## LIST OF OPEN ELECTIVES
TO BE OFFERED IN THE ODD SEMESTER (CEG / ACT CAMPUS)

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**DEPARTMENT OF APPLIED SCIENCE AND TECHNOLOGY**

**B.Tech. Petroleum Engineering and Technology**

**FACULTY OF SCIENCE AND HUMANITIES**

**DEPARTMENT OF CHEMISTRY**

B.E./B.Tech./B.Arch. students can take these electives.

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**DEPARTMENT OF ENGLISH**

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OBJECTIVES

- This course gives an opportunity for the students to know the various moral and ethical issues through various prominent theories. It educates the code of ethics as well as the industrial standards and how they can be used for ensuring safety and reducing the risk. The course enunciated the Rights and Responsibilities of individuals. Various other ethical global issues also have been explained along with case studies.

UNIT I HUMAN VALUES


UNIT II ENGINEERING ETHICS


UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics - A Balanced Outlook on Law – Case studies.

UNIT IV RESPONSIBILITIES, RIGHTS AND SAFETY


UNIT V GLOBAL ISSUES


TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, the student should be able to practice ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOK:

REFERENCES:
GI7591    GEO SPATIAL MAPPING    L T P C
3 0 0 3

OBJECTIVES:
- To introduce concepts of Cartography and GIS
- To expose the process of map making and production
- To introduce GIS data structures, data input and data presentation

UNIT I    ELEMENTS OF CARTOGRAPHY    9
Definition of Cartography - Maps - functions - uses — Types of Maps – Map Scales and Contents – Map projections – shape, distance, area and direction properties – perspective and mathematical projections – Indian maps and projections – Map co-ordinate systems – UTM and UPS references

UNIT II    MAP DESIGN AND PRODUCTION    9

UNIT III    FUNDAMENTALS OF GIS    9

UNIT IV    DATA INPUT AND TOPOLOGY    9

UNIT V    DATA OUTPUT AND QUALITY    9
Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability - OGC - Spatial Data Infrastructure - -Data Output - Map Compilation – Chart/Graphs – v

OUTCOMES:
At the end of the course, the student shall
- Be familiar with appropriate map projection and co-ordinate system for production of Maps and shall be able to compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations
- Understand the basic concepts and components of GIS, the techniques used for storage of spatial data and data compression
- Understand the concepts of spatial data quality and data standard

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the concepts of remote sensing processes and its components.
- To expose the various remote sensing platforms and sensors and to introduce the elements of data interpretation

UNIT I REMOTE SENSING AND ELECTROMAGNETIC SPECTRUM

UNIT II EMR INTERACTION WITH ATMOSPHERE
Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere - Scattering (Rayleigh, Mie, non-selective scattering) absorption and refraction – Atmospheric effects on visible, infrared, thermal and microwave spectrum – Atmospheric windows.

UNIT III EMR INTERACTION WITH EARTH

UNIT IV PLATFORMS AND SENSORS

UNIT V DATA PRODUCTS AND VISUAL INTERPRETATION

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The characteristics of electromagnetic radiation and its interaction with earth features
- The types and configuration of various satellites and sensors
- The elements of data interpretation

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

- To expose the students to the basic concepts and fundamental knowledge in Farm Management
- Farm financial analysis investment and budgeting for farms.

UNIT I  FARM MANAGEMENT  9
Farm management - need and analysis – scope – Definitions – objectives – Farm management and its relationship with other sciences – Farm management decisions – farm business organizations – factors influencing the size of the farm.

UNIT II  FARM PLANNING AND BUDGETING  9

UNIT III  FARM RECORDS AND ACCOUNTANCY  9

UNIT IV  MANAGEMENT OF FARM RESOURCES  9

UNIT V  APPLICATION OF TECHNIQUES TO FARM MANAGEMENT  9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:

- To introduce the student to the concept of hydrological aspects of water availability and requirements. At the completion of the course the student should be able to quantify, control and regulate the water resources.

UNIT I  ATMOSPHERIC WATER SYSTEM

UNIT II  HYDROLOGIC PROCESSES

UNIT III  RUNOFF
Watershed, catchment and basin – Catchment characteristics – factors affecting runoff - Runoff estimation using empirical – Strange’s table and SCS methods – Stage discharge relationships – Flow measurements – Hydrograph – Unit Hydrograph

UNIT IV  GROUNDWATER AND RAIN WATER HARVESTING
Origin – Classification and properties of aquifers – Groundwater potential – Darcy’s law - Importance - RWH in rural and urban areas - RWH from building roof and open areas Direct storage sumps - RWH structures

UNIT V  FLOODS AND DROUGHTS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EE7591  INTRODUCTION TO CONTROL SYSTEMS
AIM
To learn the concepts of linear Systems theory and its analysis.

OBJECTIVES
To impart knowledge on Different system representation, block diagram reduction and Mason’s rule.

- Time response analysis of LTI systems and steady state error.
- The open loop and closed loop frequency responses of systems
- Stability concept.
- State variable analysis.
UNIT I MATHEMATICAL MODELS OF PHYSICAL SYSTEMS 9
Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction— Signal flow graphs.

UNIT II TIME RESPONSE ANALYSIS & ROOT LOCUS TECHNIQUE 9

UNIT III FREQUENCY RESPONSE ANALYSIS 9
Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.

UNIT IV STABILITY CONCEPTS & ANALYSIS 9

UNIT V STATE VARIABLE ANALYSIS 9
Concept of state – State Variable & State Model – State models for linear & continuous time systems – Solution of state & output equation – controllability & observability.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

EE7592 FUNDAMENTALS OF SOFT COMPUTING

AIM
To cater the knowledge of Neural Networks, Fuzzy Logic Control, Genetic Algorithm and Evolutionary Programming and their applications for controlling real time systems.

