List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Biotechnology*

Programme Name : *B.Sc.*

Academic Year : 2021-2022

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
1.	BTUATA1	Biotechnology and Human Welfare
2.	BTUATL1	Plant Tissue Culture
3.	BTUBTT1	General Microbiology
4.	BTUBTA1	Bio-management of environment
5.	BTUBTL1	Animal Tissue Culture
6.	LS/BT/C-305L	MOLECULAR BIOLOGY
7.	LS/BT/GE-303L	INTELLECTUAL PROPERTY RIGHT AND ENTREPRENURESHIP
8.	LS/BT/SEC-301L	MOLECULAR TECHNIQUES IN DISEASE DIAGNOSIS
9.	LS/BT/SEC-302L	ANIMAL CELL CULTURE
10.	LS/BT/SEC-512L	RECOMBINANT DNA TECHNOLOGY
11.	LS/BT/DSE-501L	BIOINFORMATICS
12.	LS/BT/DSE-501L	BIOSTATISTICS
13.	LS/BT/DSE-502L	INDUSTRIAL FERMENTATION
14.	LS/BT/C-613L	BIOPROCESS TECHNOLOGY
15.	LS/BT/DSE-603L	MICROBIAL TECHNOLOGY
16.	LS/BT/DSE-603L	BIODIVERSITY AND BIOPROSPECTING
17.	LS/BT/DSE-604PD	DISSERTATION

Signature & Seal of HoD

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Scheme for Choice Based Credit System (CBCS) in B.Sc. Honours Biotechnology

Course		Course Code	Name of the course	Credit
		Semester-I		
Core (C)	C1Theory	BTUATT1	Cell Biology	3
	C1 Practical	BTUALT1	Laboratory-1 based on core-1	2
	C2 Theory	BTUATT2	Biochemistry	3
	C2 Practical	BTUALT2	Laboratory-2 based on core-2	2
Generic Elective-1 (GE-1)	GE-1 Theory	BTUATG1	Bioethics and Biosafety	3
	GE-1 Practical	BTUALG1	Laboratory-GE1 based on GE-1	2
Ability Enhancement Course (AEC)	AEC1	BTUATA1	Biotechnology and Human Welfare	2
Skill Enhancement Course	SEC1	BTUATL1	Plant Tissue Culture	2
Additional Credit Course As per University Notification				
			TOTAL	**19**
		Semester-II		
Core (C)	C3 Theory	BTUBTT1	General Microbiology	3
	C3 Practical	BTUBLT1	Laboratory-3 (based on core-3)	2
	C4 Theory	BTUBTT2	Genetics	3
	C4 Practical	BTUBLT2	Laboratory-4 (based on core-4)	2
Generic Elective-2 (GE-2)	GE-2 Theory	BTUBTG1	Biostatistics	3
	GE-2 Practical	BTUBLG1	Laboratory (based on GE-2)	2
Ability Enhancement Course (AEC)	AEC2	BTUBTA1	Bio-management of environment	2
Skill Enhancement Course	SEC2	BTUBTL1	Animal Tissue Culture	2
Additional Credit Course As per University Notification				
			Total	**19**

COURSE: Ability Enhancement Course - 1 (AEC - 1)

Biotechnology and Human Welfare (BTUATA1) **CREDITS: 2**

Course Objective

The objective of this course is to introduce the scope of biotechnology for human welfare.

Course Learning Outcomes

Learning outcomes on completion of this course the students will be able to;

- Understand industrial biotechnology related techniques.
- Understand agriculture and environmental biotechnology related techniques.
- Understand forensic science related technique
- Understand molecular diagnosis techniques.

Course contents

Unit I

Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, Enzyme immobilization: methods and application.

Unit II

Agriculture and Environments: Plant Tissue culture, N_2 fixation, transgenic plants: insect resistance, bacterial/ fungal stress tolerance, drought/salt tolerance, bioremediation, biofertilizers, biopesticides, biofuels and bioleaching.

Unit III

Forensic science: solving violent crimes such as murder and rape; solving claims of paternity and theft etc. using various methods of DNA finger printing, Polymerase chain reaction, Restriction fragment length polymorphism.

