Program Educational Objectives:

Bachelor of Food Technology curriculum is designed to prepare the graduates having attitude and knowledge to

1. Have successful professional and technical career.
2. Have strong foundation in basic sciences, mathematics and computational platforms
3. Have knowledge on the theory and practices in the field of Food Technology and allied areas.
4. Practice and inspire high ethical values and technical standards

Program Outcome:
1. Knowledge gaining from the subject that will facilitate to start own company. (Entrepreneur)
2. Ability to apply knowledge of mathematics, sciences and engineering
3. Ability to develop new Food products.
4. Ability to design an industry
5. Ability to understand ethical and professional responsibilities
6. Ability to review, comprehend and report technological development

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# ANNA UNIVERSITY, CHENNAI
## UNIVERSITY DEPARTMENTS
### B. TECH. FOOD TECHNOLOGY
#### REGULATIONS – 2015
##### CHOICE BASED CREDIT SYSTEM
###### CURRICULA AND SYLLABI I - VIII SEMESTERS

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# HUMANITIES AND SOCIAL SCIENCES (HS)

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# ENGINEERING SCIENCES (ES)

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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
- To develop the four language skills – Listening, Speaking, Reading and Writing.
- To improve the students’ communicative competence in English.
- To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF  12
Listening – Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/ friend; Reading – Skimming a passage– Scanning for specific information; Writing – Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.); Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs; Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS  12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description( non-technical)- Grammar – Tense (simple past& past continuous) - Use of imperatives – Subject – verb agreement – Active and passive voice; - Vocabulary – Compound words – Word formation – Word expansion (root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL  12
Listening - Listening to lectures/ talks and completing a task; Speaking – Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing - Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/narrative); Grammar – Tenses (perfect), Conditional clauses –Modal verbs; Vocabulary – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING  12
Listening- Watching videos/ documentaries and responding to questions based on them; Speaking– Informal and formal conversation; Reading –Critical reading (prediction & inference); Writing– Essay writing (compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS  12
Listening- Listening to programmes/broadcast/ telecast/ podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading – Extensive reading; Writing- Poster making – Letter writing (Formal and E-mail) ; Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary – Collocation.
TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%
TOTAL:60 PERIODS

LEARNING OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book & Workbook) Cambridge University Press, New Delhi: 2005

MA7151 MATHEMATICS – I
(L T P C)
4 0 0 4
(Common to all branches of B.E / B.Tech. Programmes in I Semester)

COURSE OBJECTIVES
- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I DIFFERENTIAL CALCULUS
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

13

UNIT III INTEGRAL CALCULUS 12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

UNIT V DIFFERENTIAL EQUATIONS 12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL : 60 PERIODS

COURSE OUTCOMES
- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE:
- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL AND MODERN PHYSICS  9

UNIT IV  APPLIED OPTICS  9
UNIT V CRYSTAL PHYSICS

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS

OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:

CY7151 ENGINEERING CHEMISTRY

COURSE OBJECTIVES
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS
Adsorption-Types of adsorption-adsorption of gases on solids- adsorption from solutions.

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY
9

UNIT IV CHEMICAL THERMODYNAMICS
9
Second law: Entropy—entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius Clapeyron equation; Maxwell relations—Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation—variation of chemical potential with temperature and pressure.

UNIT V NANO CHEMISTRY
9
Basics—distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles—sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS

COURSE OUTCOMES
• Will be familiar with polymer chemistry, surface chemistry and catalysis.
• Will know the photochemistry, spectroscopy and chemical thermodynamics.
• Will know the fundamentals of nano chemistry.

TEXT BOOKS

REFERENCE BOOKS

GE7151 COMPUTING TECHNIQUES L T P C
(Common to all branches of Engineering and Technology) 3 0 0 3
OBJECTIVES:
• To learn programming using a structured programming language.
• To provide C programming exposure.
• To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I  INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II  C PROGRAMMING BASICS

UNIT III  ARRAYS AND STRINGS

UNIT IV  POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V  FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL: 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
• Write C program for simple applications
• Formulate algorithm for simple problems
• Analyze different data types and arrays
• Perform simple search and sort.
• Use programming language to solve problems.

TEXTBOOKS:

REFERENCES:
OBJECTIVES
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and 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.

UNIT I  PLANE CURVES AND FREE HANDSKETCHING 14

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES 14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS 14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14
Sectioning of 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. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS 15
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3
Introduction to drafting packages and demonstration of their use.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
• Perform free hand sketching of basic geometrical shapes and multiple views of objects.
• Draw orthographic projections of lines, Planes and Solids
● Obtain development of surfaces.
● Prepare isometric and perspective views of simple solids.

TEXT BOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
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 solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

BS7161 BASIC SCIENCES LABORATORY L T P C 0 0 4 2
(Common to all branches of B.E. / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:
● To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
● To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of liquids.
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young’s modulus
3. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box -Determination of Band gap of a semiconductor.
13. Viscosity of liquids - Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS

OUTCOME:
Upon completion of the course, the students will be able
• To determine various moduli of elasticity and also various thermal and optical properties of materials.
• To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:
(Minimum of 8 experiments to be conducted)

1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phena nthroline/thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

TEXTBOOKS

GE7162 ENGINEERING PRACTICES LABORATORY (Common to all Branches of B.E. / B.Tech. Programmes) 0 0 4 2

COURSE OBJECTIVES
• To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES
   PLUMBING
   • Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
   • Laying pipe connection to the suction side of a pump.
   • Laying pipe connection to the delivery side of a pump.
   • Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
• Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY
• Study of joints in door panels and wooden furniture
• Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICES
• Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
• Stair case light wiring
• Tube – light wiring
• Preparation of wiring diagrams for a given situation.
  Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES
   WELDING
   • Arc welding of Butt Joints, Lap Joints, and Tee Joints
   • Gas welding Practice.
   • Basic Machining - Simple turning, drilling and tapping operations.
   • Study and assembling of the following:
     a. Centrifugal pump
     b. Mixie
     c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES
• Soldering simple electronic circuits and checking continuity.
• Assembling electronic components on a small PCB and Testing.
• Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL : 60 PERIODS

COURSE OUTCOMES
• Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
• Ability to use welding equipments to join the structures
• Ability to do wiring for electrical connections and to fabricate electronics circuits.

HS7251  TECHNICAL ENGLISH  L T P C  4 0 0 4

OBJECTIVES
• To enable students acquire proficiency in technical communication.
• To enhance their reading and writing skills in a technical context.
• To teach various language learning strategies needed in a professional environment.

CONTENTS
UNIT I  ANALYTICAL READING  12
Listening- Listening to informal and formal conversations; Speaking – Conversation Skills(opening, turn taking, closing )-explaining how something works-describing technical functions and applications;Reading –Analytical reading, Deductive and inductive reasoning; Writing- vision statement-structuring paragraphs.

UNIT II  SUMMARISING  12
Listening- Listening to lectures/ talks on Science & Technology;Speaking –Summarizing/ Oral Reporting, Reading – Reading Scientific and Technical articles; Writing- Extended definition – Lab Reports – Summary writing.

UNIT III  DESCRIBING VISUAL MATERIAL  12
Listening - Listening to a panel discussion; Speaking – Speaking at formal situations; Reading –Reading journal articles - Speed reading;Writing-data commentary-describing visual material-writing problem-process- solution-the structure of problem-solution texts- writing critiques

UNIT IV  WRITING/ E-MAILING THE JOB APPLICATION  12
Listening- Listening to/ Viewing model interviews; Speaking –Speaking at different types of interviews – Role play practice ( mock interview); Reading – Reading job advertisements and profile of the company concerned;Writing- job application – cover letter –Résumé preparation.

UNIT V  REPORT WRITING  12
Listening- Viewing a model group discussion;Speaking –Participating in a discussion - Presentation;Reading – Case study - analyse -evaluate – arrive at a solution;Writing– Recommendations- Types of reports (feasibility report)- designing and reporting surveys- – Report format.- writing discursive essays.

TEACHING METHODS:
Practice writing
Conduct model and mock interview and group discussion.
Use of audio – visual aids to facilitate understanding of various forms of technical communication.
Interactive sessions.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

LEARNING OUTCOMES

TOTAL:60 PERIODS
Students will learn the structure and organization of various forms of technical communication.
Students will be able to listen and respond to technical content.
Students will be able to use different forms of communication in their respective fields.

TEXTBOOK:

REFERENCES:

MA7251 MATHEMATICS – II

(4 0 0 4)

(Common to all branches of B.E. / B.Tech. Programmes in II Semester)

COURSE OBJECTIVES
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I MATRICES

12


UNIT II VECTOR CALCULUS

12

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION

12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, $az$, $\frac{1}{z}$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

UNIT V LAPLACE TRANSFORMS 12

TOTAL: 60 PERIODS

COURSE OUTCOMES
Upon successful completion of the course, students should be able to:
- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE:
- To make the students understand the basics of phase diagrams and various materials preparation techniques
- To equip the students with a knowledge on different types of electron theory, basics of quantum mechanics and about superconductors
- To introduce the physics of semiconducting materials and applications of semiconductors in device fabrication
- To introduce the students with the theory and applications of magnetic and dielectric materials
- To provide the students a sound platform towards learning about advanced materials and their applications.

UNIT I
PREPARATION OF MATERIALS

UNIT II
ELECTRICAL AND SUPERCONDUCTING MATERIALS
Classical free electron theory - expression for electrical conductivity - thermal conductivity, - Wiedemann-Franz law - Quantum free electron theory - applications of Schrodinger wave equation: particle in a finite potential well - particle in a three-dimensional box - degenerate states - Fermi-Dirac statistics - density of energy states - electron in periodic potential - electron effective mass - concept of hole. Superconducting phenomena, properties of superconductors - Meissner effect and isotope effect. Type I and Type II superconductors, High T$_c$ superconductors - Magnetic levitation and SQUIDS.

UNIT III
SEMICONDUCTING MATERIALS
Elemental Semiconductors - Compound semiconductors - Origin of band gap in solids (qualitative) - carrier concentration in metals - carrier concentration in an intrinsic semiconductor (derivation) - Fermi level - variation of Fermi level with temperature - electrical conductivity - band gap determination - carrier concentration in n-type and p-type semiconductors (derivation) - variation of Fermi level with temperature and impurity concentration - Hall effect - determination of Hall coefficient - LED - Solar cells.

UNIT IV
DIELECTRIC AND MAGNETIC MATERIALS

UNIT V
NEW MATERIALS AND APPLICATIONS
OUTCOME:
On completion of the course, the students will be able to
- acquire knowledge of phase diagram, and thin film and nanomaterial preparation
techniques
- familiarize with conducting materials, basic quantum mechanics, and properties and
applications of superconductors.
- gain knowledge on semiconducting materials based on energy level diagrams, its types,
temperature effect. Also, fabrication methods for semiconductor devices will be
understood.
- realize with theories and applications of dielectric and ferromagnetic materials
- familiarize with ceramics, composites, metallic glasses, shape memory alloys,
biomaterials and their important applications.

REFERENCES:

IB7252 MICROBIOLOGY

AIM
To introduce students to the principles of Microbiology , to emphasize the structure and
biochemical aspects of various microbes.

OBJECTIVE
• To provide to the students the fundamentals of Microbiology , the scope of microbiology and
solve the problems in microbial infection and their control.

UNIT I INTRODUCTION TO MICROBIOLOGY
History (scientists and discoveries) and scope of microbiology (Primary and secondary
metabolites), classification and nomenclature of microorganisms, microscopic examination of
microorganisms: light, fluorescent, dark field, phase contrast, and electron microscopy. Stains
and staining techniques – Definition of auxochrome, chromophores, dyes, Classification of
stains, Theories of staining, Mechanism of gram staining, acid fast staining, negative staining,
capsule staining, flagella staining, endospore staining.

