VISION

To be a department of academic excellence focused on education, research and development and to conquer the frontiers of biotechnology, benefitting the society.

MISSION

- To impart quality technical education
- To continuously enhance and enrich the teaching / learning process
- To provide an ambience for overall development of the students to be more creative, innovative and globally competent ethical professionals
- To promote research and develop technologies and products for the sustenance and wellbeing of the society

PROGRAM EDUCATIONAL OBJECTIVES

This program enables Biotechnology graduates

I. To apply knowledge across the disciplines and in emerging areas of biotechnology for higher studies, research, employability and product development
II. To develop communication skills, sense of responsibility to protect the environment and ethical conduct towards their profession and commitment to serve the society
III. To possess academic excellence, managerial skills, leadership qualities and understand the need for lifelong learning for a successful professional career

PROGRAM OUTCOMES

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems
2. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics,
natural sciences and engineering sciences.

3. **Design and Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

8. **Ethics:** Apply the ethical principles and commit to professional ethics and responsibilities and norms of engineering practices.

9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively in complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and a leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OUTCOMES**

1. To apply the knowledge and solve problems through clinical research and improve health related issues of the society

2. To design, develop processes and bioproducts for health care

3. Apply basic skills in Engineering to promote interdisciplinary research in Biotechnology
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# PROFESSIONAL ELECTIVES (PE)

## PROFESSIONAL ELECTIVE – I (SEMESTER-V)

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HS19151  TECHNICAL ENGLISH  L T P C
Common to all branches of B.E./ B.Tech programmes – I semester  2 10 3

OBJECTIVES:
- To enable learners to acquire basic proficiency in English reading and listening.
- To write in English precisely and effectively.
- To speak flawlessly in all kinds of communicative contexts.

UNIT I - VOCABULARY BUILDING
The concept of word formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives - Synonyms, antonyms, and standard abbreviations. Compound words – abbreviation – single word substitution – Listening: Listening comprehension, listening to motivational speeches, podcasts and poetry. Speaking: Short talks on incidents - place of visit – admiring personalities, etc.

UNIT II - BASIC WRITING SKILLS
Sentence structures - Use of phrases and clauses in sentences - punctuation - coherence - Organizing principles of paragraphs in documents - Techniques for writing precisely. Reading & Writing – Free writing – paragraphs - article reading and writing criticism - change of tense forms in short text or story – inferential reading – rewrite or interpret text - prepare questions based on the text. Speaking: Everyday situations – conversations and dialogues, speaking for and against.

UNIT III - GRAMMAR AND LANGUAGE DEVELOPMENT
Subject-verb agreement- Noun-pronoun agreement - Articles – Prepositions – Redundancies. Reading & Writing: Read from innovation and ideas that changed the world, newspaper column writing – Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps, pictures, etc.).

UNIT IV - WRITING FOR FORMAL PRESENTATION

UNIT V- EXTENDED WRITING AND SPEAKING

TOTAL HOURS 60

COURSE OUTCOMES
On completion of course students will be able to
- Discuss and respond to the listening content.
- Read and comprehend different texts and appreciate them
- Understand structures and techniques of precise writing
- Analyse different genres of communication and get familiarized with new words, phrases, and sentence structures.
- Write and speak appropriately in varied formal and informal contexts.
TEXT BOOK
English for Technologists & Engineers, Orient BlackSwan Publications, Chennai.

REFERENCES
1. Technical Communication, Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House, Delhi
3. Communication Skills, Pushplata, Sanjay Kumar, Oxford University Press

MA19153- APPLIED CALCULUS
L T P C
3 1 0 4

Common to I sem. B.Tech. – BIOTECH, FOOD TECH& CHEMICAL

OBJECTIVES
- To gain knowledge in using matrix algebra techniques.
- To understand the techniques of calculus which are applied in the Engineering problems.

UNIT I – MATRICES 12
Symmetric and skew – symmetric matrices, orthogonal matrices – Eigen values and Eigen vectors - Cayley – Hamilton theorem (without proof) and applications - orthogonal transformation and quadratic forms to canonical forms - Nature of quadratic forms.

UNIT II – APPLICATION OF DIFFERENTIAL CALCULUS 12
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolutes as envelope of normals.

UNIT III – FUNCTIONS OF SEVERAL VARIABLES 12

UNIT IV - APPLICATION OF INTEGRATION AND IMPROPER INTEGRALS 12
Evaluation of area, surface area and volume of revolution - Centre of Gravity – Moment of inertia – Improper integrals: Beta and Gamma integrals and their properties.

UNIT V - MULTIPLE INTEGRAL 12
OUTCOMES

On completion of the course students will be able to:

- Apply the concept of Eigenvalues and eigenvectors, diagonalization of a matrix for solving problems.
- Analyze, sketch and study the properties of different curves.
- Handle functions of several variables and problems of maxima and minima.
- Apply the techniques of integration in engineering problems and to use the concept of improper integrals.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

TEXT BOOKS


REFERENCES


PH19142- PHYSICS FOR BIOSCIENCE


OBJECTIVES

- To enhance the fundamental knowledge of Physical, Quantum, magnetic and dielectric properties of materials
- To study the behavior of light, sound and nuclear radiation in materials.

UNIT I - PROPERTIES OF MATTER


UNIT II - QUANTUM PHYSICS AND SUPERCONDUCTIVITY

UNIT III - MAGNETIC AND DIELECTRIC MATERIALS

UNIT IV - WAVES, OPTICS, AND SOUND

UNIT V - NUCLEAR AND PARTICLE PHYSICS

TEXT BOOKS:

REFERENCES
LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 10 experiments)

1. Determination of Young’s Modulus of the given material by Uniform bending
2. Determination of Young’s Modulus of the given material by Non Uniform bending
3. Determination of Rigidity Modulus of the given material by Torsion pendulum
4. Determination of Band gap of given Semiconducting material.
5. To determine the work function and threshold frequency using Einstein’s Photoelectric effect.
7. Determination of free space permeability using Helmholtz coil.
10. Spectrometer - Minimum deviation of a prism.
11. Determination of Resonance frequency of LC circuit and LCR circuits.
12. Detection of ionizing radiation using Geiger Muller Counter

TOTAL PERIODS 75

Use the basic instruments like vernier caliper, micrometer and microscope for various basic measurements.

