Veer Narmad South Gujarat University

Biotechnology Course: CBCS

NEW (Effective from June 2015)

Semester	Semester V & VI (24+24 Credits)						Total Credits
Subject	Theory			Laboratory Work			
	Course	Credit	hours	Course	Credit	Hours	
Foundation Compulsory	1	2	3	-	-	-	2
Generic Elective	1	2	3	-	-	-	2
Core 1	6	12	12	1	6	12	18
Foundation Elective	1	2	2	-	-	-	2
Total	9	**18**	**20**	1	**6**	**12**	**24+24**

Semester-V

Core 1: Biotechnology

Course 1: BT 11: Introduction to Computers & Bioinformatics
Course 2: BT 12: Introduction to Virology
Course 3: BT 13: Introduction to Nanobiotechnology
Course 4: BT 14: Fundamentals of Mycology
Course 5: BT 15: Genetic Engineering
Course 6: BT 16: Bioethics & Biosafety

Practical Core 1: BTP 05: Biotechnology Semester-V

Semester-VI

Core 1: Biotechnology

Course 1: BT 17: Pharmaceutical Biotechnology
Course 2: BT 18: Immunotechnology
Course 3: BT 19: Microbial Biotechnology
Course 4: BT 20: Environmental Biotechnology
Course 5: BT 21: Plant Biotechnology
Course 6: BT 22: Animal Biotechnology

Practical Core 1: BTP 06: Biotechnology Semester-VI

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Syllabus: Semester-V

CORE: 1; Course: 01

BT-11: INTRODUCTION TO COMPUTER & BIOINFORMATICS

UNIT 1: INTRODUCTION OF COMPUTERS

1.1 Evolution of computers and characteristics of computers

1.2 Parts of Computer System

- 1.2.1 Hardware
- 1.2.2 Software
- 1.2.3 Data and User

1.3 Essential Computer Hardware

- 1.3.1 Processing device
- 1.3.2 Memory device- RAM & ROM
- 1.3.3 Input and Output devices
- 1.3.4 Storage device- Optical & Magnetic

1.4 Essential Computer Software

- 1.3.1 System software
- 1.3.2 Application software

1.5 Computer Data

UNIT 2: DATABASE MANAGEMENT SYSTEM

2.1 Database system applications.

2.2 Purpose of Database system.

2.3 View of Data- Data abstraction, Instance and schema, Data model.

2.4 Database language- DDL, DML.

2.5 Database Architecture- Two tier Architecture, Three tier Architecture.

UNIT 3: INTRODUCTION TO BIOINFORMATICS

3.1 A word on Bioinformatics.

- 3.1.1 Branches of Bioinformatics.
- 3.1.2 Aims of Bioinformatics.
- 3.1.3 Scope and Research area of Bioinformatics.

3.2 Organization of Bioinformatics in India

- 3.2.1 BTIS
- 3.2.2 Bioinformatics Server in India
    - 3.2.2.1 Protein structure prediction server.
    - 3.2.2.2 Genomics and Proteomics server.
    - 3.2.2.3 Conformational epitope prediction server.

UNIT 4: BIOLOGICAL DATABASE

4.1 Biological Database

4.1.1 Primary Database- Nucleotide sequence, Protein sequence.

4.1.2 Secondary Database- Nucleotide sequence-TIGR, Protein sequence-PROSITE.

4.1.3 Structure Database- PDB, SCOPE, CATH.

4.1.4 Metabolic Pathway Database KEGG, BioCyc.

4.1.5 Database retrieval tool SRS, Entrez.

4.1.6 Literature Database PubMed.

REFERENCES:

1. Sinha and Sinha, Computer Fundamental 4th Edition.
2. Introduction of Computer by Perter Norton, 6th Edition.
3. Database system concept, 5th Edition, Silberscath Korth.
4. Bioinformatics Principle and Application, Gosh and Mallick.
5. Introduction to Bioinformatics, T. K. Attwood, D. J. Parry- Smith, Samiron Pukhan.
6. Bioinformatics Database, Tools and Algorithms by Orpita Bosu.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Syllabus: Semester-V

CORE: 1; Course: 02

BT-12: INTRODUCTION TO VIROLOGY

UNIT 1: INTRODUCTION

1.1 What are Viruses?
1.2 History: Understanding Viruses.
1.3 Components of Viruses
1.4 Classification:
  1.4.1 RNA Virus
  1.4.2 DNA Virus
1.5 Properties of Viruses.