UNIT II MICROBES- STRUCTURE AND REPRODUCTION
Structural organization and multiplication of bacteria, viruses (TMV, Hepatitis B), algae
(cyanophyta, rhodophyta) and fungi (Neurospora), life history of actinomycetes (Streptomyces),
yeast (Saccharomyces), mycoplasma (M. pneumoniae) and bacteriophages ( T4 phage, λ
phage)

UNIT III MICROBIAL NUTRITION, GROWTH AND METABOLISM
Nutritional classification of microorganisms based on carbon, energy and electron sources
Definition of growth, balanced and unbalanced growth, growth curve and different methods to
quantify bacterial growth: counting chamber, viable count method, counting without equipment,
different media used for bacterial culture (defined, complex, selective, differential, enriched), the
mathematics of growth-generation time, specific growth rate.
UNIT IV  CONTROL OF MICROORGANISMS
Physical and chemical control of microorganisms  Definition of sterilization, dry and moist heat, pasteurization, tyndalization; radiation, ultrasonication, filtration. Disinfection sanization, antiseptics sterilants and fumigation. Determination of phenol coefficient of disinfectant. Host-microbe interactions; anti-bacterial, anti-fungal and anti-viral agents; mode of action and resistance to antibiotics; clinically important microorganisms

UNIT V  INDUSTRIAL MICROBIOLOGY AND MICROBIAL ECOLOGY
Microbes involved in preservation (Lactobacillus, bacteriocins), spoilage of food and food borne pathogens (E.coli, S.aureus, Bacillus, Clostridium). Industrial use of microbes (production of penicillin, alcohol, vitamin B-12); biogas; bioremediation(oil spillage leaching of ores by microorganisms ,pollution control); biofertilizers, biopesticides. Biosensors.

TOTAL: 45 PERIODS

TEXT BOOKS

GE7153  ENGINEERING MECHANICS

OBJECTIVE:
The objective of this course is to inculcate in the student the ability to analyze any problem in a simple and logical manner and to predict the physical phenomena and thus lay the foundation for engineering applications.

UNIT I  STATICS OF PARTICLES

UNIT II  EQUILIBRIUM OF RIGID BODIES

UNIT III  DISTRIBUTED FORCES
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration , Theorems of Pappus-Guldinus, Distributed Loads on Beams, Center of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies , Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration , Polar Moment of Inertia , Radius of Gyration of an Area , Parallel-Axis Theorem.
Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV  FRICTION  

UNIT V  DYNAMICS OF PARTICLES  

OUTCOMES:
- Upon completion of this course, students will be able to construct meaningful mathematical models of physical problems and solve them.

TEXT BOOK

REFERENCES

IB7251  BIOCHEMISTRY  
L T P C 3 0 0 3

AIM
To enable students learn the fundamentals of Biochemical Processes and Biomolecules.

OBJECTIVES
- To ensure students have a strong foundation in the structure and reactions of Biomolecules.
- To introduce them to metabolic pathways of the major biomolecules and relevance to clinical conditions.
- To correlate Biochemical processes with Biotechnology applications.

UNIT I  INTRODUCTION TO BIOMOLECULES
Basic principles of organic chemistry, role of carbon, types of functional groups, biomolecules.
chemical nature of water, pH and biological buffers.

**UNIT II  STRUCTURE AND PROPERTIES OF IMPORTANT BIOMOLECULES**


**UNIT III  METABOLISM CONCEPTS**


**UNIT IV  INTERMEDIARY METABOLISM AND REGULATION**

Glycolysis, TCA cycle, gluconeogenesis, pentose phosphate shunt, glyoxalate shunt, fatty acid synthesis and oxidation, reactions of amino acids, deamination, transamination and decarboxylation, urea cycle. Bioenergetics - High energy compounds, electronegative potential of compounds, respiratory chain, ATP cycle, calculation of ATP yield during oxidation of glucose and fatty acids.

**UNIT V  CASE STUDIES**

Case study on overproduction of primary and secondary metabolites - glutamic acid, threonine, lysine, methionine, isoleucine, propionic acid and ethanol.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**


**REFERENCES**

Experiments
1. Introduction, Laboratory Safety, Use of Equipment; Sterilization Techniques
2. Culture Media-Types and Use; Preparation of Nutrient broth and agar
3. Culture Techniques, Isolation and Preservation of Cultures- Broth: flask, test tubes; Solid:Pour plates, streak plates, slants, stabs
5. Microscopic Methods in the Study of Microorganisms., Microscopic identification of yeast/mould
6. Staining Techniques Simple, Differential- Gram’s Staining, spore /capsule staining
7. Quantification of Microbes: Sampling and Serial Dilution; Bacterial count in Soil – TVC
8. Effect of Disinfectants- Phenol Coefficient
9. Antibiotic Sensitivity Assay
10. Growth Curve in Bacteria and Yeast
11. Effect of pH, Temperature, UV radiation on Growth Bacteria

TOTAL : 60 PERIODS

Equipment Needed for 20 Students
Autoclave 1
Hot Air Oven 1
Incubators 2
Light Microscopes 4
Incubator Shaker 1
Colorimeter 2
Lamina Flow Chamber 2
Glassware, Chemicals, Media as required

TEXT BOOKS

AIM
To learn and understand the principles behind the qualitative and quantitative estimation of biomolecules (proteins, carbohydrates, lipids, metabolites etc.,) and laboratory analysis of the same in the body fluids.

EXPERIMENTS
1. General guidelines for working in biochemistry lab (theory)
2. Units of volume, weight, density and concentration measurements and their range in biological measurements. Demonstration of proper use of volume and weight measurement devices.
3. Accuracy, precision, sensitivity and specificity (theory)
4. Preparation of buffer –titration of a weak acid and a weak base.
5. Qualitative tests for carbohydrates – distinguishing reducing from non-reducing sugars and keto from aldo sugars.
7. Protein estimation by Biuret and Lowry’s methods.
8. Protein estimation by Bradford and spectroscopic methods.
9. Extraction of lipids and analysis by TLC.
10. Estimation of nucleic acids by absorbance at 260 nm and hyperchromic effect (demo).

Equipment Needed for 20 Students

- Autocalve
- Hot Air Oven
- Incubators
- Light Microscopes
- Incubator Shaker
- Colorimeter
- Laminar Flow Chamber
- Glassware, Chemicals, Media as required

TOTAL: 60 PERIODS

TEXT BOOKS
1. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
2. Introduction of Practical Biochemistry by David T. Phummer. (II Edition)

REFERENCES

MA7358 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

OUTCOMES:
The students can able to solve the partial differential equations, find the Fourier series analysis and solve the problems by using Fourier transform and Z transform techniques.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS
UNIT II  
FOURIER SERIES  12
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III  
APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION  12
Method of separation of variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV  
FOURIER TRANSFORM  12

UNIT V  
Z – TRANSFORM AND DIFFERENCE EQUATIONS  12

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:

FT7304  FOOD PROCESS CALCULATIONS  L T P C
4 0 0 4

OBJECTIVES:
To introduce students to basic principles of stoichiometry and its calculations.

UNIT I  9+3
Units and Dimensions: Basic and derived units, use of model units in calculations, Methods of expression, compositions of mixture and solutions. Ideal and real gas laws – Gas constant - calculations of pressure, volume and temperature using ideal gas law.

UNIT II  9+3
Fundamental Calculations and Humidity: Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity - Use of humidity in condensation and drying - Humidity chart, dew point.

UNIT III 9+3
Basic Principles of Stoichiometry - Importance of material balance and energy balance in a process Industry-Dimensions, Units, conversion factors and their use –Data sources, Humidity and applications. Material Balance: Stoichiometric principles, Application of material balance to unit operations like distillation, evaporation, crystallization, drying, extraction, Leaching.

UNIT IV 9+3

UNIT V 9+3
Enthalpy Changes: Standard heat of reaction, heats of formation, combustion, solution, mixing etc., calculation of standard heat of reaction - Effect of pressure and temperature on heat of reaction - Energy balance for systems without chemical reaction.

TOTAL: 60 PERIODS
(Use of Psychometric chart is permitted in the examination)

OUTCOMES:
To make them understand different types of laws of chemistry of materials and also prepare the students to accurately calculate the stoichiometric relations between the materials involved in the unit operation process

TEXT BOOKS

REFERENCES

FT7303 FOOD MICROBIOLOGY L T P C 3 0 0 3

OBJECTIVES:
• The course aims to develop the knowledge of students in the basic area of Food Microbiology.
• This is necessary for effective understanding of food processing and technology subjects as well as food safety.
• This course will enable students to appreciate the role of microbes in food spoilage, preservation of foods and food borne infections.

UNIT I ROLE OF MICROBES IN SPOILAGE OF FOODS 9
Factors affecting spoilage of foods, Microbial flora associated with various food groups their spoilage potential. Microbiological spoilage problems associated with typical food products.

UNIT II CONTROL OF MICROBES IN FOODS 9
Use of antimicrobial chemicals- organic acids, sugars, sodium chloride, nitrites, phosphates, sulphites, benzoates, sorbates / propionates naturally occurring antimicrobials; physical methods- low and high temperatures, drying, radiation and high pressure; tolerance of microbes to chemical and physical methods in various foods.

UNIT III MICROBES IN FOOD FERMENTATIONS  9
Microbes of importance in food fermentations, – homo & hetero-fermentative bacteria, yeasts & fungi; biochemistry of fermentations – pathways involved, lactic acid bacteria fermentation and starter cultures, alcoholic fermentations -yeast fermentations - characteristics and strain selection, fungal fermentations. microbes associated with typical food fermentations- yoghurt, cheese, fermented milks, breads, idli, soy products, fermented vegetables and meats.

UNIT IV MICROBIAL AGENTS OF FOOD BORNE ILLNESS  9
Food borne infections and food poisoning, microbial toxins, Gram Negative and Gram positive food borne pathogens; toxigenic algae and fungi; Food borne viruses; helminths, nematodes and protozoa.

UNIT V MICROBIAL EXAMINATION OF FOODS  9
Detection & Enumeration of microbes in foods; Indicator organisms and microbiological criteria; Rapid and automated microbial methods - development and impact on the detection of food borne pathogens; Applications of immunological, techniques to food industry; Detection methods for E. coli, Staphylococci, Yersinia, Campylobacter, B. cereus, Cl. botulimum & Salmonella, Listeria monocytogenes Norwalk virus, Rotavirus, Hepatitis A virus from food samples.

TOTAL : 45 PERIODS

OUTCOME:
On completion of the course the students are expected to
• Be able to understand and identify the various microbes associated with foods and food groups.
• Be able to understand and identify the role of these microbes in food spoilage, food preservation.
• Understand the role of pathogens in food borne infections. • Understand the methods used to detect pathogens in foods.

TEXT BOOKS

REFERENCES
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  AN OVERVIEW OF NUTRITION
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; Digestion, Absorption and Transport: Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption of nutrients.

UNIT II  CARBOHYDRATES
Simple Sugars: mono and disaccharides, Properties, Caramelization, Maillard reaction; Sugar alcohols; Oligosaccharides: structure, nomenclature, occurrence, uses in foods. Polysaccharides: Starch - Structure, Properties, Functional role in food system, Modified starches, Resistant starch, Starch hydrolysates, Applications in food industry. Non-starch polysaccharides: Pectins, Gums & Hydrocolloid, Fiber - Cellulose & hemicellulose; Food sources, functional role and uses in foods. Digestion and absorption of carbohydrates, lactose intolerance; Glycemic and Non-glycemic carbohydrates, blood glucose regulation, 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

UNIT III  PROTEINS & LIPIDS
Review of protein structure & conformation; Properties & reactions of proteins in food systems: Dissociation, optical activity, solubility, hydration, swelling, foam formation & stabilization, gel formation, emulsifying effect, thickening & binding, amino acids in Maillard reaction, denaturation; Food enzymes; Texturized proteins; Food sources, functional role and uses in foods. Review of structure, composition & nomenclature of fats. Non-glyceride components in fats & oils; Properties of fats & oils: crystal formation, polymorphism, melting points, plasticity, 44 isomerisation, unsaturation; Modification of fats: hydrogenation - cis and trans isomers, interesterification, acetylation, winterization; Hydrolytic rancidity & oxidative rancidity; Radiolysis Shortening power of fats, tenderization, emulsification, frying - smoke point, auto oxidation, polymerization; Fat replacements; Food sources, functional role and uses in foods. Lipid digestion, absorption and transport; Functions of the triglycerides; essential fatty acids - n-3 and n-6 fatty acids; trans fatty acids, Medium Chain Triglycerides, phospholipids and sterols; Health effects and recommended intakes of lipids. Digestion and absorption of proteins; Functions of proteins; amino acids, Recommended intakes of proteins, Deficiency - short term and long term effects.