Unit IV

Health: development of non- toxic therapeutic agents, recombinant live and DNA vaccines, gene therapy, Molecular diagnosis: (monoclonal antibodies, DNA probes, Microarrays), transgenic animals.

Suggested Reading

1. Sateesh MK Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V Bioethics and Biosafety in Biotechnology, New age international publishers
3. Gupta, Elements of Biotechnology
4. Dubey, T. B. of Biotechnology
5. Kumar H. Modern Concept of Biotechnology
6. Jogdand, Advances in Biotechnology
7. Chatwal, T. B. of Biotechnology
8. Primrose, Molecular Biotechnology

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COURSE: Skill Enhancement Course - 1 (SEC-1)

Plant Cell Culture (BTUATL1) **CREDITS: 2**

Course Objective

The course deals with the Plant tissue culture principles and basic techniques. The objective of the course is to make students well-versed with the methods and techniques of plant tissue culture and its application.

Course Learning Outcomes

- Students will acquire skills related to plant tissue culture
- Students will acquire skills on plant tissue culture techniques
- Students will acquire skills on Micropropagation
- Students will acquire skills related to In-vitro Fertilization

Course contents

Unit-I (Introduction to Plant Tissue culture)

Introduction to Plant Tissue culture, Terms and definitions, Historical background, Laboratory organization, Tools and techniques, methods of sterilization. Laboratory contaminants- it's control and measures.

Unit-II (Media and Culture Preparation)

Role of Micro and macro nutrients, Vitamins and carbon source in tissue culture, Media preparation- pH, Temprature, Solidifying agents, Slant Preparations etc. Maintenance of cultures, Environmental Conditions, explants characteristics.

Unit-III (Culture techniques)

Explants selection, sterilization and inoculation; Various media preparations; MS, B5, SH PC L-2; Callus and cell suspension culture.

Unit-IV (Initiation of Cultures)

Induction and growth parameters; Culture initiation, Callus culture., Micropropagation through various explants

Unit-V (In-vitro Fertilization)

Role of Ovary and ovule in In-vitro Fertilization in production of agricultural and horticultural crops. Techniques and significance of Androgensis and Gynogenesis (ovary, ovule, egg, synergids culture)

Suggested Reading

1. Bhojwani S.S. And Rajdan M.K. (1983). Plant Tissue Culture : Theory and practice.
2. Reinert J.and Bajaj Y.P.S. (1977). Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture, By Springer - Verlag, Berlin

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3. Amritrao, P.V.D.A. Evans, W.P.Sharp and Bajaj Y.P.S. (1990) Handbook of Plant Cell Culture volumes I-V, McGraw Hill Publishing Co.,New York.
4. Chawla, H.S. 2000. Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
5. Dixon, R.A. and Gonzales, R. A. (Eds.) 1994. Plant Cell Culture - A Practical Approach. Oxford University Press, New York.
6. Gamborg, O.L and Phillips, G.C. 1998. Plant Cell, Tissue Organ Culture. Narosa Publishing House, NewDelhi.

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COURSE: Ability Enhancement Course – 2 (AEC - 2)

Bio-management of Environment (BTUBTA1) **CREDITS: 2**

Course Objective

The aim of the course is to study the different techniques such as bioremediation (using microorganisms) and phytoremediation (using plants) techniques which is helpful for the degradation of environmental pollutants such as pesticides, heavy metals, radioactive substances etc. present in the soil, water and aquifers.

Course Learning Outcomes

- On the successful completion of the course, students are aware of the biomanagement of soil.
- Have knowledge about biomanagement of petroleum contaminant.
- Aware of the biomanagement of heavy metal.
- Have the knowledge of bioremediation (using microorganisms) and phytoremediation techniques.

