQiA35urBhDCARIsAOU7QwlbinI12miC2qhXIUjBKCWJnYJLuzbOqP7HS4acHaqQqouHt4jBk5EaAsr9EALw_wcB		

Text Books:

- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.
- Genetics, P.K. Gupta, Rastogi Publication
- Concepts of Genetics (Sixth Edition), William S. Klug and Michael R, Cummings, Pearson Education
- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.
- Molecular Cell Biology, H.Lodish, A.Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company.
- Genetics, M.W. Strickberger, Prentice Hall College Division
- Genetics, P.J.Russell, Benjamin/Cummings
- Principles of Genetics, E J Gardner, John Wiley & Sons Inc

University of Engineering and Management

Institute of Engineering & Management, New Town

Syllabus for B. Tech Admission Batch 2022

Subject Name: Cell and Molecular Biology **Credit: 2**
Subject Code: BSBT304 **Lecture Hours: 24**

Prerequisite: Basic Knowledge of biology, chemistry, genetics and biochemistry

Relevant Links:
Study material: https://uemeduin-my.sharepoint.com/:w:/g/personal/pratik_talukder_uem_edu_in/EQpxicu4BopDsC3EMDChG7wBpU2xKnityEsCHbcSO5NOlQ?e=euGz7g
https://www.onlinetutorials.org/teaching-academics/basics-of-molecular-biology-and-genetics/
https://www.coursera.org/specializations/cancer-biology
https://onlinecourses.nptel.ac.in/noc24_bt07/preview

Course Objective

1. The course acquaints the students with concepts of cytology as well as molecular biology and is so designed as to make students aware about the molecular mechanism of central dogma of molecular biology

2. Also students will learn about the vast scope of the subject and will acquaint with applications of cell and molecular biology.

Course Outcomes

On completion of this course, the students will be able to:

CO1. Comprehend Basics of microscopy the cell organelle, cell membrane, cell cycle and its relevance
CO2. Students will learn genome organization in prokaryotes and eukaryotes, the concept of Gene and the gene architecture and gene expression
CO3. Students will understand in details the central dogma of life; replication, transcription and translation and other related concepts
CO4. The regulation of gene expression in prokaryotes using operon concept and eukaryotes
CO5. Students will understand the hormonal control of gene expression and various mechanism of gene silencing.
CO6. Students will have the foundational knowledge of the fields of cell and developmental biology and will understand the role of developmental genetics in defining biological processes

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Cell biology**	Microscopy-Visualizing cells and tissues; Integrating cells into tissues (animals and plants); Structure of cell and cell organelles, Details of thecell cycle,	***International academia***: https://ocw.mit.edu/courses/res-7-007-7-06x-cell-biology/ ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://www.sigmaaldrich.com/IN/en/product/s	8	1. Understanding components of different kinds of microscopes. 2. Visualization of cellular structures. 3. Study of mitosis in onion root tips 4. Estimation of mitotic index 5. Preparation and observation of meiotic cell division stages

		cell division and regulation; Cell-Cell junctions; Mitosis and Meiosis.	igma/tox1?utm_source=google&utm_medium=cpc&utm_campaign=15000382053&utm_content=128280893003&gclid=Cj0KCQjwztOwBhD7ARIsAPDKnkBTAbGnb83rGvnYsjWN67GNnw4D6t_Ohcp-uNJGiEQxiCZFnZ5CaRYaArHsEALw_wcB		
2	**ModuleII**	Replication in prokaryotes and eukaryotes: Mechanism, Model, structure and function of different Enzymes in DNA replication. Initiation, Elongation &Termination of replication; Inhibitors of DNA replication; RNA replication.Transcription:Components of transcriptional machinery in prokaryotes	***International academia***: https://ocw.mit.edu/courses/18-417-introduction-to-computational-molecular-biology-fall-2004/5d9b3d4a5a1557de90cbcc60b2c718f5_lecture_06.pdf ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: https://www.bio-rad.com/en-in/category/dna-extraction-electrophoresis-kits?ID=16873535-f79b-4612-91ee-1ad8d93d26e4	8	1. Making competent E. coli cells using chemical methods. 2. Estimation of size in bp of DNA using agarose gel electrophoresis.

		and eukaryotes:Structure of mRNA, promoter, RNA polymerases and transcription factors, terminators. Process of transcription in prokaryotes and eukaryotes: Initiation, Elongation & Termination of transcription (Rho dependent and independent). Post transcriptional processing of RNA: capping, splicing (different types), polyadenylation and RNA editing. mRNA stability. Inhibitors of transcription.			