UNIT IV  WATER AND MICRONUTRIENTS
Chemistry, physical properties, free, bound & entrapped water, water activity. Drinking water, mineral water, water hardness, water quality for food processing, Mineral & vitamin content of foods - Food and Pharmaceutical grades; Recommended daily intake, toxicities, deficiencies, factors affecting bioavailability, Stability under food processing conditions.

UNIT V  METABOLISM, ENERGY BALANCE AND BODY COMPOSITION
Review of catabolic and anabolic pathways of glucose, fats and amino acids; Definition, units, calorific value of foods – bomb calorimeter; energy requirements – basal metabolism, specific dynamic action of foods, energy balance, direct and indirect calorimetry, physiological energy value of foods; Energy Balance and Body Composition: Energy balance; body weight and body composition; health implications; obesity, BMR and BMI calculations; Weight Control: Fat cell development; hunger, satiety and satiation; dangers of weight loss; how to identify unsafe weight loss schemes; treatment of obesity; attitudes and behaviors toward weight control.

**TOTAL : 45 PERIODS**

**OUTCOME:**
On completion of the course the students are expected to
- Be able to understand and identify the various food groups; the nutrient components (macro and micro), proximate composition.
- Be able to understand and identify the non-nutritive components in food, naturally present.
- Understand and use effectively, food composition tables and databases.
- Grasp the functional role of food components and their interaction in food products in terms of colour, flavour, texture and nutrient composition

**TEXT BOOKS:**

**REFERENCES:**

**EE7151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

**OBJECTIVE:**
- To impart the knowledge on basic concepts of electrical circuits and electrical machines.
- To impart the knowledge on basic concepts of electronic components, devices and circuits

**UNIT I BASIC CONCEPTS AND DC CIRCUITS**
Ohm's law - Electrical resistance - Series /Parallel resistive circuits - Star/Delta transformations - Kirchoff's law - Node and Mesh analysis - Thevenin's and Norton's theorem.
UNIT II A.C.CIRCUITS
RMS and average value of periodic waves - Form factor - Phase and Phase difference - Simple RC,RL and RLC circuits - series and parallel resonance - power and power factor - introduction to three phase systems – power measurement in 3 phase system.

UNIT III D.C. MACHINES

UNIT IV ELECTRONIC COMPONENTS AND DEVICES
Operating principle and characteristics of Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor - Field Effect Transistors – UJT – SCR.

UNIT V ANALOG CIRCUITS
Rectifier and Power Supply Circuits, clipper, clamer using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator.

TOTAL: 45 PERIODS

REFERENCES:

FT7301 FLUID MECHANICS IN MECHANICAL OPERATIONS

OBJECTIVES:
- To introduce the students to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes.

OUTCOMES:
- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

UNIT I PROPERTIES OF FLUIDS
on surfaces – total pressure and centre of pressure - Horizontal, vertical and inclined plane surface. Pressure diagram – total pressure on curved surface. Archimedes principles – buoyancy – meta centre – metacentric height

UNIT II  FLUID FLOW ANALYSIS  12

UNIT III  FLOW MEASUREMENTS  12

UNIT IV  OPEN CHANNEL FLOW  12

UNIT V  DIMENSIONAL ANALYSIS & PUMPS  12

TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- Enable students to understand the methods of isolating and characterizing various microbes associated with foods and food groups.
- Enable students to understand and use various microbiological techniques for the study of foods.
- Understand the methods used to detect pathogens in foods.

OUTCOMES:
- Complete understanding of isolation, characterization of various microbes associated with foods and food groups.
- Familiarize with microbiological techniques for the study of foods.
- Better understanding of methods to detect pathogens in foods.

LAB EXPERIMENTS:
1. Introduction, Laboratory Safety, Use of Equipment; Sterilization Techniques; Culture Media-Types and Use; Preparation of Nutrient broth and agar
2. Culture Techniques, Isolation and Preservation of Cultures- Broth: flask, test tubes; Solid: Pour plates, streak plates, slants, stabs
3. Microscopy – Working and care of Microscope; Microscopic Methods in the Study of Microorganisms; Staining Techniques- Simple, Differential- Gram’s Staining
4. Quantification of Microbes: Sampling and Serial Dilution; Bacterial count in food products TVC
5. Microbiological Quality of Water (MPN)
6. Microbiological quality of milk
7. Enumeration of Lactic acid bacteria from fermented foods
8. Yeast & Mould count from fruits
9. Enumeration of spores from pepper
10. Inhibitory effect of spices on microbial load in fish & flesh foods
11. Enumeration & Isolation of E. colifrom processed meat/chicken
12. Thermal destruction of microbes: TDT & TDP
13. Enumeration & Isolation of Staphylococcifrom ready to eat street foods
14. Effect of cleaning and disinfection on microbial load

EQUIPMENTS:
- Auto-calve 1
- Hot Air Oven 1
- Incubators 2
- Light Microscopes 4
- Incubator Shaker 1
- Colorimeter 2
- Lamina Flow Chamber 2
- Glassware, Chemicals, Media as required

TOTAL : 60 PERIODS

REFERENCE
OUTCOMES:
- Better understanding the physical and chemical properties of food.
- Familiarize in precipitation of casein and gellation of starch.
- Understanding the food groups, constituents of food, energy from food
- Exposing to nutritional assessment, food constituents and their daily dietary allowances

EXPERIMENTS:
1. Estimation of Viscosity of foods
2. Properties of solutions- sugar & salt
3. Preparation of emulsions
4. Solubility, specific gravity, Refractive index and Oxidative rancidity of fats and oils
5. Iso-electric precipitation of casein, Effect of rennin on milk proteins
6. Gelling properties of starch
7. Study of gluten formation
8. Enzymatic Browning in foods
9. Enzymatic hydrolysis of sucrose and measurement of optical rotation
10. Calculation and Computing of nutrient composition of foods
11. Nutritional anthropometry - Standards for reference – WHO Growth Charts from birth to 18 years, Body Mass Index and reference value
12. Techniques of measuring height, weight, head, chest and arm circumference, waist to hip ratio, skin-fold thickness, Calculation of percent Body fat using skin fold callipers
13. Calculation of energy balance of individuals based on 3 day dietary recall.
14. Dietary survey of a group of individuals/community
15. Comparison of Food Composition data bases

TOTAL: 60 PERIODS

MA7357 PROBABILITY AND STATISTICS

OBJECTIVES:
- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability.

UNIT I RANDOM VARIABLES 12
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTS OF SIGNIFICANCE 12

UNIT IV DESIGN OF EXPERIMENTS 12
Completely randomized design – Randomized block design – Latin square design - factorial design - Taguchi’s robust parameter design.
UNIT V  STATISTICAL QUALITY CONTROL  
Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:

GE7251  ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
3  0 0 3

OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution.
(c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards—soil waste management: causes, effects and control measures of municipal solid wastes—role of an individual in prevention of pollution—pollution case studies—disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site—Urban/Rural/Industrial/Agricultural.

UNIT III NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies—timber extraction, mining, dams and their effects on forests and tribal people—Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems—Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies—Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies—Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources case studies—Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification—role of an individual in conservation of natural resources—Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets—river/forest/grassland/hill/mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

REFERENCES:

TOTAL: 45 PERIODS

FT7402 INTRODUCTION TO FOOD PROCESSING

OBJECTIVES:
The course aims to introduce the students to the area of Food Processing. This is necessary for effective understanding of a detailed study of food processing and technology subjects. This course will enable students to appreciate the importance of food processing with respect to the producer, manufacturer and consumer.

UNIT I PROCESSING OF FOOD AND ITS IMPORTANCE
Source of food - food of plant, animal and microbial origin; different foods and groups of foods as raw materials for processing – cereals, pulses, grains, vegetables and fruits, milk and animal foods, sea weeds, algae, oil seeds & fats, sugars, tea, coffee, cocoa, spices and condiments, additives; need and significance of processing these foods.

UNIT II METHODS OF FOOD HANDLING AND STORAGE
Nature of harvested crop, plant and animal; storage of raw materials and products using low temperature, refrigerated gas storage of foods, gas packed refrigerated foods, sub atmospheric storage, Gas atmospheric storage of meat, grains, seeds and flour, roots and tubers; freezing of raw and processed foods.

UNIT III LARGE-SCALE FOOD PROCESSING
Milling of grains and pulses; edible oil extraction; Pasteurisation of milk and yoghurt; canning and bottling of foods; drying – Traditional and modern methods of drying, Dehydration of fruits, vegetables, milk, animal products etc.; preservation by use of acid, sugar and salt; Pickling and curing with microorganisms, use of salt, and microbial fermentation; frying, baking, extrusion cooking, snack foods.

UNIT IV FOOD WASTES IN VARIOUS PROCESSES
Waste disposal-solid and liquid waste; rodent and insect control; use of pesticides; ETP; selecting and installing necessary equipment.

UNIT V FOOD HYGIENE
Food related hazards – Biological hazards – physical hazards – microbiological considerations in foods. Food adulteration – definition, common food adulterants, contamination with toxic metals, pesticides and insecticides; Safety in food procurement, storage handling and preparation; Relationship of microbes to sanitation, Public health hazards due to contaminated water and food; Personnel hygiene; Training & Education for safe methods of handling and processing food; sterilization and disinfection of manufacturing plant; use of sanitizers, detergents, heat, chemicals, Cleaning of equipment and premises.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course the students are expected to
• Be aware of the different methods applied to processing foods.
• Be able to understand the significance of food processing and the role of food and beverage industries in the supply of foods.

TEXT BOOKS:

FT7404 UNIT OPERATIONS FOR FOOD INDUSTRIES

OBJECTIVES:
To understand the principles involved in separation methods.

UNIT I EVAPORATION AND CONCENTRATION

UNIT II MECHANICAL SEPARATION

UNIT III SIZE REDUCTION

UNIT IV CONTACT EQUILIBRIUM SEPARATION

UNIT V CRYSTALLIZATION AND DISTILLATION

TOTAL: 60 PERIODS

OUTCOMES:
To understand Principles of separation methods used in the process industry. To appreciate different equipments developed for separation.

TEXT BOOKS:

REFERENCE:

FT7403 REFRigeration and Cold Chain Management

OBJECTIVES:
• To understand the underlying principles of operation in different Refrigeration & cold storage systems and its components.
• To provide knowledge on design aspects of cold storage systems

UNIT I REFRigERATION PRINCIPLES

UNIT II VAPOUR COMPRESSION REFRIGERATION AND COMPONENTS
Vapour compression system - refrigeration components – compressor and condenser – types, construction and working - expansion device and evaporators – types, construction and working

UNIT III REFRIGERANTS AND VAPOUR ABSORPTION CYCLE

UNIT IV SHELF – LIFE OF FOOD PRODUCTS
Defining overall Shelf-life, remaining shelf life in the context of Chilled & Frozen foods; - Deterioration modes of food items; Models of quality deterioration- Kinetic model; shelf-life
model; Q10/q10 model; TTT model for the remaining shelf – life; General procedure for shelf – life testing – the 11 steps procedure.
Storage of frozen foods; - Basic design requirements of storage to uphold the shelf –life – size , insulation, entry –exit position, palletization, proper disk-space for air-circulation, automatic door –closing, proper lighting, temperature monitoring and recording facility; stacking systems, emergency exits, material handling devices like fork-lifts, pallet trucks, etc floor heaters, vapour barriers, etc.

UNIT V COLD CHAIN
What is cold chain? Need for the chain for chilled / frozen food item, various links of the chain; importance of shelf- life; just – in-time deliveries; Temperature limits;in various countries- Europe, US, Australia etc; Chilling and freezing:- Chilling injury, cook-chilling systems; cold – shortening; PPP and TTT concepts; Temperature monitoring; -Critical temperatures; Temperature –time indicators(TTI); Time –temperature –correlation-the kinetic approach, effective temperature; Transportation regulations; Role of packaging in cold chain– MAS, MAP, CAS, CAP etc; Thaw indicators.

OUTCOMES:
• Upon completion of this course, the students will be able to demonstrate the operations in different Refrigeration & cold storage systems and also able to design Refrigeration & cold storage systems.