UNIT 2: VIRAL REPLICATION

2.1 General characteristics.
2.2 Bacteriophage replication.
2.3 Replication of animal virus.

UNIT 3: CULTIVATION TECHNIQUES

3.1 Culturing viruses in laboratory.
3.2 Isolation of viruses.
3.3 Structural investigation of cells and virions.
3.4 Electrophoretic techniques.
3.5 Detection of viruses and virus components.
3.6 Infectivity assays.

UNIT 4: INTRODUCTION, CLINICAL FEATURES AND TREATMENT OF:

4.1 Poliomyelitis
4.2 HIV and AIDS
4.3 Hepatitis B
4.4 Human Papilloma Virus
4.5 Herpes Simplex
4.6 SIV & HPAI

REFERENCES:

1. Understanding Viruses: Teri shors, Jones and Bartlett publication.
2. Microbiology with disease by Body System: Robert W. Bauman, Benjamin Cummings Publication.
3. Virology-Principle and Application by John Carter, Willey publication
4. Microbiology- Principles and explorations: Jacquelyn Black, John Wiley and Sons Publication.

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Syllabus: Semester-V

CORE: 1; Course: 03

BT-13: INTRODUCTION TO NANOBIOTECHNOLOGY

UNIT 1: INTRODUCTION TO NANOTECHNOLOGY & NANOBIOTECHNOLOGY

1.1 Introduction to Nano-world.
1.2 Types and properties of nanomaterials
1.3 Introduction to nanobiotechnology.
1.4 Dominion of biological machines.

UNIT 2: SYNTHESIS OF NANOMATERIALS

2.1 Approaches for synthesis of nanoparticles.
2.2 Techniques for synthesis of nanostructures.
2.3 Self-assembly techniques.
2.4 Introduction to biosynthesis.
2.5 What is biosynthesis? Why biosynthesis?

UNIT 3: MOLECULAR NANOTECHNOLOGY

3.1 Mastering the complex DNA nanostructure.
3.2 DNA tweezers.
3.3 DNA actuators.
3.4 DNA scissors.
3.5 Self-assembly of protein nanoarchitecture.
3.6 Applications of protein nanostructures.

UNIT 4: APPLICATIONS OF NANOBIOTECHNOLOGY

4.1 Application of carbon nanotubes in:
- 4.1.1 Diagnostic equipment
- 4.1.2 Surgical supplements
- 4.1.3 Tissue engineering
- 4.1.4 Gene delivery
- 4.1.5 Anticarcinogenic activity
- 4.1.6 Drug delivery
- 4.1.7 Neurodegenerative disorder therapy

4.2 Use of liposomes.
4.3 Photocatalysis of pollutants.
4.4 Application in food and agriculture.

REFERENCES:

1. Sharon Madhuri *et al.*, 2012, Bio-nanotechnology, Ane Books Pvt. Ltd.
2. Kulkarni S. K., 2007, Nanotechnology: Principles & Practices, Capital Publishing Co.

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Syllabus: Semester-V

CORE: 1; Course: 04

BT-14: FUNDAMENTALS OF MYCOLOGY

UNIT 1: INTRODUCTION

1.1 Place of fungi in 'tree of life'.
1.2 Characteristics of fungi.
1.3 Morphology of yeasts and filamentous fungi.
1.4 Classification of fungi.
1.5 Life cycle of the yeast *Saccharomyces.*
1.6 Life cycle of filamentous Ascomycete.