OUTCOMES

On completion of the course, students will be able to

- Apply the knowledge of properties of matter, elasticity and bending moments of beam for real time applications.
- Understand and apply the principles of quantum physics and superconductivity in devices.
- Make use of magnetic and dielectric properties of materials in engineering and technology.
- Apply the properties of optics and sound to develop innovating instruments.
- Utilize the concepts of nuclear and particle physics in imaging and irradiation techniques.

GE19101- ENGINEERING GRAPHICS
OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)  1

Importance of graphics in engineering applications– Use of drafting instruments– BIS

Conventions and specifications– Size, layout and folding of drawing sheets– Lettering and dimensioning. Basic Geometrical constructions.

UNIT I  PLANE CURVES AND FREE HAND SKETCH  15

Curves used in engineering practices: Conics– Construction of ellipse, parabola and hyperbola by eccentricity method– Construction of cycloids, Construction of involutes of square and circle– Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II  PROJECTION OF POINTS, LINES AND PLANESURFACE  15

Orthographic projection- principles-Principal planes- projection of points. First angle projection - Projection of straight lines inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method- Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS  15

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  15

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V  ISOMETRIC, PERSPECTIVE PROJECTIONS AND FREE HAND SKETCHING  15

Principles of isometric projection– isometric scale– Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- Perspective projection of simple solids

Prisms, pyramids and cylinders by visual ray method.
OUTCOMES:

On Completion of the course, the student will be able to

- do the construction of plane curves and orthographic projection of points
- do the orthographic projection of lines and plane surfaces.
- do the projections of solids
- do the section of solids and development of lateral surfaces
- prepare isometric, perspective projection of simple solids and free hand sketching

TEXTBOOK:


REFERENCES:


Publication of Bureau of Indian Standards:


SpecialpointsapplicabletoUniversityExaminationsonEngineeringGraphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solutions within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.
OBJECTIVES:

- To provide hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

I CIVIL ENGINEERING PRACTICE 15

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
(b) Preparation of basic plumbing line sketches for wash basins, water heaters, etc.
(c) Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.

Carpentry Works:
(a) Study of joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise: Woodwork, joints by sawing, planning and chiseling.

II MECHANICAL ENGINEERING PRACTICE 15

Welding:
(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
(b) Gas welding practice.

Basic Machining:
(a) Simple Turning and Taper turning.
(b) Drilling Practice.

Sheet Metal Work:
(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner
OBJECTIVES:

- To understand the importance of natural resources, pollution control and waste management.
- To provide the students about the current social issues and environmental legislations.

UNIT I - NATURAL RESOURCES

Environment - definition - scope and importance - forest resources - use and overexploitation - water resources - use and over utilization - dams - benefits and problems - water conservation - energy resources - growing energy needs - renewable and non renewable energy sources - use of alternate energy sources - land resources - land degradation - role of an individual in conservation of natural resources.

UNIT II - ENVIRONMENTAL POLLUTION

Definition - causes, effects and control measures of air pollution - chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, and ozone depletion - noise pollution - mitigation procedures - control of particulate and gaseous emission (Control of $SO_2$, $NO_X$, CO and HC).


Soil pollution: definition-causes-effects and control of soil pollution.

UNIT III - SOLID WASTE MANAGEMENT

Solid wastes - sources and classification of solid wastes - solid waste management options - sanitary landfill, recycling, composting, incineration, energy recovery options from wastes.


UNIT IV - SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development - concept, components and strategies - social impact of growing human population and affluence, food security, hunger, poverty, malnutrition, famine - consumerism and waste products - environment and human health - role of information technology in environment and human health - disaster management - floods, earthquake, cyclone and landslide.
UNIT V - TOOLS FOR ENVIRONMENTAL MANAGEMENT


OUTCOMES:

On completion of the course students will be able to

- Be conversant to utilize resources in a sustainable manner.
- Find ways to protect the environment and play proactive roles.
- Apply the strategies to handle different wastes
- Develop and improve the standard of better living.
- Be conversant with tools of EIA and environmental legislation.

TOTAL PERIODS 45

TEXTBOOKS


REFERENCES

SEMESTER – II

MA19251- DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS  

L T P C  3 1 0 4

Common to II sem. B.E. - AERO, AUTO, CIVIL, MCT & MECHANICAL and 
B. Tech. - BIOTECH, FOOD TECH. & CHEMICAL

OBJECTIVES

- To handle practical problems arising in the field of engineering and technology using differential equations.
- To solve problems using the concept of Vectors calculus, Complex analysis, Laplace transforms.

UNIT I – SECOND AND HIGHER ORDER DIFFERENTIAL EQUATIONS  12

Second and higher order Linear differential equations with constant coefficients - Method of variation of parameters – Cauchy’s and Legendre’s linear equations - Simultaneous first order linear equations with constant coefficients.

UNIT II – PARTIAL DIFFERENTIAL EQUATIONS  12

Formation of partial differential equations - Solutions of standard types of first order partial differential equations - Lagrange’s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT III – VECTOR CALCULUS  12

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT IV- ANALYTIC FUNCTIONS  12


UNIT V- LAPLACE TRANSFORM  12

OUTCOMES

On completion of the course, students will be able to

- Apply various techniques in solving ordinary differential equations.
- Develop skills to solve different types of partial differential equations
- Use the concept of Gradient, divergence and curl to evaluate line, surface and volume integrals.
- Use the concept of Analytic functions, conformal mapping and complex integration for solving Engineering problems.
- Use Laplace transform and inverse transform techniques in solving differential equations.

TEXT BOOKS


REFERENCES


CY19141-CHEMISTRY FOR TECHNOLOGISTS

Common to I sem. B.Tech. - CHEMICAL and II sem. B.Tech. - BIO. TECH. and FOOD TECHNOLOGY

OBJECTIVES

- To acquire molecular level understanding of matter
- To understand the basics of surface chemistry and nanomaterials
- To attain knowledge on natural products and polymers

UNIT I - CHEMICAL BONDING

Types of chemical bonds - electronegativity - bond polarity and dipole moments, partial ionic character of covalent bonds - VB theory - concept of hybridization. Molecular orbital theory - LCAO - bonding in homonuclear and heteronuclear diatomic molecules. Intermolecular forces - types -
hydrogen bonding - importance of hydrogen bonding in biomolecules - van der Waals forces – consequences.