TEXT BOOKS:

REFERENCES:
Rate of drying for food products; design parameters of different type of dryers; properties of air-water mixtures. Psychrometric chart, freezing and cold storage. Freeze concentration, dehydrofreezing, freeze drying, IQF; calculation of refrigeration load, design of freezers and cold storages.

UNIT IV NON-THERMAL METHODS
Super Critical Technology for Preservation - Chemical preservatives, preservation by ionizing radiations, ultrasonics, high pressure, fermentation, curing, pickling, smoking, membrane technology. Hurdle technology.

UNIT V FOOD PACKAGING
Basic packaging materials, types of packaging, packaging design, packaging for different types of foods, retort pouch packing, costs of packaging and recycling of materials.

TOTAL: 45 PERIODS

OUTCOMES:
- To understand the principles of food processing and preservation.
- To understand the role of different methods the processing of different foods and their impact on the shelf life, quality, and other physical and sensory characteristics of foods.
- To familiarize with the recent methods of minimal processing of foods
- To understand the materials and types of packaging for foods

TEXT BOOKS

REFERENCES

FT7411 FOOD PROCESSING AND PRESERVATION LAB

OBJECTIVES:
To develop skills related to
- Preservation of foods
- Use of various techniques and additives for food processing and Preservation

EXPERIMENTS:
1. Heat transfer studies in a plate heat exchanger (Parallel and counter flow)
2. Refrigeration and Freezing of vegetables and fruits
3. Drying of vegetables and fruits with and without additives - Drying rate studies including, constant rate and falling rate periods and the effects of various factors on them.
4. Osmotic drying of foods with salt and sugar.
5. Canning & bottling of vegetable and fruit products
6. Filtration and concentration of fruit juices
7. Production of extruded products.
8. Spray drying of juices/milk
9. Pasteurization of milk
10. Retort processing of foods
11. Determination of Water vapor transmission rate of different packaging materials
12. Determination of migration characteristics of packaging materials
13. Determination of tensile and burst strength of given packaging material

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to select the specific preservation technology suitable for a specific food
• Ability to Process the different categories of food

REFERENCES:

FT7412 UNIT OPERATIONS IN FOOD INDUSTRIES LAB L T P C 0 0 4 2

OBJECTIVE:
• To develop knowledge in handling basic operation equipment’s

OUTCOMES:
Upon completion of this practical course the student will
• Have knowledge on the basic principles of chemical engineering and its applications.
• Be able to apply the skill of material balance and energy balance in unit operations unit process

EXPERIMENTS:
1. Flow measurement a) Artifice meter b) Venturimeter, c) Rotameter
2. Determination of economy and thermal efficiency of rotary flash evaporator
3. Solving problems on single and multiple effect evaporator
5. Determination of collection efficiency in cyclone separator.
7. Determination of absorption efficiency in a packing tower
8. Determination of porosity, coefficient of friction and angle of repose of grains.
11. Determination of performance characteristics in size reduction using the burr mill.
12. Determination of energy requirement in size reduction using the ball mill and hammer mill.
15. Visit to a solvent extraction, sugar industry.

TOTAL: 60 PERIODS

FT7502 FUNDAMENTALS OF HEAT AND MASS TRANSFER L T P C 4 0 0 4

OBJECTIVES:
To understand the principles and applications of heat and mass transfer operations.

UNIT I HEAT TRANSFER – CONDUCTION

UNIT II HEAT TRANSFER - CONVECTION 12

UNIT III HEAT TRANSFER – HEAT EXCHANGER 12

UNIT IV HEAT TRANSFER: RADIATION 12
Radiation heat transfer – concept of black and grey body - monochromatic total emissive power – Kirchoff’s law – Planck’s law - Stefan-Boltzman’s law – heat exchange through non-absorbing media - solving problems in heat transfer by radiation.

UNIT V MASS TRANSFER 12

TOTAL: 60 PERIODS

OUTCOMES:
To understand and apply the principles in heat transfer phenomena To understand and apply the principles in mass transfer phenomena To design heat and mass transfer equipments.

TEXT BOOKS:

REFERENCES:

FT7503 PRINCIPLES OF BIOCHEMICAL ENGINEERING 3 0 0 3

OBJECTIVES:
- To understand the Enzyme kinetics, Inhibition kinetics, Immobilization
- To understand the concept of basic fermentation processes and its control systems etc.
• To get a practical knowledge about running the fermenter and its scale – up and modes of operation etc.

UNIT I INTRODUCTION TO ENZYMES 9
Classification of enzymes. Mechanisms of enzyme action; concept of active site and energetics of enzyme substrate complex formation; specificity of enzyme action; principles of catalysis – collision theory, transition state theory; role of entropy in catalysis.

UNIT II KINETICS OF ENZYME ACTION 9

UNIT III ENZYME IMMOBILIZATION 6
Physical and chemical techniques for enzyme immobilization – adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding etc., - examples, advantages and disadvantages.

UNIT IV OVERVIEW OF FERMENTATION PROCESSES 9
Overview of fermentation industry, general requirements of fermentation processes, basic configuration of fermentor and ancillaries, main parameters to be monitored and controlled in fermentation processes.

UNIT V RAW MATERIALS AND MEDIA DESIGN FOR FERMENTATION PROCESS 12
Criteria for good medium, medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation of optimal growth and product formation, examples of simple and complex media, design of various commercial media for industrial fermentations – medium optimization methods

TOTAL : 45 PERIODS

OUTCOMES:
The student will be able to
• Understand the fundamentals of Enzyme kinetics, Inhibition kinetics and Immobilization
• Understand the concept of basic fermentation processes and its application during scale up operations.

TEXT BOOKS:

REFERENCES:
To expose the students to the principles, methods and techniques of chemical and instrumental methods of food analysis.

UNIT I  INTRODUCTION  10
Introduction, food regulations and standards; sampling methods, and sample preparation for analysis; statistical evaluation of analytical data. General methods of food analysis- Moisture determination by different methods; ash analysis-different methods; titrable acidity in foods; determination of crude fiber and dietary fibre.

UNIT II  LIPIDS, PROTEINS AND CARBOHYDRATE ANALYSIS  10
Analysis of oils and fats for physical and chemical parameters and quality standards, protein analysis by different techniques; analysis of carbohydrates by different techniques.

UNIT III  SPECTROSCOPIC TECHNIQUES  10
Basic principles; application of UV-Visible spectrophotometer in the analysis of food additives; IR Spectroscopy in online determination of components of food- FT-IR tintometer in color intensity determination; application of Atomic Absorption Spectrophotometer and ICP-AES in analysis of mineral elements and fluorimeter in vitamin analysis.

UNIT IV  CHROMATOGRAPHIC TECHNIQUES  10
Basic principles; application of paper chromatography and TLC in food analysis; detection of adulterants in foods; Column chromatography for purification analysis- Ion exchange and affinity chromatography; HPLC and GC in food analysis; Significance of MS detectors in HPLC and GC; FAME analysis in oils and fats.

UNIT V  ELECTROPHORESIS, REFRACTOMETRY AND POLARIMETRY  5
Basic principles; application of the electrophoresis in food analysis; Brix value of fruit juices; total soluble solids in fruit products; Refractive indices of oils and fats; specific rotations of sugars; Estimation of simple sugars and disaccharides by polarimeter.

TOTAL: 45 PERIODS

OUTCOMES:
• To understand the principles behind analytical techniques in food analysis.
• To know the methods of selecting appropriate techniques in the analysis of food products.
• Appreciate the role of food analysis in food standards and regulations for the manufacture and the sale of food products and food quality control in food industries.
• To familiarize with the current state of knowledge in food analysis.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To enable the students to understand the concepts and operation of equipment in handling of enzymes and cultivation of microbes in industrial scale.

OUTCOMES:
To sterilize a bioreactor
To operate a bioreactor
To design experiments to evaluate the performance of the bioreactor.
To develop enzyme immobilized processes.

EXPERIMENT:
2. Medium optimization – Plackett Burman design, response surface methodology
3. Enzyme kinetics – Michaelis Menton parameter, effect of temperature and pH
4. Enzyme immobilization – gel entrapment, cross linking
5. Preparation of bioreactor, utilities for bioreactor operation
6. Thermal death kinetics
7. Batch sterilization design
10. Estimation of kla – sulphite oxidation method
11. Estimation of overall heat transfer coefficient

TOTAL: 60 PERIODS

REFERENCES:

FT7512 FOOD ANALYSIS LAB

OBJECTIVES:
Analysis of foods and food products for chemical components, compliance to standards; detection of adulterants in foods.

OUTCOME:
- Better understanding in analysis of foods and food products for chemical components.
- Knowing standards for food products.
- Obtain knowledge of adulterants in foods.

LAB EXPERIMENTS:
1. Determination of moisture in spices powder by distillation method and Hot air oven method.
2. Determination of total fat, protein in milk and milk products.
3. Rancidity test for fried foods to assess primary and secondary oxidative products.
4. Determination of Vitamin C in fruit juices.
5. Estimation of synthetic Food colour in sweets, confectioneries and beverages.
7. Determination of Iodine content in iodized salt.
8. Detection of Annatto, lead, MSG, sulphur-di-oxide, Emulsifiers and stabilizers in food products.
10. Determination of soluble and insoluble fibre in foods.
11. Detection of adulterants in edible oil and ghee.
12. Column chromatographic separation of colours.
13. The identification of sugars in fruit juice using TLC.

TOTAL : 60 PERIODS

TEXTBOOKS:

GE7652 TOTAL QUALITY MANAGEMENT

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Definition of TQM -- Basic concepts of TQM — Gurus of TQM (Brief introduction) -- TQM Framework - Barriers to TQM — Benefits of TQM.

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I
The seven traditional tools of quality -- New management tools -- Six-sigma Process Capability -- Bench marking -- Reasons to bench mark, Bench marking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using...
the findings, Pitfalls and Criticisms of Bench Marking – FMEA – Intent of FMEA, FMEA Documentation, Stages, Design FMEA and Process FMEA.

UNIT IV  TQM TOOLS & TECHNIQUES II  9

UNIT V  QUALITY MANAGEMENT SYSTEM  9

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to apply TQM concepts in a selected enterprise.
- Ability to apply TQM principles in a selected enterprise.
- Ability to apply the various tools and techniques of TQM.
- Ability to apply QMS and EMS in any organization.

TEXT BOOK:

REFERENCE BOOKS:

FT7603  FOOD PROCESS ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
To expose the students to the fundamental knowledge of food, its properties and different methods of food processing

UNIT I
Roasting and Frying equipment. Extraction and Leaching, Crystallization and Distillation: Basic principles involved.

UNIT II


UNIT III

UNIT IV

UNIT V  HYGIENE PRACTICES
Cleaning and sanitation of food equipments and contains: can, crate, bottle, washing, CIP and COP cleaning. Hygienic design of Food processing equipment. Sanitary requirement, sanitary pipes and fittings.

OUTCOMES:
- Students will understand the importance of quality control and food packaging in shelf life of foods.
- Understand thermal processing of food and hygiene practices in food industry.

TEXTBOOK:
REFERENCES:

FT7602 FOOD ADDITIVES

OBJECTIVES:
To expose the students to the use of different chemical additives in foods during food processing and preservation

UNIT I INTRODUCTION
Definition, role of food additives, classification of food additives based on their role, dual role of certain additives, INS numbering system of food additives, safety requirements of food additives, Acceptable daily intake of food additives, JECFA and Food Chemical Codex standards for food additives, status of food additives with respect to Indian laws, GMP and permissible upper levels of food additives under Indian food laws.

UNIT II ACIDITY REGULATORS AND PRESERVATIVES
Acidity Regulators – definition, chemical structure, role and importance, pH modulation and taste, acidity profile, permitted acidity regulators, levels of usage and food applications. Preservatives of chemical and microbial origin; mode of action on spoilage organisms and pathogens, factors affecting the performance of preservatives, active forms of preservatives, necessity in a food and levels of usage; permitted preservatives and food applications. Case studies / illustrations

UNIT III EMULSIFIERS, STABILIZERS AND THICKENERS
Emulsion, surface tension, oil in water and water in oil emulsion, Hydrophilic and Lipophilic balance (HLB), role of emulsifiers, different classes of emulsifiers and their chemical structure, their HLB values and role in emulsion stabilization; role of different stabilizers and other substances in emulsion stability; emulsion formation process and equipment; measurement of emulsion stability; permitted emulsifiers and stabilizers and food applications. Thickeners – definition, chemical structure, role in food processing and product end characteristics, list of permitted thickeners and food applications.