UNIT 2: FUNGAL PHYSIOLOGY & DIFFERENTIATION

2.1 Chemical requirements for growth.
2.2 Fungal cultivation media.
2.3 Physical Requirements for growth.
2.4 Cellular reproduction.
2.5 Mould-yeast dimorphism.
2.6 Sclerotia.
2.7 Nutrient –translocating organs.

UNIT 3: CONTROL OF FUNGAL GROWTH

3.1 Management of environmental and biological factors.
3.2 Biological and chemical control.
3.3 Cellular targets of antifungal agents.
3.4 Fungicides for plant disease control.
3.5 Control of fungal infections of humans.

UNIT 4: APPLIED MYCOLOGY

4.1 Fungal parasites and symbionts of plants.
4.2 Fungal pathogens of humans.
4.3 Fungal parasites as biological control.
4.4 Fungal saprotrophs.
4.5 Fungi in Biotechnology.
4.6 Case study: Hepatitis B vaccine.

REFERENCES:

1. Deacon, J. (2007). *Fungal Biology*. 4th Ed., Blackwell Publishing.
2. Kavanagh, K. Ed. (2006). *Fungi: Biology and Applications*. Wiley.
3. Wiley, J., & Sherwood, L. (2011). *Prescott's Microbiology*, 8th Ed., McGraw-Hill Science/Engineering/Math.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Syllabus: Semester-V

CORE: 1; Course: 05

BT-15: GENETIC ENGINEERING

UNIT 1: RECOMBINANT DNA TECHNOLOGY AND ENZYMES

1.1 Recombinant DNA Technology.
1.2 How to clone a gene?
1.3 Restriction Endonucleases.
1.4 Ligases.
1.5 Enzymes used to modify ends of DNA.
1.6 Use of Linkers, Adapters and Connectors.

UNIT 2: VECTORS

2.1 Vectors in Vogue.
2.2 Vectors in Plasmid.
2.3 Vectors from Bacteriophages: Charon phages and Replacement vectors.
2.4 Cosmids.
2.5 Vectors from Simian Virus 40.
2.6 Artificial Minichromosomes.
2.7 Vectors from Yeasts.
2.8 Vectors from Ti Plasmids.

UNIT 3: TECHNIQUES USED IN GENETIC ENGINEERING

3.1 Introducing genes into Prokaryotes: Cell Transformation with plasmids and Phage Transfection.
3.2 Introducing genes into Eukaryotes.
3.3 Insertion inactivation of Marker genes.
3.4 Colony hybridization.
3.5 Cells for Cloning: *B. subtilis*, *S. cerevisiae* and CHO cultured cells.

UNIT 4: APPLICATIONS OF GENETIC ENGINEERING

4.1 DNA sequencing by Sanger and Coulson's Method.
4.2 Messing's Shot-gun Method.
4.3 Oligonucleotide Directed Mutagenesis.
4.4 Applications of gene cloning techniques in Agriculture.
4.5 Vaccines.
4.6 Gene Replacement Therapy.

REFERENCE:

1. Mitra, S. (2007). Genetic Engineering: Principles and Practice, MacMillan India Ltd., New Delhi.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Syllabus: Semester-V

CORE: 1; Course: 06

BT-16: BIOETHICS & BIOSAFETY

UNIT 1: BIOETHICS

1.1 Introduction and need of Bioethics.
1.2 Definitions & Applications.
1.3 Relationship with other Sciences.

UNIT 2: INTRODUCTION TO ETHICAL, LEGAL AND SOCIAL IMPLICATIONS

2.1 Human Genome Project.
2.2 GMO: Foods & Crop.
2.3 Stem Cell Research.
2.4 Drug testing on Human volunteers.
2.5 Organ transplantation.