UNIT II - SURFACE CHEMISTRY AND CATALYSIS


UNIT III - NANO MATERIALS

Basics-distinction between nanoparticles and bulk materials - size-dependent properties - nanoparticles - nanocluster – nanorod - nanotube and nanowire - synthesis of nanoparticles - chemical methods -metal nanocrystals by reduction ,solvothermal synthesis, photochemical synthesis, sonochemical synthesis and chemical vapor deposition -physical methods - ball milling , electrodeposition - biogenic synthesis - properties and applications.

UNIT IV - HETEROCYCLIC COMPOUNDS AND NATURAL PRODUCTS

Heterocyclic compounds-synthesis and reactions of pyrrole -furan - thiophene- pyridine- quinoline-isoquinoline. 

Terpenoids- Isolation - Isoprene rule-structural elucidation of citral and menthol.

UNIT V - POLYMERS

Polymers-definition - polymerization - types - addition and condensation polymerization - free radical polymerization mechanism - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity - plastics - preparation - properties and uses of PVC, teflon, polycarbonate, polyurethane, nylon-6,6, PET, KEVLAR-Green polymers - Introduction -poly lactic acid (PLA)

TEXT BOOKS


REFERENCES


Syllabus for Chemistry Laboratory 30
(Any 10 experiments to be conducted)

1. Estimation of mixture of acids by conductometry
2. Estimation of copper / ferrous ions by spectrophotometry
3. Estimation of acid by pH metry.
4. Estimation of alkalinity by indicator method.
5. Estimation of chloride by argentometric method
6. Determination of total, temporary and permanent hardness by EDTA method.
7. Estimation of DO by winkler’s method
8. Estimation of sodium and potassium in water by flame photometry
9. Determination of corrosion rate on mild steel by weight loss method
11. Verification of adsorption isotherms (acetic acid on charcoal)
12. Phase change in a solid.
13. Preparation of simple drug
14. Determination of rate constant of a reaction
15. Determination of distribution coefficient
16. Preparation of Thiokol rubber.

TOTAL PERIODS 75

OUTCOMES

On completion of the course students will be able to

- Be conversant with basics of molecule formation and interactions
- Measure molecular/bulk properties like absorbance, molecular weight, DO and chloride
- Apply the knowledge of surface chemistry in practical and industrial applications
- Be familiar with structure and properties of natural products
- Be assertive on various types of polymers and their properties including green polymers

GE19141 PROGRAMMING USING C

Objectives:

- To develop simple algorithms for arithmetic and logical problems.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions , pointers and structures
- To do input/output and file handling in C

UNIT I GENERAL PROBLEM SOLVING CONCEPTS

Computer – components of a computer system-Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

UNIT II C LANGUAGE & TYPES OF OPERATOR AND EXPRESSIONS

Introduction- C Structure- syntax and constructs of ANSI C - Variable Names, Data Type and Sizes, Constants, Declarations - Arithmetic Operators, Relational Operators, Logical Operators, Type
Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.

**UNIT III I/O AND CONTROL FLOW**  
9

Standard I/O, Formatted Output – Printf, Variable-length argument lists- Formatted Input – Scanf, Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels.

**UNIT IV FUNCTIONS AND PROGRAM STRUCTURE**  
9

Basics of functions, parameter passing and returning type, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, C Preprocessor, Standard Library Functions and return types.

**UNIT V POINTERS AND ARRAYS & STRUCTURES**  
9

Pointers and addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional arrays, Strings, Initialisation of Pointer Arrays, Command line arguments, Pointers to functions, complicated declarations. Basic Structures, Structures and Functions, Array of structures, Pointer of Structures, Self-referential Structures, Table look up, Typed ef, Unions, Bit-fields, File Access -Error Handling, Line I/O, Miscellaneous Functions.

**TOTAL PERIODS: 30**

**Laboratory**

1. Algorithm and flowcharts of small problems like GCD  
2. Structured code writing with:  
   i. Small but tricky codes  
   ii. Proper parameter passing  
   iii. Command line Arguments  
   iv. Variable parameter  
   v. Pointer to functions  
   vi. User defined header  
   vii. Make file utility  
   viii. Multi file program and user defined libraries  
   ix. Interesting substring matching / searching programs  
   x. Parsing related assignments

**Platform Needed:** GCC Compiler for Windows/Linux

**Total Periods: 60**

**COURSE OUTCOMES:**

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
• To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
• To apply programming to solve simple numerical method problems.

Text Books:

Reference Books:

GE19202 BASIC CIVIL AND MECHANICAL ENGINEERING (Common to II Sem Biotech and EEE) 3 0 0 3

COURSE OBJECTIVES
• To impart basic knowledge on Civil and Mechanical Engineering.

A – CIVIL ENGINEERING
UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

UNIT II COMPONENTS AND STRUCTURES 9

B – MECHANICAL ENGINEERING
UNIT III POWER PLANT ENGINEERING 9

UNIT IV I C ENGINES 9
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 9

TOTAL: 45 PERIODS

COURSE OUTCOMES
At the end of this course students can
- Able to explain the usage of construction material and proper selection of construction materials.
- Able to design building structures.
- Identify the components used in power plants.
- Demonstrate working principles of petrol and diesel engine
- Understand and explain the components of refrigeration and air conditioning cycle.

TEXT BOOKS:

REFERENCES:

BT19201 BIOCHEMISTRY

L T P C
3 0 0 3

OBJECTIVES
The objectives of this course is to enable the students to understand
- The chemical basis of life which involves the importance of water, biological buffers and biomolecules
- The structure, properties of biomolecules involved in biochemical reactions.
- The role of enzymes in metabolism and to study their kinetics.
- Intermediary metabolic reactions and their regulation.
- Energy production from biomolecules
UNIT I  INTRODUCTION TO BIOMOLECULES


Carbohydrates: (mono, di – oligo & polysaccharides) - mutarotation, glycosidic bond - epimers, anomers and asymmetric nature of carbon - reactions of monosaccharides and reducing sugars.


UNIT II  STRUCTURE AND PROPERTIES OF PROTEINS AND NUCLEIC ACIDS


Nucleic acids: Introduction to nucleic acids - Nucleic acids as genetic material - purines pyrimidines, nucleoside and nucleotide - structure and physicochemical properties of elements in DNA and RNA - biological significance of DNA and RNA - different between DNA and RNA - primary structure of DNA - chemical and structural qualities of 3',5'-phosphor diester bond - secondary structure of DNA - Watson & Crick model - Chargaff’s rule - hyperchromic effect - nucleoprotein complexes.