UNIT IV ANTIOXIDANTS AND ANTI-CAKING AGENTS
Antioxidants - Chemistry of oxidative deterioration of food and its constituents and its effect on the quality; defining antioxidant; water soluble and oil soluble antioxidants and their chemical structure, permitted antioxidants; mechanism of action, permitted levels and food application. Anti-foaming and propellants, Anti-caking agents – definition, role in preventing spoilage, mode of action, permitted list of anti-caking agents and food application.

UNIT V COLOR AND ARTIFICIAL SWEETENERS
Color – Natural and synthetic food colors, their chemical structure, shades imparted, stability, permitted list of colors, usage levels and food application. Artificial Sweeteners – list, structure, taste profile, permitted list, usage levels and food applications.

OUTCOMES:
- To understand the principles of chemical preservation of foods
• To understand the role of different food additives in the processing of different foods and their specific functions in improving the shelf life, quality, texture and other physical and sensory characteristics of foods
• To know the regulations and the monitoring agencies involved in controlling the safer use of additives in foods

TEXTBOOK:

REFERENCES:

TEXTBOOKS:


REFERENCES:

HS7551 EMPLOYABILITY SKILLS L T P C
3 0 0 3

COURSE DESCRIPTION
This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE OBJECTIVES
• To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
• To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
• To make them employable graduates

CONTENTS
UNIT I READING AND WRITING SKILLS 9
Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc. ) writing reports – collecting, analyzing and interpreting data

UNIT II SOFT SKILLS 9
Hard skills & soft skills - soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills – interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III PRESENTATION SKILLS 9
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentation

UNIT IV GROUP DISCUSSION SKILLS 9
Participating in group discussions – understanding group dynamics - brainstorming the topic questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others
opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V  INTERVIEW SKILLS
Interview etiquette – dress code – body language – mock interview --attending job interviews – answering questions confidently – technical interview – telephone/Skype interview - practice in different types of questions – one to one interview &panel interview – FAQs related to job interview- Emotional and cultural intelligence.

TOTAL: 45 PERIODS

LEARNING OUTCOMES
- Students will be able to make presentations and participate in group discussions with high level of self-confidence.
- Students will be able to perform well in the interviews
- They will have adequate reading and writing skills needed for workplace situations

REFERENCES:

EXTENSIVE READING

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com

FT7611 DAIRY PROCESS TECHNOLOGY LAB

OBJECTIVES:
To develop skills related to
- Preservation and analytical techniques in milk and milk products
- Use of various techniques and additives for milk product processing and quality analysis

OUTCOMES:
On the completion of the course, the students will able to get experience on dairy process technology.

EXPERIMENTS:
Properties of milk
1. Determination of viscosity, density and specific gravity of milk
2. Determination of redox potential, acidity and pH of milk
1. Analysis of milk
2. Platform test - Methylene Blue Reduction Test, clot on boiling test
3. Determination of protein in milk by formol titration (pynes method)
4. Determination of lactose content of milk by polarimeter
FT7702 FOOD PACKAGING TECHNOLOGY  

L T P C  

3 0 0 3  

OBJECTIVES:  
The course aims to develop the knowledge of students in the area of packaging of foods and the related technology used. This course will enable students to appreciate the application of scientific principles in the packaging of foods.

UNIT I BASICS OF PACKAGING  
Packaging – Concepts, definition, Significance, classification. Packaging – Development, Retail/Unit; Packaging of foods – fresh and processed

UNIT II PACKAGING MEDIA & MATERIALS  
Primary packaging media – Properties and application, Paper boards, metals, plastics, wood and plywood, glass, flexible materials Labels, caps and closures and adhesives, inks and lacquers, cushioning materials, reinforcements; Testing & evaluation of packaging media – retail packs & transport packages

UNIT III PACKAGING SYSTEMS AND METHODS  
Vacuum packaging, gas flush packaging, CAP & MAP, aseptic & retort packaging, box in box. Food products-General classification and packaging types, varieties and trends Storage handling and distribution of packages-including pallets & containers

UNIT IV PACKAGING DESIGN  
Food marketing and role of packaging; Packaging aesthetic and graphic design; Packaging – Laws and regulations

UNIT V ENVIRONMENTAL ISSUES IN PACKAGING  
Coding and marking including bar coding and Environmental, ecological & Economic issues, recycling and waste disposal.

TOTAL: 45 PERIODS

OUTCOMES:  
To gain knowledge on  
- The different types of materials and media used for packaging foods.  
- Hazards and toxicity associated with packaging materials and laws, regulations and the monitoring agencies involved food safety, labelling of foods  
- Methods of packaging, shelf life and food factors affecting packaging
TEXT BOOKS:

FT7703 \hspace{1cm} FOOD SAFETY, QUALITY AND REGULATION \hspace{1cm} L T P C
\hspace{1cm} 3 \hspace{1cm} 0 \hspace{1cm} 0 \hspace{1cm} 3

OBJECTIVES:
• To characterize different type of food hazards, physical, chemical and biological in the industry and food service establishments
• To help become skilled in systems for food safety surveillance
• To be aware of the regulatory and statutory bodies in India and the world
• To ensure processed food meets global standards

UNIT I
Introduction to food safety and security: Hygienic design of food plants and equipments, Food Contaminants (Microbial, Chemical, Physical), Food Adulteration (Common adulterants), Food Additives (functional role, safety issues), Food Packaging & labeling. Sanitation in warehousing, storage, shipping, receiving, containers and packaging materials. Control of rats, rodents, mice, birds, insects and microbes. Cleaning and Disinfection, ISO 22000 – Importance and Implementation

UNIT II
Food quality: Various Quality attributes of food, Instrumental, chemical and microbial Quality control. Sensory evaluation of food and statistical analysis. Water quality and other utilities.

UNIT III
Critical Quality control point in different stages of production including raw materials and processing materials. Food Quality and Quality control including the HACCP system. Food inspection and Food Law, Risk assessment – microbial risk assessment, dose response and exposure response modelling, risk management, implementation of food surveillance system to monitor food safety, risk communication

UNIT IV
Indian and global regulations: FAO in India, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection Convention (IPPC)

UNIT V
Codex Alimentarius Commission - Codex India – Role of Codex Contact point, National Codex contact point (NCCP), National Codex Committee of India – ToR, Functions, Shadow Committees etc.

OUTCOMES:
• Thorough Knowledge of food hazards, physical, chemical and biological in the industry and food service establishments
• Awareness on regulatory and statutory bodies in India and the world

REFERENCES:
1. Handbook of food toxicology by S. S. Deshpande, 2002
2. The food safety information handbook by Cynthia A. Robert, 2009
4. Microbiological safety of Food by Hobbs BC, 1973

FT7651  CREATIVITY, INNOVATION AND NEW PRODUCT DEVELOPMENT  LT P C 3 0 0 3

OBJECTIVES:
To study the various issues related to Creativity, Innovation and New Product Development.

UNIT I  INTRODUCTION  9
The process of technological innovation - factors contributing to successful technological innovation - the need for creativity and innovation - creativity and problem solving - brainstorming - different techniques

UNIT II  PROJECT SELECTION AND EVALUATION  9
Collection of ideas and purpose of project - Selection criteria - screening ideas for new products (evaluation techniques)

UNIT III  NEW PRODUCT PLANNING  9
Design of prototype - testing - quality standards - marketing research - introducing new products

UNIT IV  NEW PRODUCT DEVELOPMENT  9

UNIT V  MODEL PREPARATION & EVALUATION  9
Creative design - Model Preparation - Testing - Cost evaluation - Patent application

TOTAL: 45 PERIODS

OUTCOMES:
To impart the knowledge of various aspects of Creativity, Innovation and New Product Development

TEXT BOOKS:

REFERENCES:

FT7701  BAKING AND CONFECTIONERY TECHNOLOGY  LT P C 3 0 0 3

OBJECTIVES:
This course will enable the student to
• Familiarize with the commercial methods of baking bread and recent advances in bakery industry

63
• Learn microbiological aspects of bakery products, sanitation and hygiene of baking industries.

OUTCOMES:
• Better understanding of process technology of bakery and confectionery products
• Complete learning - use of sanitation and safety practices in bakery and confectionery production

UNIT I INTRODUCTION TO BAKING 9
Classification of bakery products. Bakery ingredients and their functions-Essential ingredients: Flour, yeast and sour dough, water, salt- Other ingredients: Sugar, color, flavor, fat, milk, milk powder and bread improvers. Leaveners and yeast foods. Shortenings, emulsifiers and antioxidants.

UNIT II EQUIPMENTS 9
Introduction to utensils and equipments used in bakery industry with their purpose. Bulk handling of ingredients- Dough mixing and mixers, Dividing, rounding, sheeting, and laminating- Fermentation enclosures and brew equipment - Ovens and Slicers. Rheology of dough-Farinograph, Amylograph, Alveograph and Extensiograph.

UNIT III BREAD MAKING PROCESS 9

UNIT IV BAKERY PRODUCTS 9

UNIT V CONFECTIONERY PRODUCTS 9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

FT7712   SKILLS FOR FOOD PRODUCT DESIGN AND DEVELOPMENT   L T P C   0 0 4 2

OVERVIEW (THEORY)   5
Organization and assignment of teams, Definition of roles; Product Concepts; factors to consider; concept methodology; consumer testing; Product attributes; Concept testing approaches; Development of product specifications: Prototype development; role of ingredients and processing in defining attributes; scale up; Process flow sheet development; factors to consider in process development; process optimization; Factors to consider beyond formulation and processing - shelf life requirements; product performance testing; market positioning, Packaging and labelling, costing; Marketing: developing test market strategies

GROUP PROJECTS TO DEVELOP FOOD PRODUCTS AT LABORATORY SCALE

(PRACTICAL)   40
Project Identification: Products/Processes Review, Project Feasibility, Design and Product Specification
Project Planning: Identifying Objectives, Identifying Tools/Methods, Use of Information/Communication Technology
Project Execution: Product Trials and Standardization, Product Quality Profiling – Sensory, Microbial, Nutrient, Shelf Life, Costing, Packaging and Labeling, Product Scale up feasibility
Project Presentation: Documentation and Report, Viva Voce

TOTAL: 60 PERIODS

TEXTBOOKS:

REFERENCES:

FT7711   BAKING AND CONFECTIONERY LABORATORY LAB   L T P C   0 0 4 2

OBJECTIVE:
This course will enable the student to acquaint with the preparation of various bakery products and perform quality analysis for the same

EXPERIMENTS

65
1. Study of ingredients (major and minor): characteristics of flour, yeast, shortening, sugar, egg and salts.
2. Experiment on leavening action of baking powder, sodium- bicarbonate and ammonium-bi-carbonate.
3. Determination sedimentation value of flour
4. Estimation of water absorption power (atta, and maida)
5. Determination dough rising capacity of yeast
6. Studies of dough characteristics farinographic and extensographic
7. Preparation of biscuits-different types.
8. Preparation of bread-different types.
11. Preparation of candy.
12. Visit to a bakery/confectionary industry.

TOTAL: 60 PERIODS

REFERENCES / MANUALS/SOFTWARE:

FT7005 FOOD FLAVOURS TECHNOLOGY

OBJECTIVES:
• To understand the flavour compounds involved in development of flavor
• To understand the analytical techniques involved in flavor analysis

OUTCOMES:
• Better understanding and knowledge of contribution of different compounds for the development of flavor and Analytical techniques involved in flavor analysis.

UNIT I INTRODUCTION
Problems in flavour research – classification of food flavours; chemical compounds responsible for flavour.

UNIT II FLAVOUR COMPOUNDS
Chemical compound classes and their flavour responses; flavour development during biogenesis, flavour development during food processing; use of biotechnology to develop flavours.

UNIT III THE CHEMICAL SENSES
Anatomy of the chemical senses; neural development of the chemical senses; receptor mechanisms, neural coding; the control of eating.