UNIT 3: BIOSAFETY

3.1 Introduction and need of Biosafety.
3.2 Overview of Histroy.
3.3 Definitions & Applications.

UNIT 4: BIOSAFTY GUIDELINES & REGULATIONS

4.1 Aims of NIH guidelines.
4.2 Risk assessment:
- 4.2.1 Assessment of risk during laboratory research.
- 4.2.2 Risk assessment for planned introduction.
- 4.2.3. Risk assessment of biotechnology products.

4.3 Containment: Physical and Biological
4.4 Biosafety guidelines in India.
4.5 Biosafety Protocol [UN Cartagena Biosafety Protocol (CBP).

REFERENCES:

1. Bioethics and Biosafety, M.K.Sateesh, I.K.International 2008
2. Bioethics, S. Ignacimuthu, S. J. Narosa Publishing House Pvt. Ltd.
3. Biotechnology, B. D. Singh (2009), Kalyani Publishers, New Delhi.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Semester-V

Practical Core-1: BTP-05: Biotechnology

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1. Introduction to HTML and literature access through Internet.
2. Nucleotide Sequence retrieval from GenBank.
3. Protein Sequence retrieval form Swiss port.
4. Protein Structure retrieval from PDB.
5. Protein structure visualization by RasMol.
6. Metabolic pathway database-KEGG.
7. Isolation and titration of Bacteriophage.
8. Demonstration of virus infection in chick embryo.
9. Detection of HIV by ELISA.
10. Detection of Hepatitis B surface antigen by direct ELISA.
11. Synthesis of AgNPs by using sodium citrate.
12. *In vitro* study of antimicrobial activity of AgNPs against bacteria.
13. Isolation and identification of Moulds and Yeast.
14. Isolation of plant pathogenic fungi.
15. Isolation of plasmid DNA from *E. coli.*
16. Extraction and Purification of bacterial DNA using spin column.
17. Restriction digestion of plasmid vector.
18. Transformation of bacterial cells by $CaCl_2$ method.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M. Sc. Integrated Biotechnology
Syllabus: Semester-VI

CORE: 1; Course: 01
BT-17: PHARMACEUTICAL BIOTECHNOLOGY

UNIT 1: PHARMACEUTICALS, BIOLOGICS & BIOPHARMACEUTICALS

1.1 Introduction to pharmaceutical products.
1.2 Biopharmaceuticals and pharmaceutical biotechnology.
1.3 History of the pharmaceutical industry.
1.4 The age of biopharmaceuticals.
1.5 Biopharmaceuticals: Current status and future prospects.

UNIT 2: DRUG DELIVERY & THERAPEUTICS

2.1 Drug delivery
- 2.1.1 Liposome.
- 2.1.2 Nasal spray.
- 2.1.3 Biodegradable polymer.
- 2.1.4 Osmotic.

2.2 RNA i Therapeutics.
2.3 Antisense Technology.
2.4 Enzyme of Therapeutic value- Superoxide dismutase, DNAse.
2.5 Hormone as therapy- Insulin.

UNIT 3: DRUG DISCOVERY & DEVELOPMENT

3.1 Drug discovery and development.
3.2 Clinical pharmacology.
3.3 Pharmakokinetics and Pharmacodynamics.
3.4 Toxicology studies- Reproductive toxicity, Teratogenicity, Carcinogenicity.

UNIT 4: REGULATORY AFFAIRS

4.1 Food & Drug Administration.
4.2 The investigational new drug application.
4.3 The new drug development.
4.4 Regulatory procedure.
4.5 Role of regulatory affairs department.

REFERENCES:

1. Gray Walsh, Pharmaceutical Biotechnology: Concepts and Applications. John Wiley & Sons, ISBN: 978-0-470-01245-1.
2. Humphrey P. Rang, Drug Discovery and Development: Technology in Transition (New title) Churchil Livigstone, ISBN: 978-0-443-06420-3.
3. Rodney J. Y. Milo Gibaldi, Biotechnology and Biopharmaceuticals: Transforming Proteins and Genes into Drugs, John Whiley & Sons, ISBN: 0471450278.
4. S. N. Jogdand, Medical Biotechnology, Himalaya Publishing House.
5. R. C. Sobti, Suparna S. Pachauri, Essentials of Biotechnlogy, Ane Books Pvt. Ltd. ISBN: 9788180521607.