		Reverse transcription. Ribozyme.Translation:Components translational machinery in prokaryotes and eukaryotes:structure and function of ORF, tRNA, rRNA, aminoacylsynthetases, Ribosomes, RBS).Process of Translation in prokaryote and eukaryote: Initiation, Elongation & Termination. Concept of genetic code and Wobble hypothesis.Post translational modifications of protein, Protein folding, Protein targeting and degradation, Inhibitors of translation.			

3	**Regulation of Gene Expressions**	● Principle of gene regulation: negative and positive regulation, inducer, repressor, co-repressor, activators, co-activators, silencers, insulators, enhancers, DNA binding protein-protein interacting domain of gene regulatory protein. Gene regulation in prokaryote: concept of operon model, (lac, trp and ara operon), Phage regulatory strategy and antitermination in lambda phage ●Gene regulation in eukaryotes: DNA looping model,	***International academia***: https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/genetics/ https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/gene-regulation-and-the-lac-operon/ https://ocw.mit.edu/courses/7-03-genetics-fall-2004/fa17fc58c50767e1bbea53da44cdb662_lecture12.pdf https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/resources/the-lac-operon/ ***AICTE prescribed syllabus:*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: It can generate several copies of a DNA	8	1. Formaldehyde Gel electrophoresis of RNA 2. Polyacrylamide gel electrophoresis and estimation of MW of proteins

		hormonal control of gene expression (steroid and non-steroid), regulations at level of translation, riboswitch, gene silencing.	sequence in a very short time period. It is also important in forensic science as a tool for genetic engineering. It helps in analyzing the gene expression https://www.takarabio.com/products/mrna-and-cdna-synthesis/cdna-synthesis-kits/library-construction-kits		
4	**Developmental biology:**	Gametogenesis, fertilization and embryogenesis, morphogen gradients, differentiation, asymmetric cell division, cell fate and lineage determination; Developmental embryonic stages, zygotic division,	***International academia***: https://live.ocw.mit.edu/courses/7-014-introductory-biology-spring-2005/resources/mediaresource-2010-10-26/ https://ocw.mit.edu/courses/20-109-laboratory-fundamentals-in-biological-engineering-fall-	8	Study of different stages of chick embryos

		incomplete division and consequences; Ecto, meso and endodermal development; Early asymmetric division and generation of symmetry in developing embryo in; organogenesis and morphogenesis, role of apoptosis in organ development; Role of morphogens and their gradient in axis patterning and determination. Concept of antero-posterior, dorso-ventral, and medio-lateral axis formation.	2007/pages/labs/sirna_design/ https://ocw.mit.edu/courses/7-22-developmental-biology-fall-2005/ ***AICTE prescribed syllabus: https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry mapping***: It is used to improve the production of proteins by cleaving RNA at specific sites. Antiviral therapy https://sg.idtdna.com/pages/products/functional-genomics/antisense-oligos https://www.fullmoonbio.com/products/antibody-array/?gad_source=1&gclid=Cj0KCQiA35urBhDCARIsAOU7QwlbinI12miC2qhXIUjBKCWJnYJLuzbOqP7HS4acHaqQqouHt4jBk5EaAsr9EALw_wcB		

Text Books:

1. Principles of Gene Manipulation and Genomics, Primrose & Twyman.
2. Winnacker, Ernst L. (1987), From genes to clones: introduction to gene technology NewYork: VCH, ISBN0-89573-614-4.
3. Modern Genetic Analysis. Griffiths AJF, Gelbart WM, Miller JH, et al. New York: W.H. Freeman; 1999.

References:

4. MolecularCloning-SambrookRussel-Vol.1,2,3.
5. MolecularBiologyoftheCell.4thedition.AlbertsB, Johnson A, Lewis J, et al. New York: Garland Science ; 2002.

University of Engineering and Management

Institute of Engineering & Management, New Town

Syllabus for B. Tech Admission Batch 2022

Subject Name: Plant Biology **Credit: 2**
Subject Code: BSBT305 **Lecture Hours: 24**

Prerequisite: Basic Knowledge of biology, chemistry, genetics and biochemistry

Relevant Links:
Study material:
https://uemeduin-my.sharepoint.com/:w:/g/personal/pratik_talukder_uem_edu_in/EX9Xulkii3hJijzTefRcIMEBtsHL-cwshH__PimgS4CvEA?e=ZUR8MA
https://wi.mit.edu/bionook/plant-biology
Understanding Plants - Part I: What a Plant Knows- https://www.coursera.org/learn/plantknows
Understanding Plants - Part II: Fundamentals of Plant Biology- https://www.coursera.org/learn/plant-biology
https://www.linkedin.com/company/american-society-of-plant-biologists

Course Objective

1. The course acquaints the students with concepts of plant biology as well as plant biotechnology and is so designed as to make students aware about the plant anatomy and molecular mechanisms involved in plant biology

2. Also students will learn about the vast scope of the subject and will acquaint with applications of plant biology.

Course Outcomes

On completion of this course, the students will be able to:

1 To be able to remember and define the concept plant cell structure, structure and organisation of plant genome, and regulation of plant genome expression

2 To be able to understand the applied fields of plant biology - plant molecular biology, tissue culture, genomics and plant biotechnology

3 To be able to apply the concept of plant metabolism- primary and secondary metabolism

4 To be able to analyse the morphological, histological, anatomical and molecular changes associated with developmental biology

5 To be able to evaluate the concept of plant-pest interaction, causative agents of plant disease, defence mechanism of plants

6 Students will be able to design, compare and contrast the characteristics of plants, algae and fungi that differentiate them from each other and from other forms of life

Module Number	Topic	Sub Topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Plant cells and genomes**	Plant cell structure, Structure and organisation of plant genome, regulation of plant genome expression, transcriptional, translational and post transcriptional regulation of plant genome, plant growth regulator. Transposons, chloroplast and	***International academia***: https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/pages/reconciling-demand-and-supply-i/new-technologies-and-practices/ https://courseware.cutm.ac.in/courses/plant-tissue-culture-engineering/ ***AICTE prescribed syllabus***	8	**1.** Studying the structure of monocot stem **2.** Studying the structure of dicot stem **3.** Studying the structure of monocot root **4.** Studying the structure of dicot root

		mitochondrial genome. (Arabidopsis should be taken as the model for study of plant genome).	***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: Used for rapid vegetative multiplication of ornamental plants, genetically modified plants and fruit trees. https://www.mitconbiopharma.com/training/bio-tech-training/certificate-course-in-plant-tissue-culture/		
2	**Secondary metabolites**	Primary and secondary metabolic products (phytochemicals) of plant cells, Basic strategies and factors for secondary metabolite production, Immobilisation and biotransformation for product development and selection	***International academia***: https://courseware.cutm.ac.in/courses/plant-tissue-culture-engineering/ https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/resources/lecture-19-introduction-metabolism-polysaccharides-bioenergetics-intro-pathways/	8	Dissection of embryo from developing seeds

		of cell culture (only plant tissue culture products).	https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/pages/framing-the-discussion/ https://ocw.mit.edu/courses/1-74-land-water-food-and-climate-fall-2020/pages/reconciling-demand-and-supply-i/environmental-impacts-of-agriculture/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: Involves scientific techniques such as Genetically Modified Organisms, Bt Cotton, Pest Resistant Plants. It helps in modifying plants, animals, and microorganisms and improve their agricultural productivity https://extension.colostate.edu/topic-areas/agriculture/genetically-modified-gm-		

			crops-techniques-and-applications-0-710/		
3	**Plant Development**	Embryo and seed development. Root and shoot development. Transition from vegetative to reproductive phase and from sporophyte to gametophyte.	***International academia***: https://ocw.mit.edu/courses/7-16-experimental-molecular-biology-biotechnology-ii-spring-2005/ https://ocw.mit.edu/collections/environment/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: An important tool in plant biotechnology to transfer foreign genes of interest to plant cells to create transgenics with economically important traits. https://www.mybiosource.com/learn/testing-procedures/agrobacterium-mediated-gene-transfer/	8	Study the effect of two environmental factors (light and wind) on transpiration by excised twig