Course contents

Unit I

Biomanagement of soil: An overview of global market and available technologies local gain, global loss: The Environmental cost of action, bioavailability of contaminants in soil,microbial remediation of metals in soils

Unit II

Biomanagement of Petroleum Contaminants: benzene-contaminated underground aquifers. Biomining, Bioleaching, Enrichment of ores by microorganisms (Gold, Copper and Uranium). Environmental significance of genetically modified microbes, plants and animals, Molecular aspects and applications in biotechnology

Unit III

Biosurfactants, strategies based on the use of fungal enzymes, anaerobic Metabolism and bioremediation of BTEX Hydrocarbons (Benzene, Toluene, Ethylbenzene, and Xylene), Treatment of municipal waste and Industrial effluents, Bio-fertilizers, Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Algal and fungal biofertilizers (VAM)

Unit IV

Heavy metal phytoremediation: Microbial indicators of soil health for the assessment of remediation efficiency. Environment and the tools in rhizo- and bioremediation of contaminated soil molecular tools for monitoring and validating bioremediation, genetic engineering of bacteria and their potential for bioremediation

Suggested Reading

1. S.C. Santra, Environmental Science
2. Pradipta Kumar Mohapatra, Environmental Biotechnology
3. Hans-Joachim Jordening and Jesef Winter, Environmental Biotechnology – Concepts and Applications
4. Metcalf and Eddy, Tata McGraw hill, Waste Water Engineering
5. S.S. Purohit, Agricultural Biotechnology
6. Alicia L. Ragout De Spencer, John F.T. Spencer, Environmental Microbiology : Methods and Protocols
7. Milton Wainwright, Introduction to Environmental Biotechnology
8. Gilbert Masters, Principles of Environmental Engineering
9. Metcalf & Eddy, Wastewater Engineering
10. Sibley, Law and Strategy of biotechnological patents. Butterworth publication
11. Ganguli-Tat McGrawhill, Intellectual property rights.
12 Wattal, Intellectual Property Right. Oxford Publication

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Semester – II

COURSE: Core -3 Theory

General Microbiology (BTUBTT1) **CREDITS: 3**

Course Objective

- To introduce the concepts of microbiology in a stimulating and explanatory manner
- To aware students about history and scope of microbiology
- To learn the method of cultivation and enumeration of microbes from environment
- To understand the nutritional requirements of micro-organisms
- To understand microbial growth and population kinetics
- To understand mechanism of gene transfer and genetic recombination in bacteria

Course Learning Outcomes

After successful completion of the course student will be able to understand

- History and scope of microbiology
- Microbial diversity and microbial taxonomy
- Cultivation and maintenance of microorganisms
- Microbial growth, reproduction and metabolism
- Genetic recombination in bacteria (Transformation, Transduction and Conjugation)
- Harmful and beneficial activities of microbes

Course Contents

Unit I: History and scope of microbiology

History and scope of microbiology, Microbial taxonomy, Classification of microorganisms: criteria used including molecular and polyphasic approaches, microbial phylogeny and current classification of bacteria. Microbial Diversity: Distribution and characterization of Prokaryotic and Eukaryotic cells, Morphology and cell structure of major groups of microorganisms eg. Bacteria, Algae, Fungi, Protozoa and Viruses

Unit II: Cultivation and maintenance

Cultivation and maintenance of microorganisms: methods preservation. Nutritional categories of micro-organisms Control of microorganisms by physical, chemical and chemotherapeutic agents.

Unit III: Microbial growth and metabolisms

Microbial growth: Growth curve, Generation time, synchronous, batch and continuous culture, methods of measurement of growth and factors affecting growth of bacteria. Microbial Metabolism: Metabolic pathways, amphi-catabolic and biosynthetic pathways Bacterial

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Reproduction: Asexual reproduction (binary fission, endospores and sporulation in bacteria), Genetic recombination (Transformation, transduction and conjugation).

Unit IV: General food microbiology

Bacteria, fungi, algae and cyanobacteria pollutants of water' sewage composition and its disposal, important microorganisms in food: moulds, yeasts, bacteria. Major food born infections and intoxications in humans, food spoilage and preservation of various types of foods.

Suggested Reading

1. Alexopoulos C J, Mims CW, and Blackwell M. Introductory Mycology. John and Sons. Inc.
2. Jay JM, Loessner M J and Golden D A. Modern Food Microbiology. CBS Publishers and Distributors, Delhi, India.
3. Kumar HD. Introductory Phycology. Affiliated East Western Press.
4. Madigan MT, Martinko JM and Parker J. Brock Biology of Microorganisms. Pearson/ Benjamin Cummings.
5. Pelczar M J,Chan E C S and Krieg N R. Microbiology. McGraw Hill Book Company.
6. Stanier RY, Ingraham J L, Wheelis M L, and Painter PR. General Microbiology. McMillan.
7. Tortora GJ, Funke BR, and case CL. Microbiology: An Introduction. Pearson Education.
8. Willey JM, Sherwood LM, and Woolverton cJ' Prescott' Harley and Klein's microbiology McGraw Hill, Higher Education.