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M. Sc. Integrated Biotechnology

Syllabus: Semester-VI

CORE: 1; Course: 02

BT-18: IMMUNOTECHNOLOGY

UNIT 1: MONOCLONAL ANTIBODIES

1.1 Hybridoma Technology.
1.2 Myeloma tumours.
1.3 Procedure for generation of hybridomas.
1.4 Human monoclonal antibodies.
1.5 Application of monoclonal antibodies.
1.6 Monoclonal antibodies as Abzymes.

UNIT 2: TECHNIQUES USED IN DIAGNOSIS

2.1 Precipitation.
2.2 Agglutination.
- 2.2.1 Haemaglutination.
- 2.2.2 Bacterial agglutination.
- 2.2.3 Passive agglutination.
- 2.2.4 Agglutination inhibition.

2.3 ELISA
2.4 Radioimmunoassay.
2.5 Immunofluorescence.
2.6 Immunochromatography.

UNIT 3: HYPERSENSITIVITY & IMMUNE DISEASE

3.1 Hypersensitivity Type I, II, III & IV
3.2 Diagnosis of hypersensitivity.
3.3 Autoimmune diseases- Insulin Dependent Diabetes Mellitus.
3.4 Immunodeficiency-Severe Combined Immunodeficiency.

UNIT 4: VACCINES

4.1 Attenuated and killed vaccines.
4.2 Sub unit vaccine (Toxoids, Capsule polysaccharides, Glycoproteins).
4.3 Multivalent subunit vaccine.
4.4 DNA vaccine.
4.5 Recombinant vector vaccine.

REFERENCES:

1 Kuby Immunology –Janis Kuby, Kindst, Gatsby And Osborne, Sixth Edition, W.H. Freeman Publications.
2 Immunology And Immunotechnology- Ashim Chakravarty,Oxford University Press, ISBN-13: 978-0-19-567688-4
3 Microbiology- Lansing Prescott, John P. Harley, Donald A. Klein, Eighth Edition, Mcgraw Hill Publication.
4 Principles and Techniques of Biochemistry and Molecular Biology, Keith Wilson and John Walker, Seventh Edition, Cambridge University Press.

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M. Sc. Integrated Biotechnology

Syllabus: Semester-VI

CORE: 1; Course: 03

BT-19: MICROBIAL BIOTECHNOLOGY

UNIT 1: INTRODUCTION TO MICROBIAL FERMENTATION

1.1 Concept of fermentation technology.
1.2 Chronological development of industrial fermentation technology.
1.3 Range of fermentation processes and products.
1.4 Fermentation process outline.
1.5 Fermentative production of Citric acid & Penicillin (Outline).

UNIT 2: MICROBIAL SCREENING AND PRESERVATION

3.1 Concept of microbial screening.
3.2 Primary and Secondary screening.
2.3 Isolation of industrially important microorganisms:
2.2.1 Methods utilizing selection of desired characteristics.
2.2.2 Methods not utilizing selection of desired characteristics.
2.4 Future potential and needs of microbial screening.
2.5 Maintenance and Preservation of Microbial cultures.

UNIT 3: IMPROVEMENT OF MICROORGANISMS

3.1 Types of Microbial mutants and their practical implications.
3.2 Isolation of microbial mutants (Outline).
3.3 Selection of mutants producing high yield of primary & secondary metabolites.
3.4 Parasexual cycle.
3.5 Protoplast fusion.