OBJECTIVES
- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
- To provide adequate knowledge of application of fuzzy logic control to real time systems.
- To expose the ideas of GA and EP in optimization and control
UNIT I ARCHITECTURES – ANN

UNIT II NEURAL NETWORKS FOR CONTROL

UNIT III FUZZY SYSTEMS AND FUZZY LOGIC CONTROL

UNIT IV OPTIMIZATION TECHNIQUES

UNIT V APPLICATION OF FLC
Fuzzy logic control – Inverted pendulum – Image processing – Home heating system – Blood pressure during anesthesia – Introduction to neuro fuzzy controller.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME7591 COMPUTATIONAL MECHANICS OF FLUIDS L T P C
3 0 0 3

OBJECTIVES:
- This course aims to introduce numerical modeling and its role in the field of heat, fluid flow and combustion it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.
- To develop finite volume discretised forms of the CFD equations.
- To formulate explicit & implicit algorithms for solving the Euler Equations & Navier Stokes Equations.

PRE-REQUISITE:
Students should have good exposure to Partial Differential equations. Students must know the basics of Fluid Mechanics and Heat transfer.
UNIT I  GOVERNING DIFFERENTIAL EQUATIONS AND DISCRETISATION 8
TECHNIQUES

UNIT II  DIFFUSION PROCESSES: FINITE DIFFERENCE AND FINITE 12
VOLUME METHODS

UNIT III  CONVECTION – DIFFUSION PROCESSES: FINITE VOLUME METHOD 9
One dimensional convection – diffusion problem, Central difference scheme, upwind scheme – Hybrid and power law discretization techniques.

UNIT IV  FLOW PROCESSES: FINITE VOLUME METHOD 8
Discretisation of incompressible flow equations – Pressure based algorithms, SIMPLE, SIMPLER & PISO algorithms

UNIT V  TURBULENCE AND ITS MODELLING 8
Description of turbulent flow, free turbulent flows, flat plate boundary layer and pipe flow. Algebraic Models, One equation model, k – ε & k – ω models Standard and High and Low Reynolds number models.

TOTAL: 45 PERIODS

OUTCOME:
☐ On successful completion of this course the student will be able to apply concept of CFD to analyse flow in thermal systems.

REFERENCES
OBJECTIVES:
- To understand the basic concepts of Product Design and Process Development.
- To appreciate the importance and learn various stages of design, creation, selection and development of concepts, managing the processes and prototyping of products.

UNIT I INTRODUCTION TO PRODUCT DESIGN

UNIT II IDENTIFYING CUSTOMER NEEDS, PRODUCT SPECIFICATIONS
Identification of Customer Needs: Data Collection from customers; interpretation of raw data of customer needs; organization of the needs into a hierarchy; establishment of relative importance of needs; reflecting on the results and the process. Product Specifications: Establishment of Target and Setting up of Final Specifications – Case Studies.

UNIT III CONCEPT GENERATION, SELECTION, TESTING

UNIT IV PRODUCT ARCHITECTURE, INDUSTRIAL DESIGN, DESIGN FOR MANUFACTURE

UNIT V PROTOTYPING AND PRODUCT DEVELOPMENT ECONOMICS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Launch own ideas and the ideas of others, which would enable them to manage to work with innovation and development in large companies
- Apply new theories on innovation and change, including emerging paradigms such as user- driven innovation, open innovation and market forecasting in practice.

TEXT BOOK:

REFERENCES:
IE7591 INTRODUCTION TO INDUSTRIAL ENGINEERING  L T P C
3   0   0   3

OBJECTIVE:
The objective of this course is to provide foundation in Industrial Engineering in order to enable the students to make significant contributions for improvements in diverse organisations.

UNIT I INTRODUCTION 9

UNIT II PLANT LOCATION AND LAYOUT 9

UNIT III WORK SYSTEM DESIGN 9

UNIT IV STATISTICAL QUALITY CONTROL 9

UNIT V PRODUCTION PLANNING AND CONTROL 9

TOTAL: 45 PERIODS

OUTCOME:
The students will acquire knowledge on the basics of Industrial Engineering and they will apply these fundamentals knowledge to solve practical problems in different organisations.

TEXT BOOK:

REFERENCES:

IE7592 QUANTITATIVE TECHNIQUES FOR DECISION MAKING  L T P C
3   0   0   3

OBJECTIVES:
On successful completion of the course the students should be able:
• To Formulate LP and find optimal solution. Also resolve transportation and assignment problems.
• To find optimal solutions for Network problems.
• To design inventory system for a production environment.
• To design a queue system and solve practical problems.
• To apply the probability techniques in the decision making.
UNIT I  LINEAR PROGRAMMING PROBLEMS

UNIT II  NETWORK MODELS

UNIT III  INVENTORY MODELS
Purchase model with no shortages – manufacturing model with no shortage – Purchase model with shortage – Manufacturing model with shortages – model with price breaks - Probabilistic inventory model.

UNIT IV  QUEUING MODELS
Queueing theory terminology – Single server, multi server, Limited queue capacity – applications – Markov chains

UNIT V  DECISION THEORY
Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis. Game Theory - Two person zero sum games, pure and mixed strategies – graphical solution – solving by LP.

TOTAL:45 PERIODS

OUTCOMES:
- LP formulation and solutions. Solutions to Transportation and Assignment problems.
- Optimal solutions for Network problems.
- Design of inventory system for a production environment.
- Design of a queue system and solve practical problems.
- Application of the probability techniques in the decision making.