UNIT IV FLAVOUR ANALYSIS
Subjective versus Objective methods of analysis; psychophysics and sensory evaluation; Instrumental analysis; sample handling and artifacts; data handling

UNIT V TEACHING FLAVOUR CONCEPTS
Problem based learning; tongue and nose; Onion-Beverage-Maillard reaction-Thio-stench

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

FT7002 CEREAL TECHNOLOGY

OBJECTIVES:
- The course aims to develop the knowledge of students in the area of Cereal processing and technology.
- This is necessary for effective understanding specific aspects of food processing related to these foods.
- This course will enable students to appreciate the application of scientific principles in the processing of these materials.

OUTCOMES:
On completion of the course the students are expected to
- Be able to understand and identify the specific processing technologies used for cereals
- Understand the application of scientific principles in the processing technologies specific to the materials.

UNIT I PRODUCTION, STRUCTURE AND COMPOSITION
Status, major growing areas and production of cereals and millets in India and the world, structure, Physical properties; Density, Bulk density, Angle of repose, Hardness, asperity, porosity, stack of milling and moisture on physical properties. Chemical composition, Distribution of nutrients and Aroma of cereals and millets; anti-nutritional factors.

UNIT II WHEAT AND RICE

UNIT III OTHER CEREALS
Corn - Morphology, Physico-chemical properties, Corn milling - Wet and dry milling, Milling fractions and modify starches Corn Products – Corn flakes, Corn starch, canned corn products, puffed product; HFCS; Oats- Milling, Oat Products – Steel cut, rolled oats, quick cooking; Rye bread; Traditional and Fermented cereal products
UNIT IV  MILLETS  6
Sorghum, Pearl Millet, Finger millet, Foxtail millet, Kodo Millet - storage, insect control; processing - Pearling, Milling, Malting, Malt based foods, flaked and fermented products; Traditional and Nutritional products based on finger millet.

UNIT V  BAKED AND EXTRUDED PRODUCTS  6
Baked foods - chemical dough development, mechanical dough development, sheeting extrusion other rapid methods; Bread staling – theory, manifestation, retardation measures; Indian Confectionery. Extrusion processing – methods and products.

TOTAL: 45 PERIODS

TEXT BOOKS:

FT7004  FOOD FERMENTATION TECHNOLOGY  L T P C
3 0 0 3

OBJECTIVES:
• To impart knowledge and skills related to process technologies and equipment used for the production of various fermented food products.

OUTCOMES:
• Understanding concepts, principles and procedures involved in the area of fermented food production.
• Familiarizing with different fermenter types and their design criteria.

UNIT I  HISTORICAL PERSPECTIVE OF FOOD FERMENTATION  6
History of food fermentations; types of fermented foods and substrates/raw materials used, traditional fermented foods, biotransformation of raw materials

UNIT II  FERMENTING ORGANISMS AND THEIR ROLE  9
Principles of food and industrial fermentations; microorganisms of importance in food fermentations, Biochemistry of fermentations/fermentation pathways. Lactic Acid Bacteria and starter cultures (Taxonomy, ecology, physiology, genetics and biotechnology, phage control) Brewers and Bakers yeasts, Yeast starter culture maintenance, Moulds used in food fermentations; Genetic manipulation of fermenting microbes, Strain specific traits

UNIT III  TECHNOLOGY OF FERMENTED FOODS  12
Dairy fermentations - Yeast fermentations - Wine and beer fermentations, bread making, Mould fermentations – soy based fermented foods – miso, tempeh, soy sauces Manufacture of cheese, yoghurt, wine, beer, bread, soy sauce; processes and equipment used for manufacture; bottling / packaging, aging, storage and shelf life of fermented foods; Prevention of spoilage of fermentations.

UNIT IV  PRODUCTS OF MIXED FERMENTATIONS  9
Meats, sausages, fish sauces, sauerkraut, idli, Manufacture of different types of sausages, fish sauces, sauerkraut, idli batter- processes and equipment used for manufacture; packaging, aging, storage and shelf life of the products; Prevention of spoilage of fermentations.
UNIT V OTHER PRODUCTS FROM FERMENTATION
Fermentation production of flavor components, acids, alcohol, enzymes, pigments/colours

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

FT7003 FOOD ALLERGY AND TOXICOLOGY

OBJECTIVES:
• Familiarize with hazards, and toxicity associated with food and their implications for health.
• Know the various kinds of allergens and basis of allergic reactions
• Be familiar with various natural toxins in food.

OUTCOMES:
Awareness about the different types of allergens and Natural toxins associated with food

UNIT I INTRODUCTION
Definition and need for understanding food toxicology; Hazards - Microbiological, nutritional and environmental. Basics of immune resources - humoral and cell media resources. Allergen and mechanism of allergic resources.

UNIT II FOOD ALLERGY AND SENSITIVITY
Chemistry of food allergens, celiac disease, food disorders associated with metabolism, lactose intolerance, and asthma

UNIT III PRINCIPLES OF TOXICOLOGY
Natural food toxicants - toxicity of mushroom alkaloids, seafood, vegetables, fruits, pulses, and antinutritional compounds. Biological factors that influence toxicity, toxin absorption in the G.I.track, Industrial microflora, blood, brain barrier, storage and excretion of toxins

UNIT IV DETERMINATION OF TOXICANTS IN FOOD SAMPLING
Quantitative and qualitative analysis of toxicants in foods; Biological determination of toxicants Assessment of food safety – Risk assessment and risk benefit indices of human exposure, acute toxicity, mutagen city and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioural effect, immunotoxicity.

UNIT V TOXICANTS FORMED DURING FOOD PROCESSING
Intentional direct additives, preservatives, nitrate, nitrite, and N- nitroso compound flavour enhancers, food colours, indirect additives, residues and contaminants, heavy metals, other organic residues and packaging materials.
Toxicity of heated and processed foods, food carcinogens and mutagens - Polycyclic aromatic hydrocarbons, N - nitrosamines, Acrylamide and their mode of action

TEXTBOOKS:

REFERENCES:

FT7009 GENETIC ENGINEERING AND GENETICALLY MODIFIED FOOD

OBJECTIVES:
Introduction to GM foods and their methods of production, advantages
- To study genetically modified plants which are commercially available
- To study transgenic animals and their engineering method
- To understand genetically modified microorganisms and their applications in foods
- To know about Pharmaceutical applications of genetically engineered plants
- To understand Risk and safety assessment of the GM foods and their labeling

OUTCOME:
- Better understanding of genetically modified plants, animals and modified microorganisms
- Familiarize in Pharmaceutical applications of genetically engineered plants
- Obtain knowledge in Risk and safety assessment of the GM foods and their labeling

UNIT I BASICS OF RECOMBINANT DNA TECHNOLOGY
Manipulation of DNA and RNA – Restriction and Modification enzymes, Design of linkers and adaptors. Characteristics of cloning and expression vectors based on plasmid and bacteriophage, Vectors for insect, yeast and mammalian system, Prokaryotic and eukaryotic host systems, Introduction of recombinant DNA in to host cells and selection methods.

UNIT II DNA LIBRARIES
Construction of genomic and cDNA libraries, Artificial chromosomes – BACs and YACs, Screening of DNA libraries using nucleic acid probes and antisera.

UNIT III SEQUENCING AND AMPLIFICATION OF DNA
Maxam Gilbert’s and Sanger’s methods of DNA sequencing. Inverse PCR, Nested PCR, AFLP-PCR, Allele specific PCR, Assembly PCR, Asymmetric PCR, Hot start PCR, inverse PCR, Colony PCR, single cell PCR, Real-time PCR/qPCR – SYBR green assay, Taqman assay, Molecular beacons. Site directed mutagenesis.

UNIT IV TRANSGENIC TECHNOLOGY
DNA microinjection, Retroviral vectors, Transgenic animals – Knock in and knock out animals, Transgenic plants – Ti plasmid.

UNIT V APPLICATIONS OF RDNA TECHNOLOGY IN FOODS (Remove company names) 9
Genetically engineered proteins: Bovine Somatotropin in Milk; Genetically engineered bacteria: ChymosinLite beer; Tryptophan; Transgenic plants: Calgene Flavr Savr TM tomato, Monsanto Round-Up TM Ready, Ciba GeigyBasta TM resistant crops; Edible vaccines: Cholera vaccine in potatoes; Transgenic Fish: Atlantic salmon.

TOTAL: 45 PERIODS

TEXTBOOKS:

REFERENCE:

OBJECTIVE:
To introduce students to the principles and methods of biological instruments.

OUTCOME:
To provide to the students the fundamentals of instrument knowledge and their applications in biology.

UNIT I OPTICAL SPECTROSCOPY 9

UNIT II CHROMATOGRAPHY 9

UNIT III STRUCTURAL ELUCIDATION 9

UNIT IV MASS SPECTROMETRY 9

UNIT V ELECTROCHEMICAL MEASUREMENTS 9
Different types of electrochemical apparatus – Measuring Electrode potentials- Red-Ox proteins – Porous Silicon.
TEXTBOOKS:

FT7012 MEAT, FISH AND POULTRY PROCESS TECHNOLOGY

OBJECTIVES:
• The course aims to develop the knowledge of students in the area of animal product processing and technology.
• This course will enable students to appreciate the application of scientific principles in the processing of these materials.

OUTCOMES:
On completion of the course the students are expected to
• Be able to understand and identify the specific processing technologies used for meat and such foods and the various products derived from these materials.
• Grasp the changes in the composition of foods with respect to the type of processing technology used.

UNIT I INTRODUCTION

UNIT II MEAT PROCESSING

UNIT III FISH PROCESSING

UNIT IV POULTRY
Introduction, Types and characteristics of poultry products, composition, nutritive value, calculation of nutritive value of poultry products. Unit operation involved in poultry processing.

UNIT V EGG PROCESSING
TEXT BOOKS:

REFERENCES

FT7007 FRUITS AND VEGETABLE PROCESSING TECHNOLOGY LT P C 3 0 0 3

OBJECTIVES:
The course aims to develop the knowledge of students in the area of vegetable and fruit processing and technology. This course will enable students to appreciate the application of scientific principles in the processing of fruits and vegetables.

OUTCOME:
On completion of the course the students are expected to
- Better understanding of the concepts of physiological characteristics of fruits and vegetables
- Better insight about fruit losses during storage and ways to prevent it.
- Thorough Knowledge and understandings of the specific processing technologies used for different foods and the various products derived from these materials.

UNIT I BASIC AGRICULTURAL ASPECTS OF VEGETABLES AND FRUITS  8
Ability to identify all commercially important fruits and vegetables with their names in important Indian languages, important regions, season, Morphology, structure and composition of fruit and vegetable. Production and processing scenario of fruits and vegetable: India and World. Scope of Fruit and Vegetable Preservation Industry in India. Present status, constraints and prospectus.

UNIT II FRESH FRUITS AND VEGETABLES  8
Physical, Textural characteristics, structure and composition. Maturity standards; Importance, methods of Maturity determinations maturity indices for selected fruits and vegetables. Harvesting of important fruits and vegetables. Fruit ripening- chemical changes, regulations, methods. Storage practices: Control atmospheric, Bead atmosphere, hypotactic storage, cool store, Zero emerge cool chamber, stores striation. Commodity pre-treatment’s - chemicals, wax coating, pre-packaging, phytonutrients in fruits and vegetables grading, cleaning, Physiological post harvest diseases chilling injury and disease. Handling and packaging of fruits and vegetables

UNIT III FREEZING & DEHYDRATION OF FRUITS AND VEGETABLES  9
General pre processing, different freezing methods and equipments, problems associated with specific fruits and vegetables; Dehydration – General pre processing, different methods of drying including sun, tray, spray drying and low temperature, osmotic dehydration and other modern methods; Indian Food Regulation and Quality assurance.