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COURSE: Skill Enhancement Course - 2 (SEC-2)

Animal Cell Culture (BTUBTL1) **CREDITS: 2**

Course Objective

The objective of this course is to provide basic knowledge of animal cell culture. This course is designed to make students aware about techniques of animal cell and tissue culture. This course will also teach how cultured cells can be maintained in animal cell culture laboratory.

Course Learning Outcomes

After successful completion of the course

- Student will acquire experimental skill of Cell culture techniques and competence in laboratory techniques.
- Student will develop proficiency in establishing and maintaining of cell lines.
- To conduct the independent research in the animal cel culture and its further application

Course contents

Unit I

History and scope of animal cell culture technology. Basic requirements of animal cell culture laboratory (Laminar air flow, CO_2 incubator, centrifuge, microscope) biological containment and biosafety levels, good laboratory practices to prevent contamination, common cell culture contaminants

Unit II

Culture media and buffers, natural and defined media, basal media, serum supplemented media, serum free media, growth supplements, balanced salt solution, sterilization and filtration of media.

Unit III

Cell culture techniques, primary and secondary culture, cell lines, monolayer culture, suspension culture, organ culture, cryopreservation of cell lines

Unit IV

Behaviour of cultured cells in terms of growth, differentiation and metabolism, apoptosis, necrosis and senescence, appearance of viable and non-viable cells, application of cell culture, in-vitro fertilization

Suggested Reading

1. Butler, M and Dawson, M. (eds.).: Cell Culture Lab Fax, Eds., Bios Scientific Publications Ltd., Oxford. Clynes, M. (ed).: Animal Cell Culture Techniques. Springer.

2. Sambrook & Russel. Molecular Cloning: A laboratory manual.

3. Freshney, Culture of Animal cell: A mannual of Basic Techniques

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			Total	24	28
SUMMER Internship: 15 days			**SwayamSwachhta / NSS / Industrial/ others**	**2**	**100**
III	Core-5	LS/BT/C-305L	Molecular Biology	4	4
	Core -5 Practical	LS/BT/C-305P	Laboratory-5 based on core-5	2	4
	Core -6	LS/BT/C-306L	Bio-analytical Tools	4	4
	Core -6 Practical	LS/BT/C-306P	Laboratory-6 based on core-6	2	4
	Core – 7	LS/BT/C-307L	Chemistry-1	4	4
	Core – 7 Practical	LS/BT/C-307P	Laboratory-7 based on core-7	2	4
	Generic Elective - 3 (GE-3)	LS/BT/GE-303/IPRE-L	Intellectual Property Right and Entrepreneurship	4	4
	Generic Elective - Practical	LS/BT/GE-303/IPRE-P	Laboratory-GE3 based on GE-3	2	4
	Skill Enhancement Course (SEC - 1)	LS/BT/SEC-301/MT -L	Molecular techniques in disease diagnosis	4*	2 (4)
			Total	28	34
IV	Core-8	LS/BT/C-408L	Mammalian Physiology	4	4
	Core -8 Practical	LS/BT/C-408P	Laboratory-8 based on core-8	2	4
	Core -9	LS/BT/C-409L	Immunology	4	4
	Core -9 Practical	LS/BT/C-409P	Laboratory-9 based on core-9	2	4
	Core – 10	LS/BT/C-410L	Chemistry-2	4	4
	Core -10 Practical	LS/BT/C-410P	Laboratory-10 based on core-10	2	4
	Generic Elective - 4 (GE-4)	LS/BT/GE-404/BME-L	Bio-management of Environment	4	4
	Generic Elective - Practical	LS/BT/GE-404/BME-P	Laboratory-GE4 based on GE-4	4	4
	Skill Enhancement Course (SEC-2)	LS/BT/SEC-402/ACC -L	Animal Cell Culture	4*	2 (4)
			TOTAL	28	34
SUMMER Internship: 15 days			**Swayam Swachhta / NSS / Industrial/ others**	**2**	**100**
V	Core-11	LS/BT/C-511L	Plant Physiology and	4	4