TEXT BOOKS:

REFERENCES:

MF7591  ELECTRONICS PACKAGING TECHNOLOGY

OBJECTIVES:
- To impart knowledge on wafer preparation and PCB fabrication, the types of electronic packaging methods and components for electronics assembly & SMT process.
- To make out various Defects, Inspection Equipments in SMT assembly process and repair, rework and quality aspects of Electronics assemblies.
UNIT I  INTRODUCTION TO ELECTRONICS PACKAGING

History, definition, wafer preparation - crystal growth, crystal trimming and grinding, wafer slicing, edge rounding, lapping, etching, policing, laser inspection.
Printed circuit boards, types- single sided, double sided, multi layer and flexible printed circuit board, design, materials, manufacturing, inspection.
Electronic Packaging - Through hole technology(THT), Surface mount technology(SMT) and Mixed technology

UNIT II  ELECTRONIC COMPONENTS AND PACKAGING

Through hole components – axial, radial, multi leaded, odd form. Surface-mount components- active, passive. Interconnections - chip to lead interconnection, die bonding, wire bonding, TAB, flip chip, chip on board, multi chip module, direct chip array module, leaded, leadless, area array and embedded packaging, package marking and testing, miniaturization and trends.

UNIT III  SURFACE MOUNT TECHNOLOGY PROCESS

SMT equipment and material handling systems, handling of components and assemblies - moisture sensitivity and ESD, safety and precautions needed, IPC and other standards, stencil printing process - solder paste material, storage and handling, stencils and squeegees, process parameters, quality control. Component placement- equipment type, packaging of components for automated assembly, soldering- wave soldering, reflow process, process parameters, profile generation and control, lead free soldering, adhesive, underfill and encapsulation process

UNIT IV  INSPECTION AND TESTING OF POPULATED PCBs

Defects and Corrective action - stencil printing process, component placement process, reflow soldering process,

UNIT V  REPAIR, REWORK, QUALITY AND RELIABILITY OF ELECTRONICS ASSEMBLIES

Repair tools, methods, rework criteria and process - coating removal, conductor repair, base board repair, Reliability fundamentals, reliability testing, failure analysis, design for manufacturability, assembly, testing, reliability, and environment.

OUTCOMES:
- Upon completion of this course, the students will have a better understanding of assembly of PCBs and to perform quality inspection and repair & rework on the Printed Circuit Board Assembly.

TEXT BOOKS:

REFERENCES:
MF7592 SUSTAINABLE DEVELOPMENT AND MANUFACTURING

OBJECTIVES:
To impart knowledge on the principles of balancing social, economic and environmental dimensions for the development and the associated international and national frameworks. To impart knowledge on the creation of manufactured products that use processes that are non-polluting, conserve energy and natural resources, and are economically sound and safe for employees, communities and consumers.

UNIT I SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL ISSUES

UNIT II SUSTAINABLE DEVELOPMENT INDICATORS

UNIT III SOCIAL DIMENSIONS

UNIT IV SUSTAINABLE MANUFACTURING

UNIT V ENERGY, ENVIRONMENT AND ECONOMICS OF SUSTAINABLE MANUFACTURING

TOTAL :45 PERIODS

OUTCOME:
Upon completion of this course, the students will have a better understanding of the concept of sustainable development and be able to create products that use processes that are non-polluting, conserve energy and natural resources, and are economically sound and safe for people.
TEXT BOOKS:

REFERENCES:

PT7591 DIGITAL PHOTOGRAPHY  L T P C  3 0 0 3

OBJECTIVES
The students should be made to:
- Understand the principles of digital photography and its applications.
- Learn about Lighting techniques and image editing soft wares
- Gain knowledge on the different techniques and genres of photography

UNIT I INTRODUCTION
9

UNIT II LIGHT AND LIGHTING TECHNIQUES
9

UNIT III PHOTOJOURNALISM
9
Introduction to photojournalism, Documenting, Presenting news using photographs, Different types of photojournalism, Picture editing for Newspaper and magazines, Role of a photo editor, Telling stories through pictures, Ethics in Photojournalism.

UNIT IV DIGITAL RETOUCHING AND DIGITAL OUTPUT
9
Image size and Resolution, Selection of Tools and Techniques for Digital Manipulation, Image compression and file formats. Selective Effects to images and filters, Image Processing software – Adobe Photoshop; Color and Tonal value correction, Ethics in image editing; Evaluating an image and imaging problems.

UNIT V GENRES OF PHOTOGRAPHY AND PORTFOLIO MAKING
9
Black and white photography, Wildlife photography, Landscape, Cityscape, Architecture, Advertising, Fashion, Food, Automobile, Sports, Travel, Children, Thematic photography, Portfolio making, Case studies and Photography in online applications.

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the student should be able to:

- Use appropriate techniques for acquiring digital images.
- Edit and Retouch a digital Image.
- Design a portfolio with digital photography.

TEXT BOOKS:

REFERENCES:

PT7592 CREATIVITY AND INNOVATION L T P C

OBJECTIVES
The students should be made to:

- Understand the nuances involved in Creativity & Innovation.
- Get hands on experience in applying creativity in problem solving.

UNIT I INTRODUCTION
Need for Creative and innovative thinking for quality, components of Creativity, Methodologies and approaches, individual and group creativity, organizational role in creativity, types of innovation, barriers to innovation, innovation process, establishing criterion for assessment of creativity & innovation.

UNIT II THINKING AND VISUALIZATION
Definitions and theory of functioning of mind heuristics and models: attitudes, Approaches and Actions that support creative thinking - Advanced study of visual elements and principles- line, plane, shape, form, pattern, texture gradation, color psychology & symmetry. Techniques to enhance visualization – provocation, cross fertilize, mastermind, OPV, Brain gym.

UNIT III CREATIVITY

UNIT IV CREATIVE PROBLEM SOLVING
Generating and acquiring new ideas, product design, service design – case studies and hands-on exercises, stimulation tools and approaches, six thinking hats, lateral thinking – Individual activity, group activity, Brainstorming, Brain writing.

UNIT V INNOVATION

OUTCOME:
Upon completion of the course, the student should be able to:

- Apply his/her creative and innovative skills in solving complex problems confronting corporate realm.
TEXT BOOK

REFERENCES
1. Geoffrey Petty, "How to be better at Creativity", The Industrial Society, 1999

MI7591 TUNNELLING ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basic concept of tunnelling & ground improvement techniques
- Students will be able to understand the fundamentals design of tunnels
- Students will be able to recognize the different types of tunnelling methods, operations and equipment.