UNIT IV CANNING, PUREES AND JUICES 12
Canning- General pre processing, specific or salient points in fruits and vegetables like – Blanching, exhausting, processing conditions; Indian Food Regulation and Quality assurance Fruit Juice / pulp/ Nectar/Drinks, concentrates – General and specific processing, different packing including aseptic. Indian Food Regulation and Quality assurance Vegetable Purees/ pastes - General and specific processing, different packing including aseptic. Indian Food Regulation and Quality assurance

UNIT V FRUIT AND VEGETABLE PRODUCTS 8

TEXT BOOKS:

TOTAL: 45 PERIODS

FT7015 PULSE AND OIL SEED TECHNOLOGY L T P C 3 0 0 3

OBJECTIVES:
The course aims to develop the knowledge of students in the area of pulse and oil seed processing and technology. This is necessary for effective understanding specific aspects of food processing related to these foods. This course will enable students to appreciate the application of scientific principles in the processing of these materials.

OUTCOME:
On completion of the course the students are expected to
- Be able to understand and identify the specific processing technologies used for pulses and oil seeds and the various products derived from these materials.
- Understand the application of scientific principles in the processing technologies specific to the materials.
- Grasp the changes in the composition of foods with respect to the type of processing technology used.

UNIT I INTRODUCTION 9
UNIT II  LEGUMES  9

UNIT III  SOYA PROCESSING  9
Soya as a source of protein and oil; Processing of Soya - soya milk, soy protein Isolate, soya paneer, soya sauce; extrusion technology and production of textured vegetable proteins.

UNIT IV  OIL SEEDS  9
Chemical composition and characters of oil seed and Oils, Anti-nutritional factors, elimination Methods. Post Harvest Technology of Oil seeds, Handling Drying, Storage, Grading, Pre treatments, cleaning, Dehulling, Size reduction and flaking. Oil extraction: Traditional Methods, Ghani, Power Ghanis, Expellers - Principle of Expeller, structure design of expeller. Solvent extraction process: Principle, Pre treatment - Breaking, Cracking, flaking.

UNIT V  OIL SEED PROCESSING  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

FT7017  SPICES AND PLANTATION TECHNOLOGY  L T P C
3  0  0  3

OBJECTIVES:
To enable the students to understand about
- Coffee and its processing techniques, instant coffee, and quality grading
- Different types of tea and its manufacturing techniques, instant tea, quality parameters of tea
- Cocoa and its processing, chocolate manufacturing technology
- Processing and chemistry of major spices
- Processing and chemistry of minor spices

OUTCOMES:
On completion of the subject, students will be able to understand the processing steps involved for different plantation products and spices.
UNIT I  IMPORTANCE AND PROCESSING OF SPICES  9
A. Major Spices
Post Harvest Technology, composition, processed products of - Pepper, Cardamom, onion, ginger and turmeric – Oleoresins and essential oils – Method of manufacture – Chemistry of the volatiles – Enzymatic synthesis of flavour identical - Quality control, Flavour of major spices - Spice oil and oleoresins.
B. Minor Spices
Post Harvest Technology, composition, processed products of - Cumin, Coriander, Cinnamon, fenugreek, pepper, Garlic, Clove and Vanilla - Oleoresins and essential oils – Method of manufacture – Chemistry of the volatiles – flavours, Quality control, Present trends in synthesis of volatiles – micro-organisms, plant suspension cultures

UNIT II  PROCESSING OF COFFEE AND TEA  12

UNIT III  CHEMISTRY AND TECHNOLOGY OF COCOA AND COCOA PRODUCTS  9
Occurrence - Chemistry of the cocoa bean – changes taking place during fermentation of cocoa bean – Processing of cocoa bean – cocoa powder – cocoa liquor manufacture Chocolates – Types – Chemistry and technology of chocolate manufacture – Quality control of chocolates

UNIT IV  PROCESSING OF COCONUT, OILPALM, ARECANUT AND CASHEW  9

UNIT V  PACKAGING, GRADING AND QUALITY ANALYSIS OF SPICES  6
Cleaning and grading of spices - packaging and storage of spices – grading specifications – Agmark, ASTA, ESA specifications - processes involved in the manufacture of oleoresins and essential oils – quality analysis of spices and their derivatives
TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES
OBJECTIVES:
To introduce process economics and industrial management principles to chemical engineers.

OUTCOMES:
The objective of this course is to teach principles of cost estimation, feasibility analysis, management, organization and quality control that will enable the students to perform as efficient managers.

UNIT I  PRINCIPLES OF PRODUCTION MANAGEMENT AND ORGANISATION  15
Planning, organization, staffing, coordination, directing, controlling, communicating, organization as a process and a structure; types of organizations Method study; work measurement techniques; basic procedure; motion study; motion economy; principles of time study; elements of production control; forecasting; planning; routing; scheduling; dispatching; costs and costs control, inventory and inventory control.

UNIT II  ENGINEERING ECONOMICS FOR PROCESS ENGINEERS - INTEREST, INVESTMENT COSTS AND COST ESTIMATION  10
Time Value of money; capital costs and depreciation, estimation of capital cost, manufacturing costs and working capital, invested capital and profitability.

UNIT III  PROFITABILITY, INVESTMENT ALTERNATIVE AND REPLACEMENT  8
Estimation of project profitability, sensitivity analysis; investment alternatives; replacement policy; forecasting sales; inflation and its impact.

UNIT IV  ANNUAL REPORTS AND ANALYSIS OF PERFORMANCE  4
Principles of accounting; balance sheet; income statement; financial ratios; analysis of performance and growth.

UNIT V  ECONOMIC BALANCE AND QUALITY AND QUALITY CONTROL  8
Essentials of economic balance – Economic balance approach, economic balance for insulation, evaporation, heat transfer. Elements of quality control, role of control charts in production and quality control.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To deliver the knowledge of spectroscopic techniques and its functions
- To provide the technical information of spectroscopy for biological applications

OUTCOMES:
Upon completion of this course, the student would be able understand Basics of optical rotary dispersion methods and nuclear magnetic resonance
- Principles and applications of mass spectrometry and X-ray diffraction
- About the microscopic techniques and applications
- And apply the spectroscopic techniques for various biological applications

UNIT I  OPTICAL ROTATORY DISPERSION  5

UNIT II  NUCLEAR MAGNETIC RESONANCE  10

UNIT III  MASS SPECTROMETRY  10
Ion sources sample introduction – mass analyzers and ion detectors – biomolecule mass spectrometry – peptide and protein analysis – carbohydrates and small molecules – specific applications.

UNIT IV  X-RAY DIFFRACTION  10

UNIT V  SPECIAL TOPICS AND APPLICATIONS  10
Electron microscopy – transmission and scanning electron microscopy – scanning tunneling and atomic force microscopy – combinatorial chemistry and high throughput screening methods.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVES:
To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, 92 Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO$_2$, MgO, ZrO$_2$, NiO, nanoalumina, CaO, AgTiO$_2$, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots preparation, properties and applications

UNIT IV CHARACTERIZATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

UNIT V APPLICATIONS

OUTCOMES:
Upon completing this course, the students
- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXT BOOKS
REFERENCES

IB7752 DOWNSTREAM PROCESSING

OBJECTIVES:
To enable the students to
- Understand the methods to obtain pure proteins, enzymes and in general about product development R & D
- Have depth knowledge and hands on experience with on Downstream processes

OUTCOMES:
Upon success completion of this course, the students will be able to:
- Define the fundamentals of downstream processing for product recovery
- Understand the requirements for successful operations of downstream processing
- Describe the components of downstream equipment and explain the purpose of each
- Apply principles of various unit operations used in downstream processing and enhance problem solving techniques required in multi-factorial manufacturing environment in a structured and logical fashion

UNIT I DOWNSTREAM PROCESSING

UNIT II PHYSICAL METHODS OF SEPARATION
Unit operations for solid-liquid separation - filtration and centrifugation.

UNIT III ISOLATION OF PRODUCTS
Adsorption, liquid-liquid extraction, aqueous two-phase extraction, membrane separation – ultrafiltration and reverse osmosis, dialysis, precipitation of proteins by different methods.

UNIT IV PRODUCT PURIFICATION
Chromatography – principles, instruments and practice, adsorption, reverse phase, ion-exchange, size exclusion, hydrophobic interaction, bio-affinity and pseudo affinity chromatographic techniques.

UNIT V FINAL PRODUCT FORMULATION AND FINISHING OPERATIONS
Crystallization, drying and lyophilization in final product formulation.

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES

FT7006 FOOD PLANT DESIGN AND LAYOUT

OBJECTIVES:
To enable the students understand the various concepts of process development, design consideration and cost estimation in food industry.

OUTCOME:
The students will be able to apply their knowledge to design projects for setting up a Food Processing Industry.

UNIT I OVERALL DESIGN OF AN ENTERPRISE
Plant design, sales planning for plant design. Plant Location, levels of Plant location. Location of layout: location factors, plant site selection. Location theory and models, industrial buildings and grounds. Classification of Dairy and Food Plants, farm level collection and Chilling center. Space requirement.

UNIT II PREPARATION OF A PLANT LAYOUT

UNIT III DEVELOPMENT AND PRESENTATION OF LAYOUT
Development of the pilot layout, constructing the detailed layout: Functional design: Sitting of different sections in a plant, Layout installations.

UNIT IV QUANTITATIVE ANALYSIS FOR PLANT LAYOUT

UNIT V PRACTICAL LAYOUTS
PRACTICAL LAYOUTS: Common materials of construction of Food plant, building. Maintenance of Food Plant Building, Illumination and ventilation, Cleaning & sanitization, painting and colour coding, Fly and insect control.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCE:
2. “Food plant economic” by Zacharias B. Maroulis and George D. Saravacos published by Taylor and Francis Group, LLC, 2008

FT7016  
SPECIALTY FOODS  
L T P C  3 0 0 3

OBJECTIVES:
- To introduce students to various therapeutic and speciality foods.

UNIT I  9
Need and scope of specialty foods: Specialty food based on ease in preparation cost health benefits; Functional foods, Convenience food, Health care and medical benefits, Nutritional status, Low cost foods.

UNIT II  12
A. Specialty foods based on sources; Cereals and millets, Legumes and pulses, Fruits and vegetables, Animal food sources, By product based, Non conventional foods.
B. Specialty foods based on process; Innovative process technology, Food additives basis, Bioactive components, Novel nutraceuticals products, Packaging techniques, Adaptable technology basis, Fast and PET foods.
C. Specialty foods based on growing condition - organic, inorganic farming.

UNIT III  9
Specialty food based on genetics ; Genetically modified foods, Transgenic foods, Biotechnological aspects of detoxification. Proprietary foods.Supplementary foods.

UNIT IV  9
Therapeutic foods ; Modification of diets in disorders, feeding purposes Disease oriented of different organs ex: digestive tract, liver, cardiovascular system, kidney , metabolic disorders, allergy, endocrine disorders.

UNIT V  6
Specific consumer oriented foods; Defence persons, Space / astronaut, High altitude mountain climbers, Disaster situation – crises, care, maintenance.

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE:
2. Parvinder S. Bali, “Food Production Operation”, Oxford University, 2014

IB7552  
CHEMICAL REACTION ENGINEERING  
L T P C  3 0 0 3

OBJECTIVES:
To provide the basic concepts of types of reactions, variable affecting the rate of reaction, predicting the rate equations for different types of reactions.

To provide the information about different reactor systems, deriving the performance equations and predicting the rate equations in chemical reaction engineering system.

UNIT I

SCOPE OF CHEMICAL KINETICS & CHEMICAL REACTION ENGINEERING

8

Broad outline of chemical reactors; rate equations; concentration and temperature dependence; development of rate equations for different homogeneous reactions. Industrial scale reactors.

UNIT II

IDEAL REACTORS

10

Isothermal batch, flow, semi-batch reactors; performance equations for single reactors; multiple reactor systems; multiple reactions.

UNIT III

IDEAL FLOW AND NON IDEAL FLOW

10

RTD in non-ideal flow; non-ideal flow models; reactor performance with non-ideal flow.

UNIT IV

GAS-SOLID, GAS-LIQUID REACTIONS

9

Resistances and rate equations; heterogeneous catalysis; reactions steps; resistances and rate equations.

UNIT V

FIXED BED AND FLUID BED REACTORS

8

G/L reactions on solid catalysis; trickle bed, slurry reactors; three phase-fluidized beds; reactors for fluid-fluid reactions; tank reactors.

TOTAL: 45 PERIODS

OUTCOMES:
The student will be able to

- Write the rate equation for any type of reaction.
- Design reactors for heterogeneous reactions and optimize operating conditions.
- Relate and calculate the conversions, concentrations and rates in a reaction and identify, formulate and solve chemical engineering problems.