			Anatomy		
	Core -11 Practical	LS/BT/C-511P	Laboratory-11 based on core-11	2	4
	Core -12	LS/BT/C-512L	Recombinant DNA Technology	4	4
	Core -12 Practical	LS/BT/C-512P	Laboratory-12 based on core-12	2	4
	Discipline Specific Elective (DSE-1)	LS/BT/DSE-501L	Bioinformatics / Biostatics	4	4
	DSE-1 - Practical	LS/BT/DSE-501P	Laboratory-DSE1 based on DSE-1	2	4
	Discipline Specific Elective (DSE-2)	LS/BT/DSE-502L	Industrial Fermentations	4	4
	DSE-2 - Practical	LS/BT/DSE-502P	Laboratory-DSE2 based on DSE-2	2	4
			TOTAL	24	32
VI	Core-13	LS/BT/C-613L	Bioprocess Technology	4	4
	Core -13 Practical	LS/BT/C-613P	Laboratory-13 based on core-13	2	4
	Core -14	LS/BT/C-614L	Genomics and Proteomics	4	4
	Core -14 Practical	LS/BT/C-614P	Laboratory-14 based on core-14	2	4
	Discipline Specific Elective (DSE-3)	LS/BT/DSE-603L	Microbial Technology / Biodiversity and Bioprospecting	4	4
	DSE-3 – Practical	LS/BT/DSE-603P	Laboratory-DSE3 based on DSE-3	2	4
	Discipline Specific Elective (DSE-4) Dissertation	LS/BT/DSE-604/PD	Dissertation	6	8
			TOTAL	24	32
			TOTAL CREDITS	**152 + 4 (SI)**	

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semester after which student shall change two GE for another subject in IIIrd and IVth semester, so that the entire student can have exposure of one additional subject. **(Subject to approval by the competent authority)**

B.Sc. (Hons.) Biotechnology, Semester-III, Core-5
Course: Molecular Biology
Course Code: C5
Course Credit: (4-0-0) 4

UNIT I

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semi-conservative nature of DNA replication, Bi-directional replication, DNA polymerases, The replication complex: Pre-priming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication.

UNIT II

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, recombination repair. Homologous recombination: models and mechanism, nonhomologous end joining.

UNIT III

Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains. Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing

UNIT IV

Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation.
Regulation of gene expression in prokaryotes: Lac Operon and eukaryotes: tryptophan eukaryote.

B.Sc. (Hons.) Biotechnology, Semester-V, Core-12

Course: Recombinant DNA Technology

Course Code: C12

Course Credit: (4-0-0) 4

UNIT - I

History of recombinant DNA technology, Host controlled restriction modification system, restriction endonucleases, cutting and joining of DNA molecules *in vitro*. Phosphatases, ligases and polymerases. Southern and Northern hybridization, Preparation and comparison of Genomic and cDNA library, screening of recombinants, reverse transcription, Genome mapping, Restriction mapping, DNA fingerprinting, Principle applications and types of Polymerase chain reaction (PCR).

UNIT – II

Cloning vectors: plasmid, bacteriophage, cosmids, phagemid, expression vectors, Gene transfer methods: microinjection, electroporation, microprojectile bombardment, shot gun method, ultrasonication, lipofection, micro laser, RNA-interference, selection and screening of recombinants by genetic and immunochemical

UNIT - III

Expression of foreign genes in *E.coli* and Yeast, application of gene cloning for the analysis of gene structure and function, expression of foreign genes using strong promoters, production of protein, artificial insulin gene, recombinant vaccine and other therapeutics from cloned genes

UNIT - IV

Genetic engineering in plants: use of *Agrobacterium tumefaciens* and *Agrobacterium rhizogenes*, Ti plasmids, application of recombinant DNA technology. Genetic engineering in animals: production of transgenic mice, embryonic stem cells for gene targeting in mice, applications of gene targeting.