UNIT I INTRODUCTION
Terminology & general aspects, historical developments of tunnelling, classification of tunnelling methods, merits and demerits, conditions favourable for tunnel construction - parameters influencing location, shape and size; surface and subsurface conditions; planning and site investigations like geology, hydrogeology, geological disturbances etc.,

UNIT II GEOMECHANICS
Classification and characterisation of rock mass and soil, in-situ determination of engineering properties of rock mass, geotechnical exploration for soil profile, effect of geological structures on tunnel excavation, stress analysis using numerical methods; instrumentation and measurements in tunnelling.

UNIT III CONVENTIONAL TUNNELLING METHODS
Factors affecting choice of excavation technique; various tunnelling methods - soft ground and hard rock, shallow tunnelling, deep tunnelling; Scaling factor using their properties in tunnel design; Operation cycles in conventional tunnelling; selection of drilling equipment, drilling tools, drillability factors; types of drilling patterns and vertical drilling; selection of blasting techniques - explosives, initiators,; blast design, tunnel blast performance - powder factor, equipment selection for mucking and transportation.

UNIT IV MODERN TUNNELLING METHODS
Tunnelling by roadheaders and impact hammers - cutting principles, method of excavation, selection, limitations and technical problems, tunnel boring machines - boring principles, method of excavation, selection, performance, limitations and technical challenges, scope of application, special methods - New Austrian tunnelling; Immersed tunnelling, micro tunnelling, tunnel jacking, technical considerations and limitations.

UNIT V SUPPORTS, VENTILATION AND SAFETY
Ground squeeze, rock burst, types of supports, design and selection of support - lining, rock bolt, grouting, ground treatment in tunnelling, tunnel ventilation systems during and after completion - methods of ventilation, air conditioning, tunnelling utilities - lighting and drainage of tunnels, risk management of tunnelling; Safety aspects in road, rail tunnels and metro tunnels.

OUTCOMES
The students will able to design the tunnel for the given geo-technical conditions and choose the type of the equipment and operations.
REFERENCES

CS7591 PYTHON PROGRAMMING

OBJECTIVES:
- To introduce Object Oriented Programming using an easy-to-use language.
- To use iterators and generators.
- To test objects and handle changing requirements.
- To be exposed to programming over the web.

UNIT I INTRODUCTION TO PYTHON
9

UNIT II STRINGS
9
Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions - Verbose - Case Studies

UNIT III CLASSES
9
Closures - List of Functions - List of Patterns - File of Patterns - Generators - Defining Classes - Instantiating Classes - Instance Variables - Iterators – Itertools - Assert - Generator Expressions

UNIT IV FILES
9
Reading and Writing Text Files - Binary Files - Stream Objects - Standard Input, Output and Error.

UNIT V XML and SERIALIZATION
9
XML - Atom Feed - Parsing HTML - Searching for Nodes - html - Generation - Serializing Objects - Pickle Files - Versions - Debugging - Serializing to JSON

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Understand the concepts of object oriented programming.
- Use generators and iterators
- Develop test cases and handle refactoring.
- Use objects to program over the web.
TEXTBOOKS:

REFERENCES:

CS7592 WEB DESIGN AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
To understand the issues and process of Web design.
- To learn the concepts of Web design patterns and page design.
- To understand and learn the scripting languages with design of web Applications.
- To learn the maintenance and evaluation of web design Management.

UNIT I SITE ORGANIZATION AND NAVIGATION 8

UNIT II ELEMENTS OF PAGE DESIGN 9

UNIT III SCRIPTING LANGUAGES AND ANIMATION USING FLASH 10

UNIT IV PRE-PRODUCTION MANAGEMENT 9

UNIT V PRODUCTION, MAINTENANCE AND EVALUATION 9
Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study:- Using the skills and concepts learnt with the ADOBE IMAGEREADY, DREAMWEAVER, FLASH, and scripts

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify the various issues of web design process and evaluation.
- Determine templates for web pages and layout.
• Develop simple web applications using scripting languages.
• Determine the various issues of web project development.
• Address the core issues of web page maintenance and evaluation.

REFERENCES:

EC7591   CONSUMER ELECTRONICS       L T P C    3 0 0 3

UNIT I   CONSUMER ELECTRONICS FUNDAMENTALS     9
History of Electronic Devices- Vacuum Tubes, Transistors, Integrated Circuits- Moorse Law,
Semiconductor Devices, Diodes, Rectifiers, Transistors, Logic Gates, Combinational Circuits,
ADC, DAC and Microprocessors, Microprocessor Vs Microcontrollers, Microcontrollers in
consumer electronics, Energy management, Intelligent Building Perspective.

UNIT II   ENTERTAINMENT ELECTRONICS   9
Audio systems: Construction and working principle of : Microphone, Loud speaker, AM and FM
receiver, stereo, 2.1 home theatre, 5.1 home theatre . Display systems: CRT, LCD, LED and
Graphics displays  Video Players : DVD and Blue RAY. Recording Systems: Digital Cameras and
Camcorders.

UNIT III   SMART HOME     9
Technology involved in Smart home, Home Virtual Assistants- Alexa and Google Home. Home
Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and
Image Sensors, PIR, IR and Water Level Sensors.

UNIT IV   HOME APPLIANCES 9
Home Enablement Systems: RFID Home, Lighting control, Automatic Cleaning Robots, Washing
Machines, Kitchen Electronics- Microwave, Dishwasher, Induction Stoves, Smart Refrigerators,
Smart alarms, Smart toilet, Smart floor, Smart locks.
UNIT V COMMUNICATION SYSTEMS
Cordless Telephones, Fax Machines, PDAs- Tablets, Smart Phones and Smart Watches. Introduction to Smart OS- Android and iOS. Video Conferencing Systems- Web/IP Camera, Video security, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems.