TEXT BOOKS:


REFERENCES:


FT7001

BIO THERMODYNAMICS

L T P C

3 0 0 3

OBJECTIVES:

To introduce fundamental thermodynamic principles and their application.

OUTCOMES:

Students will learn laws of thermodynamics, thermodynamic property relations and their application to fluid flow, power generation and refrigeration processes.
UNIT I  THERMODYNAMIC LAW AND PROPERTIES OF FLUIDS  
First Law of thermodynamics, a generalized balance equation and conserved quantities, Volumetric properties of fluids exhibiting non ideal behavior; residual properties; estimation of thermodynamic properties using equations of state; calculations involving actual property exchanges; Maxwell’s relations and applications.

UNIT II  SOLUTION THERMODYNAMICS  
Partial molar properties; concepts of chemical potential and fugacity; ideal and non-ideal solutions; concepts and applications of excess properties of mixtures; activity coefficient; composition models; Gibbs Duhem equation.

UNIT III  PHASE EQUILIBRIA  
Criteria for phase equilibria; VLE calculations for binary and multi component systems; liquid-liquid equilibria and solid-solid equilibria.

UNIT IV  CHEMICAL REACTION EQUILIBRIA  
Equilibrium criteria for homogeneous chemical reactions; evaluation of equilibrium constant; effect of temperature and pressure on equilibrium constant; calculation of equilibrium conversion and yields for single and multiple reactions.

UNIT V  THERMODYNAMIC DESCRIPTION OF MICROBIAL GROWTH AND PRODUCT FORMATION  
Thermodynamics of microbial growth stoichiometry thermodynamics of maintenance, Calculation of the Operational Stoichiometry of a growth process at Different growth rates, Including Heat using the Herbert –Pirt Relation for Electron Donor, thermodynamics and stoichiometry of Product Formation

TOTAL: 45 PERIODS

TEXT BOOKS:  

REFERENCE:  

FT7013  POST HARVEST TECHNOLOGY  
AIM:  
The course aims to develop the knowledge of students in the area of post harvest processing of various foods and related technology. This course will enable students to appreciate the application of scientific principles in the processing of these materials.

OBJECTIVES:  
On completion of the course the students are expected to  
- Be able to understand and identify the specific processing technologies used for different foods and the various products derived from these materials.  
- Understand the application of scientific principles in the processing technologies specific to the materials.

OUTCOME:  

84
• Better understanding of the concepts of physiological characteristics of fruits and vegetables
• Better insight about fruit losses during storage and ways to prevent it.
• Thorough Knowledge and understandings of the specific processing technologies used for different foods and the various products derived from these materials.
• Understandings of the application of scientific principles in the processing technologies specific to the materials.

UNIT I  CEREALS AND PULSES  9
Cereal Grains- Basic agricultural aspects, structure and composition; Storage, Insect control; Processing: Wheat - milling, (Atta and maida), quality aspects of flour, wheat proteins and their function; wheat based baked products – Bread, Biscuit, Cakes, Extruded products, matling and malt products; Rice- Milling, Parboiling, Quick cooking rice. Pulses - Basic agricultural aspects, structure, composition, storage, insect control, processing-Milling/splitting, dhal milling, products – puffed, flakes, flour, soya milk, soy protein Isolate.

UNIT II  VEGETABLES AND FRUITS  9
Climatic and non climatic fruits, ripening process, phytonutrients in fruits and vegetables; Handling, transportation, controlled atmosphere ripening process, grading, cleaning, pre treatments, modified atmosphere packaging, chilling. General pre-processing, different freezing methods and equipments, problems associated with specific fruits and vegetables; Dehydration – General pre processing, different methods of drying, osmotic dehydration and other modern methods. Canning - General pre-processing, specific or salient points in fruits and vegetables like – Blanching, exhausting, processing conditions. Fruit Juice / pulp/ Nectar/Drinks, concentrates Vegetable Purees/pastes.

UNIT III  OIL SEEDS, NUTS AND SUGARS  9
Basic agricultural aspects structure, composition, Storage, Insect control; processing: traditional and modern methods of oil extraction, refining, hydrogenation; oil blends. Honey- Composition and Quality aspects; Sugars- Manufacture of table sugar, High Fructose corn syrup and Glucose syrup; Jaggery – sources, manufacture.

UNIT IV  MILK AND MILK PRODUCTS  9
Processing of Milk – Pasteurisation, homogenisation, sterilization, HTST and UHT processes; Processing and preservation of milk products - cream, sour cream, butter, ghee, skimmed 94 milk concentrate and skimmed milk powder, whey concentrate and whey powder, yoghurt, cheese and other products.

UNIT V  MEAT, FISH & POULTRY  9
Common and commercially important meats; pre and post slaughter handling, meat inspection and grading; animal welfare and safety in slaughter plant. Structure and composition of meat, carcass chilling, ageing; storage of fresh meat - Modified atmosphere packaging, packaging of retail cuts; Processing and preservation - artificial tenderizing, chilling, freezing, curing, smoking, ready-to-eat meats and meat products; Kosher and Halal certification. Marine and fresh water fish, shell fish - composition and nutrition; commercially important fish and shell fish; spoilage factors, ship board operations, storage and transport. Processing and Preservation - chilling, freezing, canning, smoking, curing, salting and drying, fish meal and fish oils. Types of poultry, production, classification & designation, grading. Processing plant operations - slaughter, bleeding, scalding, de-feathering, eviscerating, chilling, packaging; composition and nutrition, poultry meat products Eggs- structure, composition, quality factors, storage, pasteurization, freezing and drying, egg substitutes.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

FT7008 FUNCTIONAL FOODS AND NUTRACEUTICALS

OBJECTIVES:
- To understand the basic concepts of Nutraceuticals and functional food, their chemical nature and methods of extraction.
- To understand the role of Nutraceuticals and functional food in health and disease

OUTCOME:
- Knowledge of the basic concepts of Nutraceuticals and functional food, their chemical nature and methods of extraction
- Understand the role of Nutraceuticals and functional food in health and disease

UNIT I INTRODUCTION AND SIGNIFICANCE
Introduction to Nutraceuticals and functional foods; importance, history, definition, classification, list of functional foods and their benefits, Phytochemicals, zoo chemicals and microbes in food, plants, animals and microbes

UNIT II ANALYSIS OF PHYTOCHEMICALS
Qualitative and quantitative methods: phytoestrogens in plants; isoflavones; flavonols, polyphenols, tannins, saponins, lignans, Chitin; Carotenoids - Factors affecting bioavailability, chemical and histochemical characterization of cell wall polysaccharides in almond seed in relation to lipid bioavailability.

UNIT III ASSESSMENT OF ANTIOXIDANT ACTIVITY
In vitro and In vivo methods for the assessment of antioxidant activity, Comparison of different In Vitro methods to evaluate the antioxidant, Prediction of the antioxidant activity of natural phenolics from electrotopological state indices, Optimising phytochemical release by process technology; Variation of Antioxidant Activity during technological treatments, new food grade peptidases from plant sources
UNIT IV ROLE IN HEALTH AND DISEASE
Nutraceuticals and Functional foods in Gastrointestinal disorder, Cancer, CVD, Diabetic Mellitus, HIV and Dental disease; Importance and function of probiotic, prebiotic and symbiotic and their applications, Functional foods and immune competence; role and use in obesity and nervous system disorders.

UNIT V SAFETY ISSUES
Health Claims, regulations and safety issues- International and national.

TOTAL: 45 PERIODS

TEXT BOOKS:
5. Tipnis, H.P. “Bioavailability and Bioequivalence : An Update” New Age International,

REFERENCES:

GE7351 ENGINEERING ETHICS AND HUMAN VALUES
3 0 0 3

OBJECTIVES
• To emphasise into awareness on Engineering Ethics and Human Values.
• To understand social responsibility of an engineer.
• To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime -the challenger case study.

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES
safety and risk - risk benefit analysis and reducing risk - the Three Mile Island, Bhopal Gas plant and Chernobyl as case studies.

UNIT V GLOBAL ISSUES 12
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS

OUTCOMES
• Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in life-long learning with knowledge of contemporary issues.

TEXT BOOKS

REFERENCES

FT7018 TRADITIONAL FOODS L T P C 3 0 0 3

OBJECTIVES:
To help students acquire a sound knowledge on diversities of foods, food habits and patterns in India with focus on traditional foods.

OUTCOME:
• To understand the historical and traditional perspective of foods and food habits
• To understand the wide diversity and common features of traditional Indian foods and meal patterns.

UNIT I HISTORICAL AND CULTURAL PERSPECTIVES 9
Food production and accessibility - subsistence foraging, horticulture, agriculture and pastoralization, origin of agriculture, earliest crops grown. Food as source of physical sustenance, food as religious and cultural symbols; importance of food in understanding human culture - variability, diversity, from basic ingredients to food preparation; impact of customs and traditions on food habits, heterogeneity within cultures (social groups) and specific social contexts - festive occasions, specific religious festivals, mourning etc. Kosher, Halal foods; foods for religious and other fasts.

UNIT II TRADITIONAL METHODS OF FOOD PROCESSING 9

UNIT III TRADITIONAL FOOD PATTERNS 9
Typical breakfast, meal and snack foods of different regions of India. Regional foods that have gone Pan Indian / Global. Popular regional foods; Traditional fermented foods, pickles and preserves, beverages, snacks, desserts and sweets, street foods; IPR issues in traditional foods.

UNIT IV COMMERCIAL PRODUCTION OF TRADITIONAL FOODS 12
Commercial production of traditional breads, snacks, ready-to-eat foods and instant mixes, frozen foods – types marketed, turnover; role of SHGs, SMES industries, national and multinational companies; commercial production and packaging of traditional beverages such as tender coconut water, neera, lassi, buttermilk, dahi. Commercial production of intermediate foods – ginger and garlic pastes, tamarind pastes, masalas (spice mixes), idli and dosa batters.

UNIT V HEALTH ASPECTS OF TRADITIONAL FOODS 6
Comparison of traditional foods with typical fast foods / junk foods – cost, food safety, nutrient composition, bioactive components; energy and environmental costs of traditional foods; traditional foods used for specific ailments / illnesses.

TOTAL: 45 PERIODS

TEXT BOOKS:

FT7011 MANAGEMENT OF FOOD WASTE L T P C
3 0 0 3

OBJECTIVES:
• Importance of treating waste product from food industry.
• Treatment methods and recycling of waste product from food industry.

OUTCOMES:
• Awareness of Importance in treating waste product from food industry.
• Knowledge of Treatment methods and recycling of waste product from food industry.

UNIT I CLASSIFICATION & CHARACTERIZATION OF FOOD INDUSTRY WASTE 8
Classification and characterization of waste from various food industries; Need for treating waste from various food industries.

UNIT II WASTE FROM MEAT, DAIRY AND VEGETABLE PROCESSING INDUSTRY 9
Classification, analysis and disposal of waste from meat; Bioremediation and utilization of dairy waste. Treatment of water from fruit and vegetable processing industry.

UNIT III TREATMENT METHODS OF WASTE FROM FOOD INDUSTRY 9
Treatment methods for liquid waste from food industry; Design of activated sludge process, bioremediation, trickling filter process and Anaerobic Digestion Treatment methods for solid waste from food industry-drying, incineration and Design of solid waste management.

UNIT IV RECYCLING AND UTILIZATION OF WASTE PRODUCT FROM FOOD INDUSTRY
Treatment of water from food industry - BOD, COD, RO. Recovery of protein from potato starch plant, utilization of molasses, utilization of waste from meat and fish for live stock and poultry.

UNIT V REGULATORY ISSUES WITH FOOD INDUSTRY WASTE
International and national scenario on disposal of waste from food industries; Regulatory issues with food industry waste

TEXT BOOKS:

REFERENCES:

GE7071 DISASTER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management. TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
- Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

GE7074 HUMAN RIGHTS L T P C 3 0 0 3

OBJECTIVES :
- To sensitize the Engineering students to various aspects of Human Rights.


UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

GE7072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT

UNIT II REQUIREMENTS AND SYSTEM DESIGN

UNIT III DESIGN AND TESTING
- Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES: