DEPARTMENT OF BIOTECHNOLOGY

The following Courses having focus on Employability/Entrepreneurship/Skill Development:

Courses:

SEC1 – Industrial Fermentation/ SEC 2 – Immunological techniques

SEC 4 – Drug designing/ DSC – Medical biotechnology

Advanced paper – IPR, Biosafety & Entrepreneurship

Attachment: syllabus copy of the above

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Department of Biotechnology
TARA GOVERNMENT COLLEGE (A)
SANGAREDDY

HEAD

B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- III
SKILL ENHANCEMENT COURSE-1 (SEC-1)
BS 301: INDUSTRIAL FERMENTATION

1. Unit: Production of industrial chemicals, biochemicals, chemotherapeutic products and purification of proteins.

1.1. Propionic acid, butyric acid, 2-3 butanediol, gluconic acid, itaconic acid
1.2. Biofuels: biogas, ethanol, butanol, hydrogen, biodiesel
1.3. Microbial insecticides; microbial flavours and fragrances, newer antibiotics
1.4. Anti cancer agents, amino acids
1.5. Upstream and downstream processing, solids and liquid handling
1.6. Centrifugation, filtration of fermentation broth and anaerobic fermentation

2. Unit: Microbial products of pharmacological interest

2.1. Steriod fermentations and transformations
2.2. Metabolic engineering of secondary metabolism for highest productivity
2.3. Enzyme and cell immobilization techniques in industrial processing
2.4. Rate equations for enzyme kinetics- Simple and complex reactions
2.5. Enzymes in organic synthesis, proteolytic enzymes, hydrolytic enzymes, glucose isomerise
2.6. Enzymes in food technology/organic synthesis

REFERENCE BOOKS

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology — A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and Singara Charya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology. Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA.

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Dr. K. MADHURI
Department of Biotechnology
Mahatma Gandhi University, Nalgonda (T.S.)

B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- III
SKILL ENIIANCEMENT COURSE -2 (SEC- 2)
BS 302: IMMUNOLOGICAL TECHNIQUES

1. **Unit: Antibody** assays **Principle, Methodology and Applications**
   1.1. Antigen - Antibody reactions: opsonisation, neutralization, precipitation & *aggl*utination
   1.2. Immuno diffusion & radial diffusion
   1.3. Immuno electrophoresis - rocket and counter current
   1.4. ELISA & western blotting
   1.5. Radioimmunology assay & immune fluorescent assay
   1.6. Immlmo histo chemistry

2. **Unit: Cellular Assays Principle, Methodology andApplications**
   2.1. Total and differential count in human peripheral blood
   2.2. Separation of mononuclear cells from human peripheral blood
   2.3. Cell viability assay using tryphan blue
   2.4. Lymphocyte transformation assay
   2.5. Enumeration of T & B cells from human peripheral blood
   2.6. Micro cytotoxicity assay for HLA typing

REFERENCE BOOKS

1. Essential Immunology by I. Roitt, Publ: Blackwell
2. Immunology by G. Reever& I. Todd, Publ: Blackwell
3. Cellular and Molecular Immunology by Abbas AK, Lichtman AH, Pillai S. Saunders publication, Philadelphia
4. Kuby's Immunology by Golds RA, Kindt TJ, Osborne BA. W.H. Freeman and company, New York

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B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- IV
SKILL ENHANCEMENT COURSE-4 (SEC-4)
BS 402: DRUG DESIGNING

I. Unit: Introduction to Drug Discovery

1.1. Drug discovery process - historical perspective and challenges
1.2. Drug targets: proteins- receptors, ion channels and transporters; DNA- gene specific inhibitors of transcription
1.3. Drug target identification and validation: genetic approaches to identify target candidates such as mapping disease loci; role of bioinformatics in the analysis of nucleic acid sequence, protein sequence and structure.
1.4. Structural bioinformatics: prediction of 3D structure of protein using homology modelling, threading and ab-initio approach.
1.5. Structure-based drug design: active site detection, docking, binding energy calculation
1.6. Ligand-based drug design: computational methods to screen databases for new leads

2. Unit: Strategies of Drug Development

2.1. Strategies of drug designing: lead generation through combinatorial chemistry
2.2. Preparation of active compounds: natural products, synthetic compounds, semi synthetic compounds
2.3. Lead identification: High throughput screening and hit generation - small molecule drugs, large molecule drugs.
2.4. Lead optimization: Properties of druggable compounds (Lipinski rule), pharmacokinetics and pharmacodynamics
2.5. Screening of lead molecules from the phase I- IV to final drug molecule.
2.6. Pharmacogenomics: it's role in drug development and optimization

REFERENCE BOOKS

1. Textbook of Drug Design. Krogsgaard-Larsen, Liljefors and Madsen (Editors). Taylor and Francis. London UK, 2002.
2. Drug Discovery Handbook S.C. Gad (Editor) Wiley-Interscience Hoboken USA. 2005.
3. Advanced Computer- Assisted Techniques in Drug Discovery in Methods and Principles in Medicinal Chemistry by Han van de Waterbeemd (ed.) Volume 3,1994, Publishers. New York. NY (USA).
4. Virtual Screening for Bioactive Molecules by in Methods and Principles in Medicinal Chemistry. Edited by Hans-Joachim Bohm and Gisbert Schneider,Volume 10, 2000
5. Burger's Medicinal Chemistry and Drug Discovery. 6th Edition. Vol. 1. Principles and Practice. edited by M. E. Wolff, John Wiley & Sons: New York. 2003.
6. Real world drug discovery: A chemist's guide to biotech and pharmaceutical research by Robert M. Rydzewski, Elsevier Science, 1 edition (2008)
7. Drug discovery and development: Technology in transition by Raymond G Hill, Churchill Livingstone, 2 edition (2012)

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Assistant Professor
Dept. of Biotechnology
University College of Science
Mahatma Gandhi University, Nalgonda. (T.S.)

B.Sc BIOTECHNOLOGY III YEAR
SEMESTER- V
OPTIONAL- I (B) (DSE- 1E)
BS 504(B): MEDICAL BIOTECHNOLOGY

I. Unit: Inheritance of human diseases and karyotyping

1.1. Inheritance patterns - pedigree analysis of autosomal traits
1.2. Inheritance patterns - pedigree analysis of allosomal traits
1.3. Factors affecting pedigree pattern- penetrance, expressivity
1.4. Genetic heterogeneity - allele and locus heterogeneity
1.5 karvotyping of human chromosomes
1.6. Chromosome staining - G, Q, R and C banding techniques

2. Unit: Genetic basis of human disorders

2.1. Chromosomal disorders caused due to structural chromosomal abnormalities (deletions, duplications, translocations and inversions)
2.2. Chromosomal disorders caused due to numerical chromosomal abnormalities (euploidy, aneuploidy. autosomal and allosomal)
2.3. Monogenic disorders (autosomal and X-linked diseases)
2.4. Mitochondrial diseases - MON, MERRF
2.5. Multifactorial disorders - diabetes and hypertension
2.6. Cancer - types of cancer, genetic basis of cancer (oncogenes, tumour suppressor genes)

3. Unit: Techniques for diagnosis of human diseases

3.1. Prenatal diagnosis - invasive techniques - amniocentesis, chorionic villi sampling (Down's syndrome): non-invasive techniques - ultrasonography (neural tube defects)
3.2. Diagnosis using enzyme markers - Guthrie test (phenylketonuria)
3.3. Diagnosis using monoclonal antibodies - ELISA (HIV)
3.4. DNA/RNA based diagnosis - HBV
3.5. PCR based genotyping techniques for diagnosis - RFLP (MTHFR C677T mutation)
3.6. Chip based diagnosis and applications - colon cancer

4. Unit: Therapeutic approaches for human diseases

4.1. Recombinant proteins - human growth hormone, insulin

4.2. Gene therapy - *ex vivo* and *in vivo* gene therapy

4.3. Stem cells - potency definitions; embryonic and adult stem cells
4.4. Applications of stem cell based therapies and regenerative medicine
4.5. DNA based vaccines, subunit vaccines - herpes simplex virus; recombinant attenuated vaccines - cholera vaccine
4.6. Applications of monoclonal antibodies.

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B.Sc BIOTECHNOLOGY III YEAR
SEMESTER- VI
OPTIONAL PAPER I
BS 601: IPR, BIOSAFETY AND ENTREPRENEURSHIP

1. Unit: Intellectual Property rights

1.1. Intellectual Property - meaning, nature
1.2. Significance and need of protection of intellectual property
1.3. Types of intellectual property rights: patent, trademarks, copyright, design registration, trade secret, geographical indicators, plant variety protection
1.4. Copyright: meaning, nature, historical evolution and significance
1.5. Ownership of copyright - rights of authors and owners, trademarks
1.6. Plant varieties protection and plant breeding rights

2. Unit: Patent laws

2.1. Patents - concept of patent- historical overview of the patent law in India
2.2. Kinds of patents - procedure for obtaining patent in India and in other countries
2.3. Patenting microbes and organisms- novelty, International Depository Authorities (IDAs), submitting details of the deposit
2.4. Patenting genes - pros and cons, ethics, examples
2.5. Patenting markers and variants - examples
2.6. Product vs process patent - product life cycle and process design.

3. Unit: Laboratory Management and Safety

3.1. Administration of laboratories, laboratory design, laboratory information management system
3.2. Laboratory safety - good laboratory practice (GLP), biosafety levels
3.3. Basic principles of quality control (QC) and quality assurance (QA)
3.4. Handling of hazardous compounds - chemicals, solvents, poisons, isotopes, explosives and biological strains
3.5. Storage of hazardous material
3.6. Disposal of biological and radioisotope wastes

4. Unit: Entrepreneurship

4.1. Concept, definition, structure and theories of entrepreneurship
4.2. Types of start-ups with examples
4.3. Types of entrepreneurship, environment, process of entrepreneurial development 4.4. Entrepreneurial culture, entrepreneurial leadership
4.5. Product planning and development - project management, search for business idea, concept of projects, project identification
4.6. Promoting bio-entrepreneurship.

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