UNIT III  INTRODUCTION TO ENZYMES

Introduction to metabolism - enzymes classification– structure (active site, substrate binding site) - role of coenzymes - regulation of enzyme activity (feedback, allosteric, covalent modification, proteolytic activation, synthesis and breakdown) - enzyme assays and units of expression – factors affecting enzyme activity- pH, temperature, substrate (Michaelis–Menten equation Km, Vm)) and enzyme concentration.

UNIT IV  INTERMEDIARY METABOLISM AND ITS REGULATION

Introduction to metabolism -glycolysis - gluconeogenesis - pentose phosphate shunt -β oxidation of fatty acid- TCA cycle - reactions of amino acids - deamination, transamination and decarboxylation - urea cycle - interconnection of pathways and their regulation.

UNIT V  BIOENERGETICS

Structure of mitochondria - general concept of oxidation and reduction - electronegative potential - high energy compounds - ATP/ADP cycle - electron transport chain - oxidative phosphorylation - uncouplers– inhibitors - - bioenergetics of glucose and palmitic acid oxidation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course the students will be able to
• Understand the chemical basis of life which involves the importance of water, biological buffers and biomolecules.
• Comprehend the structure and functions of biomolecules.
• Cognize the action and regulations of enzymes.
• Relate the interconnection of different metabolic pathways.
• Realize the importance of ATP and other high energy compounds.

**TEXTBOOKS:**


**REFERENCES:**


**MC19102 INDIAN CONSTITUTION AND FREEDOM MOVEMENT**

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**OBJECTIVES:**

To inculcate the values enshrined in the Indian constitution

• To create a sense of responsible and active citizenship
• To know about Constitutional and Non-Constitutional bodies
• To understand sacrifices made by the freedom fighters.

**UNITI: INTRODUCTION**

UNIT II : STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III : STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY


UNIT IV : CONSTITUTIONAL FUNCTIONS AND BODIES

Indian Federal System – Center – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.

UNIT V: INDIAN FREEDOM MOVEMENT


OUTCOMES:

Upon completion of the course, students will be able to:

- Understand the functions of the Indian government
- Understand and abide the rules of the Indian constitution.
- Gain knowledge on functions of state Government and Local bodies
- Gain Knowledge on constitution functions and role of constitutional bodies and non constitutional bodies
- Understand the sacrifices made by freedom fighters during freedom movement

TEXTBOOKS:

- Bipan Chandra, History of Modern India, Orient Black Swan, 2009
- P K Agarwal and K N Chaturvedi , Prabhat Prakashan, New Delhi, 1st ed , 2017
REFERENCES:


TOTAL: 30 PERIODS

BT19211 BIOCHEMISTRY LABORATORY L T P C
0 0 4 2

OBJECTIVES

- To learn and understand the principles behind the qualitative and quantitative estimation of biomolecules
- To perform proteins, carbohydrates, lipids and metabolites estimation
- To perform enzyme assays.

EXPERIMENTS

1. General guidelines for working in biochemistry lab. Accuracy, precision, sensitivity and specificity (theory)
2. Demonstration of proper use of volume and weight measurement devices.
3. Validation of Beer’s-Lambert Law by using KMnO₄/K₂Cr₂O₇
4. Qualitative tests for carbohydrates – distinguishing reducing from non-reducing sugars and keto from aldo sugars.
5. Quantitative estimation of amino acids using Ninhydrin-distinguishing amino from imino group.
6. Protein estimation by colorimetric and spectroscopic methods.
7. Protein estimation by Bradford method.
9. Extraction of lipids and analysis by TLC
11. Demonstration of GOD-POD assay of glucose.
12. Separation of phytochemicals using Paper/Column Chromatography
13. Extraction and assay of acid phosphatase from potato.

TOTAL HOURS: 60 HOURS

COURSE OUTCOMES:

Upon completion of the laboratory sessions, the students will be able to

1. Understand the basic principles of biochemical estimations and assays
2. Obtain practical knowledge in analysing various biomolecules both quantitatively and qualitatively
3. Gain knowledge in preparation of biomolecules
4. Acquire expertise in operation of analytical techniques
5. Learn various methods of enzyme assays needed for clinical research.

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**Objectives:**
- To introduce Fourier series and Z transforms to solve problems that arise in the field of Engineering.
- To provide procedures for solving numerically different kinds of problems occurring in the field of Engineering and Technology.

**UNIT-I**  
FOURIER SERIES

- Dirichlet’s conditions
- General Fourier series
- Odd and even functions
- Half range sine series
- Half range cosine series
- Parseval’s identity
- Harmonic analysis.

**UNIT-II**  
Z-TRANSFORMS AND DIFFERENCE EQUATIONS

- Z-transforms
- Elementray properties
- Inverse Z-transform (using partial fraction and residues)
- Convolution theorem
- Formation of difference equations
- Solution of difference equations using Z-transform.

**UNIT-III**  
SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

- Newton Raphson method
- Secant method
- Gauss Jordan method
- Iterative method of Gauss Seidel
- Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

**UNIT-IV**  
INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

- Curve fitting
- Lagrange’s interpolations
- Newton’s forward and backward difference interpolation
- Approximation of derivatives using interpolation polynomials
- Numerical integration using Trapezoidal and Simpson’s 1/3 rules.

**UNIT-V**  
NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS

- Taylor’s series method
- Modified Euler’s method
- Fourth order Runge-Kutta method for solving first order equations
- Finite difference methods for solving second order equations
- Finite difference solution of one dimensional heat equation by explicit and implicit methods
- Two dimensional Laplace equation.

**Total Contact Hours:** 60

**Course Outcomes:**
On completion of course students will be able to
- develop skills to construct Fourier series for different periodic functions and to evaluate infinite series.
- solve difference equations using Z-transforms that arise in discrete time systems.
- Solve algebraic equations and eigen value problems that arise during the study of engineering problems.
- use interpolation methods to solve problems involving numerical differentiation and integration.
- solve differential equations numerically that arise in course of solving engineering problems.

