KAMARAJ COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

S.P.G.Chidambara Nadar - C.Nagammal Campus

S.P.G.C.Nagar, K.Vellakulam - 625 701, (Near Virudhunagar), Madurai District.

DEPARTMENT OF BIOTECHNOLOGY

M.TECH BIOTECHNOLOGY

R – 2020 AUTONOMOUS CURRICULUM & SYLLABUS

CHOICE BASED CREDIT SYSTEM

VISION:

To make the Department of Biotechnology, unique of its kind in the field of research and development activities pertaining to the field of biotechnology in this part of the world.

MISSION:

To impart highly innovative and technical knowledge in the field of biotechnology to the urban and rural student folks through “Total Quality Education”.

PROGRAM OUTCOMES:

PO1: An ability to independently carry out research/investigation and development work to solve practical problems

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

MB1202 **BIOSAFETY AND BIOETHICS**

L	T	P	C
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OBJECTIVES

- To familiarize the students to understand the basic definitions of biosafety, bioethics, biopolicy and good laboratory procedure and practices,
- To acquaint the students to various standard operating procedures for biotechnology research,
- To sensitize the students about legal and institutional framework for biosafety in national and international levels and knowledge about various agreements and protocols for biosafety.

UNIT I SAFETY COMPONENTS IN INDUSTRIES AND RESEARCH LABORATORIES 9

Need for safety in industries and research laboratories; – Biosafety issues in biotechnology. Biological Safety Cabinets, Primary Containment for Biohazards. Biosafety Levels - Levels of Specific Microorganisms, Infectious Agents and Infected Animals.

UNIT II SAFETY PROCEDURE AND CASE STUDIES 9

Biosafety Guidelines: Guidelines and regulations (National and International including Cartegana Protocol) – operation of biosafety guidelines and regulations;Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture. Safety procedures during the environmental release of GMOs - Risk - Analysis, Assessment, management and Communication. Case Studies –SARS and COVID'19 Pandemic outbreak.

UNIT III RISK ANALYSIS 9

Overall risk analysis-emergency planning-on site & off-site emergency planning, risk management ISO 14000, EMS models case studies. Quantitative risk assessment – rapid and comprehensive risk analysis; Risk due to Radiation, explosion due to over pressure, jet fire-fire ball.

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Introduction to ethics and bioethics, framework for ethical decision making. Ethical, legal and socioeconomic aspects of gene therapy, germ line, somatic, embryonic and adult stem cell research. Ethical implications for creating GM crops, GMO's, human genome project, human cloning, designer babies, biopiracy and biowarfare. Animal right activities. Ethical limits of Animal use. Green peace - Human Rights and Responsibilities: Professional Rights – Employee Rights – Intellectual Property Rights (IPR) -Discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to

CO1: Demonstrate the importance of safety components in industries and research laboratories
CO2: Customize the safety procedure according to the Cases
CO3: Illustrate and assess the risk
CO4: Classify the responsibilities and rights
CO5: Investigate various global issues

REFERENCES

1. Fawatt, H.H. and Wood, W.S., 1965 *Safety and Accident Prevention in Chemical Operation*, Wiley Interscience,.
2. Marcel, V.C., 1987. *Major Chemical Hazard*- Ellis Harwood Ltd., Chi Chester, UK.
3. Skeleton, B., 1997.*Process Safety Analysis: An introduction*, Institution of chemical Engineers, U.K.
4. Hyatt, N.,2004.*Guidelines for process hazards analysis, hazards identification & risk analysis*,Dyadem Press,
5. Mike Martin and Roland Schinzinger, 2005. *Ethics in Engineering*, McGraw Hill,
6. New York.
7. Charles E Harris, Michael S Pritchard and Michael J Rabins, 2000."*Engineering Ethics – Concepts and Cases*", Thompson Learning.
8. Rajmohan Joshi (1st Ed.). 2006. *Biosafety and Bioethics*. Isha Books, Delhi.

MB1203 BIOSEPARATION TECHNOLOGY

L	T	P	C
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OBJECTIVES:

- To impart knowledge on selection criteria of different separation methods based on the purity requirements of the bioproducts.
- To outline the methods available for separation of insoluble from fermentation broth
- To acquire knowledge in different methods to concentrate bioproducts
- To familiarize the chromatographic techniques to obtain pure proteins, enzymes and in general about product development R &D

UNIT I DOWNSTREAM PROCESSING IN BIOTECHNOLOGY 9

Role and importance of downstream processing in biotechnological processes, requirements of bio product purification. Economics of downstream processing in Biotechnology, cost-cutting strategies. Separation characteristics of proteins and enzymes: size, stability, properties. Process design criteria for various classes of bio products (high volume, low value products and low volume, high value products).