B.Sc. (Hons.) Biotechnology, Semester-V, DSE-2
Course: Industrial Fermentations
Course Code: DSE-2
Course Credit: (2-0-0) 2

UNIT I

Production of industrial chemicals, biochemicals and chemotherapeutic products.,butyric acid, gluconic acid, microbial insecticides, microbial flavours and fragrances, newer antibiotics, anti cancer agents

UNIT II

Microbial products of pharmacological interest, steriod fermentations and transformations, Secondary metabolism: its significance and products, Metabolic engineering of secondary metabolism for highest productivity, enzyme immobilization in industrial processing

UNIT III

Purification & characterization of proteins, Upstream and downstream processingcentrifugation, filtration of fermentation broth, ultra-centrifugation, liquid extraction, ion-exchange recovery of biological products, Process optimization and recovery of product

UNIT IV

Mathematical derivation of growth kinetics, mathematical derivations of batch and continuous culture operations; single stage CSTR; masstransfer in aerobic fermentation; resistances encountered; overall mass transfer co-efficient (Ka) determination, factors depending on scale up principle and different methods of scaling up.

B.Sc. (Hons.) Biotechnology, Semester-VI, Core-13
Course: Bioprocess Technology
Course Code: C13
Course Credit: (4-0-0) 4

UNIT I

Introduction to bioprocess technology, Range of bioprocess technology and its chronological Development, Basic principle components of fermentation technology, Types of microbial culture and its growth kinetics– Batch, Fedbatch and Continuous culture.

UNIT II

Design and types of bioprocess vessels: Significance of Impeller, Baffles, Sparger; Types of culture/production vessels: Airlift; Cyclone Column; Packed Tower and their application in production processes. Principles of upstream processing: Media preparation, Inocula development and sterilization from straw dust.

UNIT III

Introduction to oxygen requirement in bioprocess; mass transfer coefficient; factors affecting KLa. Bioprocess measurement and control system with special reference to computer aided process control.

UNIT IV

Introduction to downstream processing, product recovery and purification, effluent treatment, Microbial production of ethanol, amylase, lactic acid and single cell proteins

B.Sc. (Hons.) Biotechnology, Semester-VI, Core-13
Course: Bioprocess Technology
Course Code: C13
Course Credit: (4-0-0) 4

UNIT I

Introduction to bioprocess technology, Range of bioprocess technology and its chronological Development, Basic principle components of fermentation technology, Types of microbial culture and its growth kinetics– Batch, Fedbatch and Continuous culture.

UNIT II

Design and types of bioprocess vessels: Significance of Impeller, Baffles, Sparger; Types of culture/production vessels: Airlift; Cyclone Column; Packed Tower and their application in production processes. Principles of upstream processing: Media preparation, Inocula development and sterilization from straw dust.

UNIT III

Introduction to oxygen requirement in bioprocess; mass transfer coefficient; factors affecting KLa. Bioprocess measurement and control system with special reference to computer aided process control.

UNIT IV

Introduction to downstream processing, product recovery and purification, effluent treatment, Microbial production of ethanol, amylase, lactic acid and single cell proteins

SKILL ENHANCEMENT COURSE

B.Sc. (Hons.) Biotechnology, Semester-III, SEC-1

Course: Molecular Techniques in Disease Diagnostic

Course Code: SEC-1

Course Credit: (2-0-0) 2

Unit- I

Transportation of different clinical materials to distant Laboratories, Proper storage of samples, Chemicals, antibodies and enzymes, common anticoagulants used-composition, amount, mechanism of action and methods of preparation of different types of vials, Biosafety measures and disposal of laboratory waste. Basics of quality control methods and Laboratory accreditation

Unit – II

Composition of blood and its function, drawing of peripheral blood smear, staining & stain preparation, Methods of estimation of Haemoglobin, Methods of total counts of WBC, RBC, Platelets & fluids used, Blood Group (ABO & Rh), Cytochemical stain for diagnosis/differential diagnosis of leukemia/other diseases

Unit- III

Susceptibility tests: Diffusion test procedures, Tests for bactericidal activity, Immunodiagnostic tests,Immuno florescence, Enzyme Immunoassays: Enzyme linked immunosorbent assay, Radioimmunoassay, Immunophenotyping, Flouresence activated cell sorter, Magnetic cell sorter, FTR, Spectrophotometry