**Text Books:**

**Reference Books / Web links:**
**OBJECTIVES:**

- To inculcate knowledge on fundamentals of microorganisms and Microscopy
- To learn the structural organization, morphology and reproduction of microbes
- To acquire knowledge on basic principles of microbial culture, growth and its metabolism
- To understand the principles of sterilization technique and chemotherapeutic agents
- To enable them to know about the various applications of microbes in biotechnology

**UNIT-I INTRODUCTION TOMICROBIOLOGY**

History and Scope of microbiology, Classification and Nomenclature of microorganisms, Microscopy: Bright field, Dark field, Phase contrast, Fluorescent and Electron microscopy. Stains and Staining techniques: Simple staining, Differential staining (Gram & Acid fast), Special staining (Capsular, Flagellar& Endospore).

**UNIT-II MICROBES - STRUCTURE AND REPRODUCTION**

Structural organization and multiplication of Bacteria, General characteristics and replication of Viruses, General structure and reproduction of Fungi (Mould& Yeast), Algae and Actinomycetes. *Mycoplasma pneumoniae* and Bacteriophages.

**UNIT-III MICROBIAL NUTRITION, GROWTH AND METABOLISM**

Nutritional requirement and classification of microorganisms based on physiological factors, Culture media (defined, complex, selective, differential, and enriched), Growth: Definition, Growth curve and the mathematics of growth. Quantification of microbial growth: (Direct and Indirect methods), Microbial metabolism: aerobic and anaerobic bioenergetics

**UNIT-IV CONTROL OF MICROORGANISMS**


**UNIT-V APPLIED MICROBIOLOGY**

Application of microbial biotechnology- Biogas Production, Bioremediation, Bio fertilizers, Bio pesticides, Bioleaching, Vermicomposting, Biosensors.

**Course Outcomes:** The students will be able to

- Gain the knowledge on the principles of microscopes
- Understand and differentiate the microorganisms based on its morphology
- Formulate and design the culture media for the growth of microorganisms
- Analyze and apply the appropriate sterilization technique to control the microorganisms
- Relate and design the process of industrial biomass production using microorganisms
- Identify and address the needs in the microbial biomass production industrial
Text Book(s):

Reference Books(s) / Web links:
3. Talaron K, Talaron A, Casita, Pelczar and Reid. Foundations in Microbiology, W.C. Brown

BT19302 ENZYME TECHNOLOGY AND BIOTRANSFORMATIONS

Objectives: To enable the students
- Learn enzyme reactions and its characteristics along with the extraction, production and purification process.
- Basic knowledge concerning biotransformation reactions with the usage of enzymes.

UNIT-I INTRODUCTION TO ENZYMES

UNIT-II KINETICS OF ENZYME ACTION
Kinetics of single substrate reactions; estimation of Michaelis-Menten parameters – Multi-substrate reactions
Mechanisms and kinetics – Turnover number – Types of inhibition and models for substrate and product – Allosteric regulation of enzyme – Monod Changeux Wyman model – pH and temperature effect on enzymes

UNIT-III ENZYME IMMOBILIZATION AND BIOSENSORS
Physical and chemical techniques for enzyme immobilization – Adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding and suitable examples – Advantages and disadvantages – Design of enzyme electrodes and their application as biosensors in industry, healthcare and environment.
UNIT-IV  PURIFICATION CHARACTERIZATION AND APPLICATION OF ENZYMES  12
Isolation and purification of crude enzyme extracts from plant, animal and microbial sources – Methods of characterization of enzymes – Development of enzymatic assays. Application of enzymes in food, leather and pharmaceutical industry. Industrial applications of hyperthermophilic and psychrophilic enzymes.

UNIT-V  BIOTRANSFORMATION REACTIONS  6

Total Contact Hours  :  45

Course Outcomes:
● Students will gain knowledge on enzyme classification and enzyme reactions.
● Students will be able to understand the theoretical and practical aspects of enzyme kinetics.
● Students will be able to comprehend the immobilization process and its application in various industries
● Students will carry out enzyme isolation, purification and characterization.
● Students will be able to design biotransformation reactions and production of novel enzymes.

Text Book(s):
1 Trevor Palmer, Enzymes IInd Horwood Publishing Ltd
2 Faber K, Biotransformations in Organic Chemistry, IV edition, Springer

Reference Books(s) / Web links:
1 Harvey W. Blanch, Douglas S. Clark, Biochemical Engineering, Marcel Dekker, Inc.
2 James M. Lee, Biochemical Engineering, PHI, USA.
4 Wiseman, Enzyme Biotechnology, Ellis Horwood Pub.

BT19303  CELL BIOLOGY  Category  L  T  P  C

Objectives:
● To understand the structure and functions of cells and their organisation into tissues
● To acquire knowledge in the area of transport of ions and the mechanism of transmission of nerve impulses
● To analyse the various modes of communication between cells
● To study the types of cell division and its role in carcinogenesis
● To understand the techniques applied in cell research

UNIT-I  CELL STRUCTURE AND FUNCTION OF THE ORGANELLES  9
UNIT-II TRANSPORT ACROSS BIOLOGICAL MEMBRANES
Active, passive transport (simple diffusion, facilitated diffusion, glucose transport, anion exchanger). ATP powered pumps – Na+/K+ pumps, Ca++ pumps – significance, structure and mechanism of transport, secondary active transport, uniport, symport, antiport, exocytosis and endocytosis. Resting potential, action potential, conduction of nerve impulses, neurotransmitters. Ligand gated (acetyl choline) / voltage gated ion channels (Na+, K+, Ca++)

UNIT-III SIGNAL TRANSDUCTION
Cytoplasmic, nuclear and membrane bound receptors, examples of receptors, autocrine, paracrine and endocrine models of action, role of second messengers in cell signalling (cyclic AMP, cyclic GMP, IP3, DAG, Ca++, pathways), Ras/MAPK pathway, steroid hormone and thyroxine signalling.

UNIT-IV CELL DIVISION, APOPTOSIS AND CANCER
Mitosis, Meiosis, Cell cycle and its regulation, molecules controlling cell cycle – cyclins CDKs, CDKIs, checkpoints, cell survival and apoptosis pathways in relation to cancer.