UNIT 4: FERMENTOR DESIGN

4.1 Basic functions of fermentor.
4.2 Aseptic operation and Containment.
4.3 Factors involved in fermentor design.
4.4 Typical batch fermentor
4.5 Air-lift bioreactor and CSTF

REFERENCES:

1. *Principles of fermentation technology, 2nd edition, Whitaker,* Butterworth-Heinemann, ISBN: 978-81-8147-808-5.
2. *Text book of Industrial Microbiology,* 2nd edition, Wulf Crueger and Anneliese Crueger, Panima Publishing Corporation, ISBN: 81-86535-27-6.
3. *Industrial Microbiology by A. H. Patel, Macmillan India Ltd.* ISBN: 0333-90842-2.
4. Microbial Biotechnology, H.A. Modi, Pointer Pub., Jaipur. ISBN: 978-81-7132-591-7.

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M. Sc. Integrated Biotechnology

Syllabus: Semester-VI

CORE: 1; Course: 04

BT-20: ENVIRONMENTAL BIOTECHNOLOGY

UNIT 1: BIOENERGY

1.1 Energy resources.
1.2 Biogas technology.
1.3 Bioethanol production from cellulosic waste.
1.4 Microbial Hydrogen production.
1.5 Biodiesel from Jatropha.

UNIT 2: BIOREMEDIATION

2.1 Principles of bioremediation.
2.2 Factors responsible for bioremediation.
2.3 Bioremediation strategies: *In situ* & *Ex situ*.
2.5 Metal & Organic Phytoremediation.

UNIT 3: WASTE MANAGEMENT

3.1 Characteristics of waste water.
3.2 Aerobic biological processes of waste water treatment: Activated sludge and Oxidation ponds.
3.3 Anaerobic biological processes of waste water treatment: UASB and Anaerobic baffled reactor.
3.4 Conventional solid waste treatment technologies.
3.5 Municipal waste management rules.
3.6 Composting: Design aspects and process.
3.7 Vermicomposting.

UNIT 4: SOME SPECIAL PROCESSES

4.1 Abatement of Air pollution.
4.2 Bioleaching: Types and Methods.
4.3 Metal Precipitation.
4.4 Biopolymers: Types and Preparation.
4.5 Properties and Practical applications of PHA**.**

REFERENCES:

1. Fulekar, M. H. (2007) Environmental Biotechnology, CRC Press.
2. Thakur, I. S. (2011) Environmental Biotechnology, I. K. International Pub. House Pvt. Ltd.
3. Maier, R. M. (2009) Environmental Microbiology, Academic Press.

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M. Sc. Integrated Biotechnology

Syllabus: Semester-VI

CORE: 1; Course: 05

BT-21: PLANT BIOTECHNOLOGY

UNIT 1:

1.1 Introduction and History of Plant tissue culture.
1.2 Laboratory Requirement and General Techniques.
1.3 Tissue culture Media (Murashiage and Skoog, Gamborg, Rosinni) Preparation, role of different media constituents and natural extracts.
1.4 Cellular Differentiation and Totipotency.

UNIT 2:

2.1 Micropropagation- Introduction, advantages and limitations.
2.2 Micropropagation (direct organogenesis).
2.3 Micropropagation (indirect organogenesis).

UNIT 3:

3.1 *In vitro* Embryogenesis: Somatic and Zygotic embryo culture conditions and practical applications.
3.2 Synthetic seeds – Classification, Encapsulation, Advantages limitations and Applications.
3.3 Cryopreservation and Germplasm conservation.

UNIT 4:

4.1 Haploid Production- Anther, Pollen, Ovary and Ovule Culture.
4.2 Factors affecting androgenesis and gynogenesis, Applications and Limitations.
4.3 Protoplast isolation and Culture- Methods of Isolation, Factors affecting Isolation, Purification and steps involved in culture.
4.4 Single cell culture.