Unit - IV

Molecular techniques to detect genetic disorders: Polymerase chain reaction, Restriction fragment length polymorphism, Nuclear hybridization methods, Single nucleotide polymorphism and DNA finger printing

B.Sc. (Hons.) Biotechnology, Semester-IV, SEC2
Course: Animal Cell Culture
Course Code: SEC-2
Course Credit: (2-0-0) 2

UNIT I

History and scope of animal cell culture technology. Basic requirements of animal cell culture laboratory (Laminar air flow, CO_2 incubator, centrifuge, microscope) biological containment and biosafety levels, good laboratory practices to prevent contamination, common cell culture contaminants

UNIT II

Culture media and buffers, natural and defined media, basal media, serum supplemented media, serum free media, growth supplements, balanced salt solution, sterilization and filtration of media.

UNIT III

Cell culture techniques, primary and secondary culture, cell lines, monolayer culture, suspension culture, organ culture, cryopreservation of cell lines

UNIT IV

Behaviour of cultured cells in terms of growth, differentiation and metabolism, apoptosis, necrosis and senescence, appearance of viable and non-viable cells, application of cell culture, in-vitro fertilization

DISCIPLINE CENTRIC SUBJECTS

(Any two per semester in semesters 5-6)

B.Sc. (Hons.) Biotechnology, Semester-V, DSE1

Course: Bioinformatics

Course Code: DSE1

Course Credit: (4-0-0) 4

Unit -I

Introduction to bioinformatics, Applications of Bioinformatics, General Introduction of Biological Databases: Flat files, relational, object oriented databases and controlled vocabularies File Format (Genbank, FASTA). Introduction of Data Generating Techniques for Genomics: shotgun sequencing, clone contig, Nucleic acid databases

Unit-II

Introduction of Data Generating Techniques in proteomics: Mass spectroscopy. Protein databases (PDB, Swiss Prot, TREMBL). File Format (PDB). Searching Databases: SRS, Entrez

Unit-III

Pairwise sequence alignments, Local alignment and Global alignment, Mutation/Substitution Matrices. Introduction to BLAST and interpretation of result, Multiple Sequence Alignment

Unit-IV

Genome Annotation: Gene identification, Detecting Open Reading Frames, Phylogenetic analysis tools

B.Sc. (Hons.) Biotechnology, Semester-V, DSE3
Course: Microbial Technology
Course Code: DSE3
Course Credit: (4-0-0) 4

UNIT I

Introduction to Microbial biotechnology, Definition, Bioprospecting of microbial diversity, Isolation and preservation of industrially important microorganisms

UNIT II

Production of proteins and enzymes in bacteria, recombinant vaccines, polysaccharides from microbes

UNIT III

Microbes as biocontrol agents: microbial insecticides: their mode of action (Metarhiziumanisopliae, Bacillus thuringiensis, Nuclear Polyhedrosis Virus), requirements of biopesticide registration, insect resistance transgenic plants

UNIT IV

Microbial biomass production, lignocellulose biodegradation, application of ligninolyticmicrorganisms and enzymes in biodegradation

B.Sc. (Hons.) Biotechnology, Semester-V, DSE3
Course: Biodiversity and Bio-prospecting
Course Code: DSE3
Course Credit: (4-0-0) 4

UNIT I

Components of biodiversity, Biodiversity crisis and biodiversity loss, Importance of biodiversity in daily life, Biodiversity and climate change, Types of Ecosystems, India as mega biodiversity Nation, Hot spots and biodiversity in India, Biodiversity and Ecosystem functioning, Plant and Animal systematic, Species concept in biodiversity studies

UNIT II

Modern Tools in the study of Biodiversity, endemism, endemic plants and animals, assessment of mapping of biodiversity; GIS/Remote sensing; Biotechnology and Conservation, IUCN, Germplasm banks, National Parks, Botanical Gardens, Wild life Sanctuaries, Bioresources, Health and biodiversity

UNIT III

Introduction to bioprospecting, bioprospecting from plants, plant derived drugs, botanicals for biocontrol, bioprospecting from animal sources, scope and examples

UNIT IV

Bio-prospecting from microbes, micro organisms as a source of novel enzymes, antibiotics, antiviral agents, immunosuppressive agents and other therapeutic agents