UNIT-V TECHNIQUES USED TO STUDY CELLS

Total Contact Hours : 45

Course Outcomes: At the end of the course the students will be able to

- apply knowledge in the area of cellular organisation
- analyse the modes of transport and relate the same to function of nervous muscular systems.
- examine the methods of communication within the cells
- correlate the basic concepts of cell division and their role in carcinogenesis
- design simple methods to analyse cell and their morphology

Text Book(s):

Reference Books(s) / Web links:

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BT19304 STOICHIOMETRY AND THERMODYNAMICS

Category  L  T  P  C
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Objectives:

- To learn the fundamentals of units and conversion
- To understand the concepts in material balance for different unit operations
- To gain knowledge in the concepts of energy balance equations
- To endow the students with the thermodynamic relations and concept of partial molar properties
- To solve VLE calculations for binary system

UNIT-I INTRODUCTION 12
Dimensions – system of units - conversion factors - Compositions of mixtures and solutions - gas laws

UNIT-II CONCEPTS IN MATERIAL BALANCES 12
Material balance concept – overall & component – material balance applications for evaporator, gas absorber without reaction, Distillation (Binary system), Liquid extraction, solid-liquid extraction, crystallization, drying, mixing, Recycle and Bypass illustration. Chemical Reaction-Limiting, excess component, Fractional conversion and yield, Combustion Reactions.

UNIT-III CONCEPTS IN ENERGY BALANCES 12
Energy balance equation for open systems, closed system, sensible and latent heat calculations - Application of energy balance in Bioprocesses

UNIT-IV PROPERTIES OF FLUIDS AND SOLUTION THERMODYNAMICS 12
Scope of thermodynamics, fundamental concepts in thermodynamics, Maxwell’s relations and applications; Partial molar properties - determination of partial molar properties; Concepts of chemical potential and fugacity; ideal and non-ideal solutions; activity coefficient; Gibbs Duhem equation.

UNIT-V PHASE EQUILIBRIA 12
Criteria for phase equilibria, Activity coefficient Composition models, VLE calculations for binary and multi component systems, Bubble point, dew point calculations for VLE; consistency test for VLE data; Phase diagrams for binary solutions; Binary liquid- liquid equilibrium diagrams applications.

Total Contact Hours : 60

Course Outcomes: Upon the completion of the course, the students will be able to

- Learn the fundamentals of the units and conversions
- Solve the material balance problems for different unit operations
- Solve energy balance equations for different systems
- Apply the concepts of partial molar properties in solutions
- Determine the VLE composition for binary systems.

Text Book(s):
4 Y.V.C. Rao, Chemical Engineering Thermodynamics5, University Press (India) Ltd., Hyderabad 1997

Reference Books(s) / Web links:
Objectives:
- To impart knowledge on industrial fermentation technology
- To understand the fundamentals of upstream and downstream process in fermentation
- To design fermentation process for the production of various primary metabolites
- To learn new technology for the production of secondary metabolites
- To develop skills for bulk production of commercially and therapeutically important bioproducts

UNIT-I INTRODUCTION TO INDUSTRIAL FERMENTATION TECHNOLOGY
History and scope of Fermentation technology, Fermentor and its types, Biochemistry of Fermentation Process, Types of fermentation process- Batch, Continuous and Fed Batch, Submerged fermentation, Solid state fermentation, products from plant, animals and microorganisms.

UNIT-II UPSTREAM AND DOWNSTREAM PROCESS

UNIT-III PRODUCTION OF PRIMARY METABOLITES
Production of commercially important primary metabolites like organic acids (Citric acid and acetic acid), amino acids (Glutamic acid and Lysine), Enzymes (Amylase and Protease) and Ethyl alcohol.

UNIT-IV PRODUCTION OF SECONDARY METABOLITES
Production of commercially important secondary metabolites: Antibiotics (Penicillin, Streptomycin & Tetracycline), Vitamins (B12, B2 & C) and Biotransformation - Steroids.

UNIT-V PRODUCTION OF OTHER MODERN BIOTECHNOLOGY PRODUCTS
Food products (Cheese & SCP & Mushroom culture), Alcoholic beverages (Beer & Wine), Biopesticides, Biofertilizers, Biopreservatives (Nisin), Biopolymers (Xanthan gum & PHB), Recombinant therapeutic & diagnostic proteins (Insulin & Monoclonal antibodies).

**Total Contact Hours**: 45

**Course Outcomes**: Upon completion of the course, students will be able to:
- Gain knowledge on fundamentals of fermentation technology
- Apply appropriate techniques of upstream and downstream process for the bio product production
- Formulate and design the production process of primary metabolites
- Analyze and apply the knowledge of fermentation techniques for the production and recovery of secondary metabolites
- Design and develop the process for the production of modern biotechnology products

**Text Book(s):**

**Reference Books(s) / Web links:**

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**BT19311 MICROBIOLOGY LABORATORY**

**Category** L T P C

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**Objectives:**
- To Train students in the proper use and maintenance of the Microbiology laboratory with emphasis on observation microbes by staining techniques
To demonstrate appropriate methods to estimate the number of microorganisms in a sample
To demonstrate an understanding of environmental effects on bacterial growth
To familiarize the student on biochemical tests to identify microbes.
Provide students with a hands-on familiarity with basic research procedure and associated critical and investigative thinking skills utilizing identification of unknown microorganism from specimens.

**List of Experiments**

1. Laboratory Safety
2. Introduction to sterilization techniques
4. Culture media: Media preparation- Broth, Agar (deep, slant and plate)
5. Culture techniques: Isolation- Streak plate, Pour plate, spread plate, Slant and Stab
6. Quantification of Microbes from soil, water, and milk: Serial dilution, Pour plate, Spread plate and streak plate method

   Staining:
   - Simple Staining
   - Gram’s staining
   - Capsule Staining
   - Spore Staining

7. Motility test:- Hanging drop method
9. Growth Curve
10. Effect of pH, Temperature, UV radiation on Microbial Growth
11. Antibiotic Sensitivity test
12. Effect of Disinfectants- Phenol Coefficient test
13. Micrometry

| Total Contact Hours | 45 |

**Course Outcomes:**
- The student will be able to identify Microorganism through microscope
- The student will be able to prepare a suitable media and cultivate the microbes by different techniques.
- The student can able to isolate and identify microbial strain by staining and biochemical tests
- The students can able to find out antibiotic susceptibility and resistance prototype of pathogens.
- The student will be able to check the role of physiological factors on Microbial growth and multiplication.