TEXT BOOKS:

EC7592 PRINCIPLES OF MODERN COMMUNICATION SYSTEM
UNIT I The evolution of electronic communication: From smoke signals to smart phones - History of communications: Theoretical Foundations, Development & Applications - Frequencies for communication - Frequency regulations - Overview of communication transmitter and receiver.
UNIT III Wireless Communication: Introduction - Bluetooth - Infrared communication - IEEE Wireless LANs (Wi-Fi) - IEEE 802.16 (WiMaX) - Future mobile and wireless networks: Introduction to 5G- device to device communication- IoT.

REFERENCES:
4. Education India, 2010
OBJECTIVES:

- To have a clear understanding of the concepts of Telemedicine, including basic terminologies, services, impact and challenges of telemedicine.
- To understand the generic architecture of telemedicine systems and Constituents of each sub-system of telemedicine.
- To know the computer and networking technologies for telemedicine.
- To understand health records and data management for health care services.
- To implement and understand clinical cum technical aspects of telemedicine.

UNIT I INTRODUCTION TO TELEMEDICINE 9

UNIT II ARCHITECTURE OF TELEMEDICINE SYSTEMS 9

UNIT III COMPUTER AND NETWORKING TECHNOLOGIES FOR TELEMEDICINE 9

UNIT IV DATA AND INFORMATION STANDARDS IN TELEMEDICINE 9

UNIT V CLINICAL AND TECHNICAL ASPECTS OF TELEMEDICINE 9

TOTAL: 45 PERIODS

OUTCOMES:

- Demonstrates understanding of the underlying technology principles of a telemedicine system (TMS).
- Demonstrates awareness of the main approaches to providing remote solutions to deliver patient care.
- Evaluate the process and business considerations when defining and implementing a TMS in the remote.
TEXT BOOKS:

REFERENCES:

BM7592 ELECTRONICS IN MEDICINE L T P C
3 0 0 3

UNIT I ELECTRONICS IN CARDIOLOGY 9
Physiology of Heart and its abnormalities, Cardiac Monitoring and Recording Devices- ECG, Pacemaker, Defibrillators, Counter pulsation technique, Intra aortic balloon pumping and prosthetic heart valves and Imaging for cardiovascular system.

UNIT II ELECTRONICS IN NEUROLOGY 9
Neurons and its abnormalities, EEG, Evoked response – Auditory and Visual sensory, Polysomnography, nerve stimulator and Imaging for brain disorders.

UNIT III ELECTRONICS IN NEPHROLOGY 9
Nephrons and its abnormalities, Principle of Haemodialysis, Membrane, Dialysate, Different types of heamodialysers, Artificial kidney, Lithotripsy.

UNIT IV ELECTRONICS IN CIRCULATORY SYSTEM 9

UNIT V ELECTRONICS IN VISUAL AND AUDITORY SYSTEM 9
Anatomy of eye and its abnormalities, Laser in ophthalmology, Ear and it abnormalities Types of Deafness, Audiometer, Hearing Aids and cochlear implants.

TOTAL: 45 PERIODS

REFERENCES:
OBJECTIVES:

- To learn the characteristics of mobile applications.
- To learn about the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn development of mobile applications.

UNIT I INTRODUCTION

UNIT II USER INTERFACE

UNIT III TOOLS
Google Android Platform – Android Application Architecture – Android Studio – Android Widgets and Menus – Event handling – Packaging and Deployment - Apple iPhone Platform

UNIT IV APPLICATION DESIGN

UNIT V APPLICATION DEVELOPMENT
Storing and Retrieving data – Communication via the Web – Notification and Alarms – Telephony – Location based services – Apps with Firebase Real Time Database – Project on respective Discipline.

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:

- To design and implement the user interfaces for mobile applications.
- To design the mobile applications that is aware of the resource constraints of mobile devices.
- To develop advanced mobile applications that accesses the databases and the web.
- To develop useful mobile applications in the current scenario using Google Android Studio.

TEXT BOOKS:

REFERENCES:
2. Professional mobile Application Development paperback,2012 Jeff Mcherter (Author),Scott Gowell (Author), Wiley India Private Limited
7. Pro iOS Table Views: for iPhone, iPad and IPod Touch Paperback,2012, Tim Duckett, Apress
IT7592  INFORMATION TECHNOLOGY ESSENTIALS  L T P C

3 0 0 3

OBJECTIVES:
• To introduce the principles required for building web applications.
• To provide working knowledge of the technologies needed for web application development.
• To know about scripting languages.
• To understand principles of database access and storage.
• To understand various applications related to Information Technology.

UNIT I  WEB ESSENTIALS  9

UNIT II  SCRIPTING ESSENTIALS  9

UNIT III  DATABASE ESSENTIALS  9
Database management - Database terms - MySQL - commands – Data types – Indexes – Functions – Accessing MySQL using PHP.

UNIT IV  NETWORKING ESSENTIALS  9
Fundamental computer network concepts - Types of computer networks - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components

UNIT V  APPLICATION ESSENTIALS  9
Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

TOTAL: 45 PERIODS

OUTCOMES:
Student will be able to
• Design and deploy web-sites
• Design and deploy simple web-applications
• Create simple database applications
• Develop an information system
• Describe the basics of networking
AIM
• This course aims at introducing the fundamentals of chemistry and technology of leather manufacture.

OBJECTIVES
• Through this course the student gains an appreciation of the underpinning science and technology involved in manufacturing of leathers.

UNIT I RAW MATERIALS AND PRESERVATION 5
Origin and characteristics of hides and skins; Categories of livestock; Grading systems; Defects in hides and skins; Various preservation techniques and their principles.

UNIT II PRETANNING PROCESSES 10
Principles and objectives of beamhouse processes viz., soaking, liming, reliming, deliming, bating, pickling, depickling and degreasing.