UNIT II PHYSICO-CHEMICAL BASIS OF BIO-SEPARATION PROCESSES 9

Cell disruption methods for intracellular products: Physical, chemical, mechanical. Separation techniques for the removal of insoluble: biomass and particulate debris. Filtration: Types of filtration, centrifugal and cross – flow filtration, Types of filtration equipment, Filtration at constant pressure and at constant rate, Empirical equations for batch and

MB1242 PRINCIPLES OF INTELLECTUAL PROPERTY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To create awareness about IPR.
- To make familiar with basics of IPR and their implications in Research, development and commercialization.
- To integrate the IPR process in their research activities.

UNIT I INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS 6

Introduction to Intellectual Property Rights, Basic concepts and need for Intellectual Property - Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of GMOs, IP as a factor in R&D; IPs of relevance to Biotechnology.?

UNIT II AGREEMENTS, TREATIES AND CONCEPT OF PRIOR ACT 9

Agreements and Treaties: History of GATT & TRIPS Agreement, Madrid Agreement; Hague Agreement, WIPO Treaties; Budapest Treaty; PCT, Indian Patent Act 1970 & recent amendments, Ordinary – PCT –Conventional – Divisional and Patent of Addition – Specifications – Provisional and complete –Forms and fees Invention in context of prior art.

UNIT III CONTEMPORARY ISSUES IN IPR 9

Interface between IPR and Human Rights; Interface between IPR and Competition Law; IPR and sustainable development; The Impact of Internet on IPR; IPR Issues in Biotechnology.

UNIT IV PATENT LAWS 9

IP Laws, Cyber Law and Digital-Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition-IP Laws – Case Studies. Licensing – Voluntary & Non –Voluntary; Assignment; Fair Use; Use and acquisition of inventions by Government; Infringement of IPRs and remedies, Enforcement Measures, Emerging issues – Case Studies.

UNIT V PATENT SEARCH, DRAFTING AND FILING PROCEDURES 12

Patent databases: Searching International Databases; Country-wise patent searches (USPTO, esp@cenet(EPO), PATENT Scope(WIPO), IPO, etc.). Patent Drafting: Drafting a Claim; Types and Arrangement of Claims; Structure of the Patent Specification; Patent Filing: National & PCT filing procedure – Time frame and cost – Status of the patent applications filed –Precautions while patenting – disclosure/non-disclosure – Financial assistance for patenting –existing schemes-Patent licensing and agreement Patent infringement – Meaning, scope, litigation, case studies.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: underline the different types of Intellectual Properties, the right of ownership and the scope of protection.
CO2: describe the agreements, treaties and concept of prior act.
CO3: discuss various contemporary issues in IPR.
CO4: identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development.
CO5: demonstrate the patent search, drafting and filing procedures.

REFERENCES:

1. Bouchoux, D.E., 2012. *Intellectual property: The law of trademarks, copyrights, patents, and trade secrets.* Cengage Learning.
2. Irish, V., 2005. *Intellectual property rights for engineers* (Vol. 22). IET.
3. Halbert, D., 2016. *Intellectual property theft and national security: Agendas and assumptions.* The Information Society, 32(4), pp.256-268.
4. Nard, C.A., 2019. *The law of patents.* Aspen Publishers.

OPEN ELECTIVE

OMB151 **FUNDAMENTALS OF NUTRITION**

L	T	P	C
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OBJECTIVES:

- The course aims to develop the knowledge of students in the basic area of Food Chemistry.
- This is necessary for effective understanding of food processing and technology subjects.
- This course will enable students to appreciate the similarities and complexities of the chemical components in foods.

UNIT I OVERVIEW OF NUTRITION 9

Definition, six classes of nutrients, calculating energy values from food, using the RDA, nutritional status, nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning: Diet planning principles, dietary guidelines; food groups, exchange lists, personal diet analysis;

UNIT II DIGESTION 9

Digestion, Absorption and Transport: Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption of nutrients.

UNIT III CARBOHYDRATES 9

Glycemic and Non-glycemic carbohydrates, blood glucose regulaion, recommendations of sugar intake for health, health effects of fiber and starch intake, Artificial sweeteners; Importance of blood sugar regulation, Dietary recommendations for NIDDM and IDDM