**Web links for virtual lab (if any)**
**BT19312**

**BASIC BIOTECHNOLOGY LAB**

**Category**

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**Objectives:**
- To Strengthen the basic concepts in biology through practical applications.

**List of Experiments**

1. Validation of properties of water – surface tension, capillary action, solubility, viscosity, thermal conductivity.
2. Osmosis and Tonicity – Hyper, Hypo and Isotonicities – Membranes - role in maintenance of pH ionic concentration etc.
3. Extraction of DNA from plant sources – structure and importance of nucleic acids
4. Synthesis of Aspirin – Prostaglandins
5. Isolation of lycopene from tomato paste - Role of natural antioxidants in food preservation
6. Preparation of 5,10,15,20-tetra kisphenyl porphyrin
   - Determination of pKa value of 4-dinitrophenol by using absorption spectrometer – special reference to importance of pH, biological buffers, Henderson – Hassel Baulch equation etc.
9. Hydrolysis of sucrose – concept of optical activity, inversion, mutarotation etc. and applications in industry.
11. Staining for different stages of mitosis in AlliumCepa (Onion) – Mitosis, Meiosis and their significance

**Total Contact Hours** : 45
### IV SEMESTER

**MA19453**  
**PROBABILITY AND STATISTICS**  
Common to IV sem. B.Tech. Biotechnology and Food Technology

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**Objectives:**
- To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.
- To provide the required skill to apply the statistical tools in Engineering problems.

**UNIT-I**  
**ONE – DIMENSIONAL RANDOM VARIABLE**  
12

Discrete and continuous random variables – Moments – Moment generating function – Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions.

**UNIT-II**  
**TWO - DIMENSIONAL RANDOM VARIABLES**  
12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Applications of Central Limit Theorem.

**UNIT-III**  
**TESTING OF HYPOTHESIS**  
12

Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, F and Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit.

**UNIT-IV**  
**DESIGN OF EXPERIMENTS**  
12

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

**UNIT-V**  
**STATISTICAL QUALITY CONTROL**  
12

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

**Total Contact Hours** : 60

**Course Outcomes:**
On completion of course students will be able to
- characterize standard probability distribution by employing basic techniques and methods of probability mass function and probability density function for discrete and continuous random variables.
- develop skills to solve problems on correlation and regression.
- obtain statistical data from experiments and able to analyze the same using statistical test.
- design experiments using suitable ANOVA techniques and draw conclusions.
- use control charts to study, analyze and interpret problems in statistical quality control.

**Text Books:**
**BT19401 ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY**

**Category**

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**Objectives:**
- To gain knowledge on the principles of spectrometry and optical instruments.
- To learn the theoretical and practical aspects of molecular spectroscopy.
- To identify the suitable structure elucidation and interaction techniques.
- To know different separation methods used in Biotechnology.
- To understand various advanced analytical techniques.

**UNIT-I INTRODUCTION TO SPECTROMETRY**


**UNIT-II SPECTROSCOPIC TECHNIQUES - I**


**UNIT-III SPECTROSCOPIC TECHNIQUES - II**


**UNIT-IV SEPARATION TECHNIQUES**


**UNIT-V ADVANCED ANALYTICAL TECHNIQUES**


Total Contact Hours: 45

**Course Outcomes:** At the end of the course the students will be able to
- demonstrate the principle of spectrometry and the optical instruments
- assess the theoretical and practical aspects of molecular spectroscopy.
- detect appropriate techniques for structure elucidation and interactions.

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**Department of BIOTECHNOLOGY, REC**

Curriculum and Syllabus | B.Tech. Biotechnology | R2019  |
---|---|---|---
Page 43
Comprehend various separation techniques in biotechnology.

apply different techniques to analyse the properties of the samples

Text Book(s):

Reference Books(s) / Web links:
4. https://youtu.be/LLPMxBB9hRw
5. https://youtu.be/2oPUyIbPxLo (Knowbee)

Objectives:
- To impart knowledge about the fluid statics and dynamics
- To endow the students with types of valves and pumps used in industries
- To study the mechanism of heat transfer by conduction
- To inculcate the heat flow mechanism by convection
- To design heat exchange equipments

UNIT-I  FLUID PROPERTIES & FLUID MECHANICS  9

UNIT-II  FLOW OF FLUID THROUGH PACKINGS  9

UNIT-III  CONDUCTION HEAT TRANSFER  9
Steady state conduction; combined resistances; unsteady state conduction; lumped heat capacity; extended surfaces; combined conduction and convection.

UNIT-IV CONVECTION HEAT TRANSFER
Dimensional analysis; forced and natural convection; convection in flow over surfaces through pipes; boiling and condensation.

UNIT-V HEAT EXCHANGERS
Heat exchanger- overall heat transfer coefficients; design of heat exchangers; NTU concept; Evaporators-single effect- mass and enthalpy balances.

Total Contact Hours : 45

Text Book(s):

Course Outcomes: Upon the completion of the course, Students will be able to
- Solve the problems related to fluid flow
- Select various valves and pumps for its application in industries
- Resolve problems for heat flow by conduction for various geometries
- Elucidate the convective heat transfer problems
- Design heat exchanger equipments

Reference Books(s) / Web links:
- Gain knowledge about the microorganisms, which spoil food and cause food borne diseases.
- Familiarise different techniques used for the preservation of foods.

**UNIT-I FOOD AND NUTRIENTS**  
Constiuents of food – carbohydrates, lipids, proteins, water, vitamins and minerals, dietary sources, role and functional properties in food, contribution to organoleptic and textural characteristics.

**UNIT-II FOOD ADDITIVES**  
Classification, intentional and non-intentional additives, functional role in food processing and preservation; food colourants – natural and artificial; food flavours; enzymes as food processing aids, food adulterants and their detection, Introduction to food safety and security.

**UNIT-III MICROORGANISMS ASSOCIATED WITH FOOD**  
Bacteria, yeasts and molds – sources, types and species of importance in food processing and preservation; fermented foods and food chemicals- Dairy products, Fruits and vegetable products and single cell protein

**UNIT-IV FOOD SPOILAGE AND FOOD BORNE DISEASES**  
Food spoilage and its types, Factors responsible for spoilage, spoilage of vegetables, fruits, meat, poultry, beverage and other food products. Classification of food borne disease-Infections –bacterial and other types; Food intoxications and poisonings – bacterial and non-bacterial

**UNIT-V FOOD PROCESSING AND FOOD PRESERVATION**  
Principles of food preservation, Preservation by high temperature- sterilization, pasteurization and blanching, thermal death curves of microorganisms, canning; Preservation by low temperature- frozen storage, freezing characteristics of foods, microbial activity at low temperatures, factors affecting quality of foods in frozen storage; Irradiation method of foods. Preservation, Food packing.

**Total Contact Hours :** 45

**Course Outcomes:*** Through this subject the student will be able to:
- Describe the fundamentals of food processing and preservation
- Familiar with the functional properties of Carbohydrates, fats, lipids, proteins in food
- Knowledge about the importance of food additives and their function and will develop strategies that will promote food safety and prevent food borne illness
- Analyze the uses of enzymes, modified proteins and develop novel products, explain, analyze and evaluate scenarios related to various unit operations in food processing and preservation
- Identify spoilage and deterioration mechanism in food and methods to control deterioration and spoilage

**Text Book(s):**

**Reference Books(s) / Web links:**
GE19304 FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS

Category L T P C
HS 3 0 0 3

Objectives:
To expose the students to the basic concepts of management in order to aid in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today’s business firms.

UNIT-I INTRODUCTION TO MANAGEMENT

UNIT-II PLANNING AND DECISION MAKING

UNIT-III ORGANIZATION AND hRM

UNIT-IV LEADING AND MOTIVATION
Leadership, Power and Authority, Leadership Styles, Leadership Skills, Leader as Mentor and Coach, Team Leadership. Motivation – Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories – Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT-V CONTROLLING

Total Contact Hours : 45

Course Outcomes:
- Understand and apply the basic principles of management.
- Understand and apply the planning, organizing and control processes,
- Will be able to understand and design organization as well as manage and develop human resource.
- Understand various theories related to the development of leadership skills, motivation techniques and team work
- Will be able to understand and apply controlling practices in all applications.

Text Book (s):

Reference Books(s) / Web links:
Objectives:
This course aims at imparting basic principles of thought process, reasoning and inference. Sustainability is the core of Indian traditional knowledge system connecting society and nature. Holistic life style of yogic science and wisdom are important in modern society with rapid technological advancements and societal disruptions. The course mainly focuses on introduction to Indian knowledge system, Indian perspective of modern science, basic principles of Yoga and holistic healthcare system, Indian philosophical, linguistic and artistic traditions.

UNIT-I Introduction To Indian Knowledge System: 9


UNIT-III Indian Philosophical Tradition: Sarvadharshan/Sadhdharshan – Six systems (dharshans) of Indian philosophy - Nyaya, Vaioshesika, Sankhya, Yoga, Vedanta-Other systems- Chavarka, Jain (Jainism), Boudh (Buddhism) – Case Studies.


UNIT-V Indian Artistic Tradition: Introduction to traditional Indian art forms – Chitrakala (Painting), Murthikala / Shilpakala (Sculptures), Vaasthukala, Sthaapathyaka kala (Architecture), Sangeeth (Music), Nruthya (Dance) and Sahithya (Literature) – Case Studies.

Total Contact Hours : 45

Course Outcomes: On completion of the course students will be able to

- Understand basic structure of the Indian Knowledge System
- Apply the basic knowledge of modern science and Indian knowledge system in practise
- Understand the importance Indian Philosophical tradition
- Appreciate the Indian Linguistic Tradition.
- Understand the concepts of traditional Indian art forms

Text Book(s):
Reference Books(s) / Web links:
2. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.

**BT19411 CHEMICAL ENGINEERING LABORATORY**

**Category** | **L** | **T** | **P** | **C**
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**Objectives:**

- To conduct experiments using flow measuring devices
- To perform characteristic studies on centrifugal pumps
- To carryout experiments on separation processes
- To perform mass transfer studies on diffusion of binary mixtures
- To study the effect of operating variables of heat exchanger

**List of Experiments**

1. Flow measurement a) Orifice meter b)Venturimeter c) Rotameter
2. Pressure drop- flow in pipes
3. Fluidisation
4. Characteristics of centrifugal pump
5. Filtration- leaf filter
6. Shell and tube heat exchanger
7. Simple and steam distillation
8. HETP in packed distillation
9. Liquid-liquid extraction
10. Adsorption isotherms
11. Diffusion
12. Leaching

**Total Contact Hours** : 45
Course Outcomes: Upon the completion of the course, the students will be able to

- Operate different flow meters
- Work on pumps
- Carry out experiments on unit operations like distillation, extraction and adsorption
- Estimate the rate of mass transfer in diffusion
- Identify and solve the problems on heat exchangers

Text Book(s):

Reference Books(s) / Web links:

Objectives:
- This lab should enable the students to apply the theoretical concepts in food processing and preservation, design innovative processing techniques and develop new food products.

List of Experiments
1. Detection of adulteration in food samples- milk and milk products, oils and fats, spices and condiments, honey, cereals, pulses, sugar and confectionary, MSG and other food products.
   Preservation techniques:
   a. Preservation of milk by various chemical and natural preservatives
   b. Antimicrobial activity of honey
   c. Antimicrobial activity of turmeric

2. Food processing:
   a. Effect of microwave radiation on processed food samples
   b. Determination of SO2 in food samples
   c. Determination of Fe2+ in food by 2,2 Bipyridyl and colorimetric method
d. Determination of lead content in food samples  
e. Separation and identification of food colors by chromatography  
f. Shelf life analysis of processed food  

Food packaging:  
a. Edible packaging materials  

Nutritional analysis of food  
a. Fat content and Peroxidase value  
b. Dietary fibres  
c. Protein estimation by Kjeldhal method  
d. Brix value measurement of sugar by refractive index  
e. Vitamin C analysis  

6 Instant and innovative food products development - jams, jellies, squashes and other confectionaries.  

Total Contact Hours : 45  

Course Outcomes: At the end of the course the student will be able to:  
- Analyse and design methods to detect the composition and quality of various food products  
- Acquire skills in processing and preservation of perishable and non perishable foods  
- Analyse methods used to identify, control and destroy microorganisms commonly found in food  
- Understand the role of beneficial microorganisms in food processing and preservation  
- Create biodegradable and edible food packaging materials  
- Develop instant and innovative food products  

Text Book(s):  

Reference Books(s) / Web links:  

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