UNIT III TANNING PROCESSES 10
Definition and objectives of tanning; Types and basic chemistry of vegetable tannins; Basic chemistry of basic chromium sulfate; Principles involved in vegetable and chrome tanning and their mechanism in brief; Combination tannages.

UNIT IV POST TANNING PROCESSES 10
Types of syntans; Basic chemistry of phenolic and acrylic syntans; Types of fatliquors: Basic chemistry of fatliquors; Types of dyes; Basic chemistry of acid, basic, direct and metal complex dyes; Principles and objectives of post tanning processes viz., neutralisation, retanning, dyeing and fatliquoring; Various unit operations involved.

UNIT V FINISHING TECHNIQUES 10
Types of binders; Basic chemistry of protein, resin and PU binders; Types of pigments; Basic characteristics of pigments; Basic theory of coating; Principles and objectives of finishing; Classification of finishing; Types of auxiliaries and finishes.

TOTAL : 45 PERIODS

TEXT BOOKS:
REFERENCE

LT7592 SKIN PROTEINS

AIM
- To understand the basic structure and function of skin and its components

OBJECTIVES
- To study the structural organization and histological characteristics of skin
- To study the structure and properties of various biomolecules present in skin
- To study the basic characteristics of enzymes and proteins involved in the maintenance of skin integrity
- To study the nature, biosynthesis, characteristics, structure and functions of collagen and the role of temperature in the stability of collagen and collagen degradation

UNIT I STRUCTURE, CHARACTERISTICS AND FUNCTIONS OF SKIN 6
Organization of skin components in different animals; Structure and function of epidermis, dermis, cutaneous and subcutaneous tissues; hair; fat tissue; nerve; erectopilli muscle; sweat glands; Histological characteristics of Cow, Ox, Buff, Cow Calf, buff calf, Goat and Sheep; Functions and properties of hides and skins.

UNIT II COMPOSITION OF HIDES AND SKINS 8
Chemical constituents of hides and skins; Fibrous and non-fibrous proteins in skin; Structure and properties of mono, di, iligo and polysaccharides; complex carbohydrates; Structure and properties of Fatty acids, Glycerolipids, phospholipids, sphingolipids, glycolipids, steroids; Structure, function and properties of amino acids

UNIT III STRUCTURE, FUNCTION, THERMAL TRANSITION AND DEGRADATION OF COLLAGEN 12
Structure; function and chemical features of collagen; Types of collagen; Tropocollagen molecules; Sub-units of collagen; Kinetics of fibril formation; precipitated forms of collagen; Electron microscopy of the collagen fibre; Biosynthesis; Denaturation temperature; Mechanism of denaturation process; Thermal shrinkage; Factors influencing melting transition; Degradation of collagen - collagenases; Physico - chemical properties methodology, mechanism of action.

UNIT IV ENZYMES AND PROTEINS IN SKIN 13
General and Physical Chemistry of enzymes & proteins in animal skin; Enzyme classification and their functions; enzyme kinetics; Protein classifications; Reactions of proteins with acids, bases and salts; Protein purification; Structural organization of proteins; Reactive groups; Cross linking.

UNIT V RESOURCES FOR HIDES AND SKINS 6
Trends in meat production and consumption practices; Fallen animal recovery systems; Availability of hides and skins in the global scenario; Types of animal byproducts - from abattoirs, meat processing plants, poultry, fishing and other sources. Present methods of collection, processing and utilization in developing countries vis - a - vis developed countries. Flaying of animals

TOTAL : 45 PERIODS
TEXT BOOKS

TT7591  BASICS OF TEXTILE TECHNOLOGY  L T P C
3 0 0 3

OBJECTIVES
- To enable the students to learn about the basics of fibre forming, yarn production, fabric formation, coloration of fabrics and garment manufacturing

UNIT I  BASICS OF FIBRE SCIENCE AND SPINNING  9
Definition of fibre, classification of textile fibers; sequence of machineries in short staple yarn spinning from ginning to cone winding and their objectives; yarn numbering system

UNIT II  BASICS OF WOVEN FABRIC PRODUCTION  13
Woven fabric – warp, weft, weaving, path of warp; looms – classification, handloom and its parts, powerloom, automatic looms, shuttleless looms, special type of looms; preparatory machines for weaving process and their objectives; basic weaving mechanism - primary, secondary and auxiliary mechanisms

UNIT III  BASICS OF NON WOVEN AND KNITTED FABRIC PRODUCTION  5

UNIT IV  BASICS OF CHEMICAL PROCESSING  13
Objectives of the processes - singeing, desizing, scouring, bleaching, mercerization; dyeing-classification of dyes, types of dyeing techniques; printing - types and styles of printing; finishing treatments – chemical and mechanical finishing.

UNIT V  BASICS OF GARMENT MANUFACTURING  5
Anthropometry, basic principles of pattern making and grading, marker planning, spreading, cutting, sorting, sewing, finishing and packing.

TOTAL PERIODS: 45

OUTCOMES:
- On completion of this course, the students shall have the knowledge on the basics of yarn formation, weaving the yarns into fabrics, coloration of the fabrics and manufacturing of garments.

TEXT BOOKS
OBJECTIVES

- To enable the students to learn about different types of fibres, their production, physical and chemical characteristics

UNIT I
Classification of fibres; definition of fibres; cotton, jute, flax fibres – cultivation, physical and chemical properties

UNIT II
Protein fibres – wool, silk, production, physical and chemical properties

UNIT III
Synthetic fibres – polyester, nylon, acrylic, polyurethanes, polypropylene, polyethylene – production, physical and chemical properties

UNIT IV
Manmade fibres – Viscose, modified viscose, modal, tencel and other metallic and non-metallic fibres – production, physical and chemical properties

UNIT V
Introduction to high performance fibres; Identification of textile fibres; specification of fibres

TOTAL: 45 PERIODS

OUTCOMES:
On completion of this course, the student would know about
- Different types of textile fibres, their method of production, physical and chemical characters
- Identification of a textile fibres

TEXT BOOKS

AIM

- The course is aimed to enable the students to have a complete knowledge on the basics of mineralogy, different raw materials, Fibers and Composites used commonly in ceramic industries.