REFERENCES:

1. Introduction to Plant Biotechnology. 2nd edition. By H.S.Chawla. Oxford & IBH publishing Co. Pvt. Ltd. New Delhi.
2. Plant Tissue culture: Theory and Practice, a revised Edition, S.S. Bhojwani and M.K. Razdan, Elsevier.
3. Plant Tissue Culture – basic and Applied by Timir Baran Jha & Biswajit Ghosh. Universities Press Pvt. Ltd.,Hyderabad.
4. Medicinal Plant Biotechnology by Ciddi Veerasham. CBS Publishers.
5. An Introduction to Plant Tissue Culture. 2nd Edition, by M.K.Razdan. Oxford & IBH Publishing Co.Pvt. Ltd.

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M. Sc. Integrated Biotechnology

Syllabus: Semester-VI

CORE: 1; Course: 06

BT-22: ANIMAL BIOTECHNOLOGY

UNIT 1: INTRODUCTION TO ANIMAL BIOTECHNOLOGY

1.1 Introduction: Historical background.
1.2 Application of animal biotechnology.
1.3 Advantages and limitation of animal tissue culture.
1.4 Types of tissue culture – Adherent culture, Suspension culture, Short term culture and Long term culture.

UNIT 2: BIOLOGY OF CULTURED CELLS

2.1 Culture environment.
2.2 Cell adhesion.
2.3 Cell proliferation.
2.4 Differentiation.

UNIT 3: LABORATORY DESIGN, EQUIPMENTS AND CELL CULTURE

3.1 Instruments and laboratory designing.
3.2 Primary culture.
3.3 Subculture and cell lines.
3.4 Cell viability and cryopreservation of cell lines.

UNIT 4: ASEPTIC TECHNIQUES AND ANIMAL CELL CULTURE MEDIA

4.1 Aseptic environment.
4.2 Sterile handling.
4.3 Defined media – Physical properties of media, complete media and serum free media.
4.4 Sterilization of media.

REFERENCES:

1. Ian Freshney, Culture of Animal Cells (Fifth Edition), Wiley-Leiss.
2. Jannie P. Mather and Peneolpe E. Roberts, Introduction to Cell and Tissue Culture, Plenum Press.
3. A. Doyle and B. Griffith, Cell and Tissue Culture: Laboratory Procedures in Biotechnology, Wiley publications.
4. D. C. Darling and S. J. Morgan (1994) Animal call culture and media, Bios Scientific Publishers Limited.
5. C. D. Helgason and C. L. Miller, Basic Cell Culture Protocols, Humana press.
6. Basant Kumar Sinha and Rinesh Kumar, Principles of Animal Cell Culture, International Book Distribution Co.
7. B.D. Singh, Expanding Horizons of Biotechnology, Kalyani Publishers.

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M. Sc. Integrated Biotechnology

Semester-VI

Practical Core-1: BTP-06: Biotechnology

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1. In-house sterility testing for autoclaves.
2. To determine MIC of commercially available antibiotics.
3. To study ADMET profile using toxicology database-ACToR.
4. Immuno-chromatography for diagnosis of Malaria/Typhoid.
5. RPR for diagnosis of Syphilis.
6. Isolation and screening of antibiotic producing microorganisms:
    (a) Crowded Plate Technique.
    (b) Wilkin's Technique.
7. Isolation and screening of organic acid producing microorganisms.
8. Isolation and screening of Extracellular enzyme producing microorganisms:
    (a) Amylase producer.
    (b) Protease producer.
    (c) Cellulase producer.
    (d) Lipase producer.
9. Production of citric acid by *Aspergillus niger*.
10. Determination of TDS and TSS of given waste water.
11. Determination of BOD of given waste water.
12. Study of heavy metal biosorption using fungal biomass.
13. Isolation of mesophyll cell by different methods.
14. Media preparation (Murashiage and Skoog, Gamborg B5) and explants inoculation.
15. Callus culture from different explants (node, internode and leaf).
16. Preparation and sterilization of Media by appropriate; autoclave and filtration techniques.
17. To perform cell culture from Splenocyte / Hepatocyte / Chick fibroblast.
18. To perform suspension culture (PBLC) and prepare metaphase plate.

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