4	**Interactions of plants with other organisms:**	Microbial pathogens, pests, parasites, viruses and viroid. Defense mechanism in plants. Useful interactions between plants and organisms.	***International academia***: https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/resources/lecture-16-recombinant-dna-and-cloning/ https://openlearninglibrary.mit.edu/courses/course-v1:MITx+15.480x+3T2021/courseware/6636360795f24bebbf7adc188c0d0bda/5234c51187a5460a841a750ab905b0c9/?activate_block_id=block-v1%3AMITx%2B15.480x%2B3T2021%2Btype%40sequential%2Bblock%405234c51187a5460a841a750ab905b0c9 ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping***: Provides a more accurate approach to genetic modification. Combat Agricultural challenges including biotic stress resistance, fungal and bacterial	8	Separation of Chlorophyll Pigments by Paper Chromatographic Method Detailed study of symptoms of important diseases of vegetable and fruit plants

			disease resistance, and viral resistance. https://www.bio-rad.com/en-in/applications-technologies/crispr-cas-gene-editing-teaching-resources?ID=Q58I0DWDLBV5		

Text Books:

1. Plant Biology. Allison Smith et al. Garland Science, 2010.
2. Botany: An Introduction to Plant Biology, James D. Mauseth
3. Introduction to Plant Tissue Culture; M.K.Razdan; Oxford & IBH Publishing Co. Pvt. Ltd.
4. Plant Pathology; P.D.Sharma; Rastogi Publications
5. Plant Biotechnology: the genetic manipulation of plants, Adrian Slater, Nigel W. Scott, Mark R. Fowler, Oxford University Press
6. Introduction to plant biotechnology; H.S.Chawla; Oxford & IBH Publishing Co. Pvt. Ltd.
7. STUDIES IN BOTANY, J.N.Mitra, Debabrata Mitra & Salil Chowdhury, Moulik Library

University of Engineering and Management
Institute of Engineering & Management, Salt Lake
CampusInstitute of Engineering & Management, New Town
Campus University of Engineering & Management, Jaipur

Syllabus for B.Tech Admission Batch 2023

Subject Name: Biophysics

Credit: 2 **Lecture Hours: 24**

Subject Code: BSBT306

Study Material: biophysics Study material (1) (1) (1).docx

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction	Introduction to biophysics, Strong and weak interactions in biomolecules, dielectric properties of biomolecules, electronic properties of biomolecules – conductivity, photoconductivity and piezoelectric effect.	**International standard** https://ocw.mit.edu/courses/5-80-small-molecule-spectroscopy-and-dynamics-fall-2008/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**5**	Not Applicable
2	**Protein Chemistry**	Conformation of proteins and enzymes, effect of amino acids on the structure of proteins, energy status of a protein molecule, helix coil transformation of proteins, structure-function relations of enzymes, cooperative properties of enzymes, dynamics of protein folding.	**International standard** **https://ocw.mit.edu/courses/7-88j-protein-folding-and-human-disease-spring-2015/** ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html	**5**	Not Applicable
3	**Nucleic Acid Chemistry**	Conformation of nucleic acids, helix coil transformation, thermodynamics of DNA denaturation, Changes in nucleic acid structures during biochemical processes.	**International standard** https://ocw.mit.edu/courses/res-5-0001-digital-lab-techniques-manual-spring-2007/resources/column-chromatography/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnolo***	**8**	Not Applicable

			gy/ ***Industry Mapping:*** https://nthrys.com/bioinformatics-training.html		
4		Electrical Phenomena in Excitable Cells, Electrically Excitable Cells, Electrical Signals of Nerve Cells, The Ionic Hypothesis and Rules of Ionic Electricity, Membrane proteins, Channels and Transporters in Biological system, Functional Properties of Voltage-Gated Ion Channels, Ion pumping and Ion Channel rhodopsins and their use, Cilia and Flagella: Structure and Movement, Molecular Motors: Kinesin, Dynein and Myosin, and intracellular movement, Microtubule structure. Mechanobiology and its importance in human health.	***International Standards:*** https://ocw.mit.edu/courses/res.ll-004-ll-educate-introduction-to-engineering-concepts-spring-2022/pages/filtration-lab-step-3-design/ ***AICTE prescribed syllabus*** ***https://www.aicte-india.org/flipbook/p&ap/biotechnology/*** ***IndustryMapping:*** https://nthrys.com/bioinformatics-training.html	**6**	Not Applicable

Submitted by Dr. Moupriya Nag (Module1 and Module 2); Dr.Dibyajit Lahiri (Module 3 and Module 4)