OBJECTIVES
On completion of the course the students are expected to
- Have learnt about clay formation, clay minerals and types of clays.
- Have studied the different types of fluxes and their characteristics.
- Have learnt the types of silicate minerals, their properties and uses.
- Have an understanding on other ceramic raw materials, their properties and uses.
- Have studied the structural characteristics and properties of oxide, carbide, nitride, carbon and other ceramic materials used for structural applications.
- Have a knowledge about Ceramic Fibers, processing methods, testing and applications of ceramic matrix composites.
UNIT I  SILICA AND ALUMINO-SILICATES
Silica - quartz & quartzite; polymorphic transformation; properties. Clay - kaolinite & Montmorillonite minerals; occurrence; types-ball clay, china clay, fire clay, bentonite clay, brick clay; properties-charged nature, cation exchange capacity, plasticity. Fluxes - composition and properties of feldspar group, nepheline syenite; other fluxes-bone ash, lithium containing minerals.

UNIT II  OXIDE CERAMICS
Occurrence, Properties and applications of alumina, zirconia, magnesia, chrome, titania, thoria, mullite, copper oxide superconductors

UNIT III  NON-OXIDE CERAMICS
Structural characteristics, properties and applications of silicon carbide, boron carbide, tungsten carbide, titanium carbide. Structural characteristics properties and applications of silicon nitride, boron nitride, titanium nitride, aluminum nitride.

UNIT IV  CERAMIC FIBERS
Fibers - definition; manufacturing techniques, properties and applications of Glass fibres, Alumina fibres, mullite fibres, zirconia fibres, boron fibres, carbon fibres and graphite fibres. Whisker - definition; formation mechanisms, SiC and Si₃N₄ whiskers; properties.

UNIT V  CERAMIC MATRIX COMPOSITES

REFERENCES
1. Mc Colm, Ceramic Science for Materials Technologists, Blackie & Sons Ltd., Glasgow, 1983.

CT7592  PROCESSING OF CERAMICS  L T P C
3 0 0 3

AIM
- The course is aimed to enable the students to have a thorough knowledge about the different ceramic fabrication process and the advanced processing techniques in ceramics.

OBJECTIVES
On completion of the course the students are expected to
- Have a thorough knowledge on the preparation of ceramic powder by mechanical and chemical methods.
- Have studied the types & role of additives in various ceramic forming processes.
- Have a better understanding on the mechanisms of sintering and grain growth during sintering.
- Have learnt the advanced processing and sintering.

UNIT I  POWDER PREPARATION
UNIT II ADDITIVES
Types of additives in ceramic forming – solvents, dispersant, binder, plasticizer, other additives. Effect/role of additive in ceramic forming - density, fluidity, viscosity, deflocculation, pH, zeta potential, plasticity.

UNIT III WET FORMING METHODS
Casting methods – Plaster mould preparation and slip casting in plaster mould, pressure casting, gel casting, tape casting, electrophoretic deposition. Plastic forming methods - Pug milling, extrusion, co-extrusion, injection molding

UNIT IV DRY FORMING METHODS
Pressing- Uniaxial pressing – stress distribution on green body – defects and remedies, vibration compaction, isostatic pressing, reactive hot pressing

UNIT V SINTERING
Definition, types of sintering – solid state sintering, liquid phase sintering; grain growth – different grain growth process and control of grain growth. Advanced sintering – pressure assisted sintering, reaction bonded sintering and microwave sintering.

REFERENCES

HUMAN GENETICS

PM7591
L T P C
3 0 0 3

AIM
- To provide knowledge on the basics of genetics.

UNIT I MENDELIAN GENETICS:
History Mendel's Laws of inheritance. Why is knowledge of medical genetics important for everyone. Common Terminology: Alleles, Dominant, recessive, incomplete dominance, codominant, autosomes, allosomes, genes, cross, testcross, backcross, expressivity penetrance, mutation.

UNIT II AUTOSOMAL INHERITANCE:
Pedigree symbols, analysis, interpretation of a pedigree. Autosomal dominant and recessive inheritance, characteristic recurrence risks, Dominant versus Recessive – cautions. Reduced penetrance. Age-dependent penetrance, Pleitropy and heterogeneity, Marfan syndrome, anticipation, consanguinity in Human populations and its consequences. Why you should not marry your close relative?

UNIT III SEX-LINKED INHERITANCE:
Sex determination in humans,TDF, SRY Sex-linked dominant and recessive inheritance, X-inactivation, Holandric Traits, color blindness, Hemophilia, Lyon's Hypothesis, Barr Bodies Turner syndrome, Klinefelter syndrome, Gynandromorphy, Mosaicism and Transgenders.
UNIT IV  CLINICAL CYTOGENETICS AND KARYOTYPING:  9
Karyotype analysis aminocentesis, chorionic villi sampling, preimplantation genetic diagnosis, abnormalities of chromosome structure and number. Chromosome abnormalities and pregnancy loss, abnormalities of chromosome structure and clinical phenotypes, chromosome instability syndromes. Deletions, Inversions and translocation – aberration in chromosomal structure. Maternal age and chromosome abnormalities example, Down syndrome.

UNIT V  ETHICS IN CLINICAL GENETICS:  9

TEXT BOOKS:

PM7592  FUNDAMENTALS OF BIOCHEMISTRY  L T P C
3 0 0 3

AIM
- To enable students learn the fundamentals of Biochemical Pathways and about biomolecules.

OBJECTIVES
- To ensure students have a strong grounding in structures and reactions of biomolecules.
- To introduce them to metabolic pathway of the major biomolecules and relevance to clinical conditions.
- To correlate biochemical processes with biotechnology applications.

UNIT I  CONCEPTS IN BIOCHEMISTRY  6
Basic principles of organic chemistry, types of functional groups, biomolecules, chemical nature, water, pH and biological buffers.

UNIT II  INTRODUCTION TO BIOMOLECULES  12

UNIT III  CONCEPTS OF METABOLISM  8
Functions of Proteins, Enzymes. Introduction to biocatalysts, metabolic pathways.

UNIT IV  INTERMEDIARI METABOLISM AND REGULATION  12
Glycolysis, TCA cycle, gluconeogenesis, pentose phosphate shunt, fatty acid synthesis and β-oxidation, urea cycle, interconnection of pathways and metabolic regulation. High energy compounds, Calculation of ATP Oxidative phosphorylation and respiratory chain.
UNIT V BIOENERGETICS
High energy compounds, electronegative potential of compounds, Oxidative phosphorylation and respiratory chain, ATP cycle, calculation of ATP yield during oxidation of glucose and fatty acids.

TEXT BOOKS

REFERENCES

IB7591 INTRODUCTION TO BIOTECHNOLOGY L T P C 3 0 0 3
Aim
- To give a preliminary introduction about biotechnology, its principles and prospects for engineers who contemplate on using it for interdisciplinary research and application

UNIT I INTRODUCTION TO BIOTECHNOLOGY & IT’S SCOPE
Definition of biotechnology, mile stones in biotechnology – Who can be a biotechnologist? Applications of biotechnology in interdisciplinary (Mathematics, Chemistry, Microbiology, Aquaculture etc) and engineering (Fermentation Technology, Electronics, Plastic Technology etc) specialties, Future prospects of biotechnology industries – GM crops, animals, microbes, etc.

UNIT II PROTEINS AS PRODUCTS
Definition of Proteins: Amino Acids – Structure, Functions and Uses; Structure, Function and Importance of Proteins. Uses of Proteins: Therapeutic proteins e.g. used for treatment of irritable bowel syndrome, Branch Chain Amino Acids; A protein from the industry using microbes: Corynebacterium sp. – A case study, recombinant proteins, enzymes: Streptokinase, amylase, lipase etc., Production of recombinant human insulin.

UNIT III DNA, GENES, GENOMES & RDNA TECHNOLOGY
DNA: Structure – Gene: One gene one Enzyme concept, One Gene many enzyme concept, One gene many polypeptide concept, Genomes, what is genomics? – Transgenic animals and their applications, DNA Vaccines, Edible vaccines, What is recombinant DNA Technology? – A Case study

UNIT IV MEDICAL BIOTECHNOLOGY
Gene testing – identification of protein and genetic disorders, Gene screening – a tool for phenotypic screening e.g. Cancer identification & Gene therapy e.g. Cystic Fibrosis as a case study, Transgenic Pigs as a artificial organ donors

UNIT V DNA FINGERPRINTING, FORENSIC SCIENCE & ETHICS IN BIOTECHNOLOGY
Case study – Homicide, Disputed parentage, Immigration issues, Ethics in Biotechnology – GM crops – Ethical issues; Golden Rice – Eradication of Blindness

REFERENCES:
1. Modern Biotechnology by Primrose
2. Biotechnology the biological principles by M. D. Trevan, S. Bofley
3. Molecular Cell Biology by Lodish
4. Genes V And VI by Lewin Benjamin
AIM
- To provide knowledge on biological aspects of cancer.

OBJECTIVES
- To impart basic concepts of cancer biology and various stages in carcinogenesis.
- To gain insight on cancer metastasis and its molecular mechanism.
- To understand cancer prognosis.

UNIT I  CELL STRUCTURE, FUNCTION AND DIVISION  9
Cell organization, structure of organelles, extracellular matrix and cell junctions. Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT II  INTRODUCTION TO CANCER  9
Definition, causes, cancer types and stages, hallmarks of cancer, modulation of cell cycle in cancer, carcinogenesis – initiation, promotion and progression, diet and cancer.

UNIT III  CANCER PROGRESSION  9
Benign and malignant tumors, progress towards metastatic cancer, metastatic cascade and tumor cell invasion, angiogenesis.

UNIT IV  CANCER GENES AND SIGNAL TRANSDUCTION  9
Activation of kinases, oncogenes/proto-oncogenes activity, retrovirus and oncogenes, tumor suppressor genes and growth factors related to transformation.

UNIT V  CANCER DETECTION AND THERAPEUTICS  9

TOTAL : 45 PERIODS

OUTCOMES
- To create awareness about basics of cancer.
- To understand the cancer microenvironment and its influence on the human system.
- To have understanding on medical applications for cancer.

TEXT BOOKS

REFERENCES
AIM
- To provide knowledge on biological molecules.

OBJECTIVES
- To impart basic concepts of fundamental molecules of the cell.

UNIT I BASICS OF BIOMOLECULES

UNIT II CARBOHYDRATES:
Classification of carbohydrates – Monosaccharides, General terminology, stereoisomerism, Steriochemistry cyclic forms of sugars, mutarotation, Important of Monosaccharides (Glucose, fructose, galactose, mannose) & Disaccharides (Sucrose, Maltose), glycosidic bond, reducing sugars, classification of polysaccharides-Homo & Hetero polysaccharides. Glycans, glysaminoglycans, glycoproteins.

UNIT III LIPIDS:
Classification of Lipids, simple lipids, fatty acids, physical properties of lipids, chemical properties of lipids, waxes, compound lipids, phospholipids, sphingolipids, cholesterol, steroid hormones and prostaglandins hypercholesterolemia and cardiovascular disease, statins as Cholesterol reducing drugs, lipoproteins.

UNIT IV PROTEINS:
Classifications and functions of proteins, Amino acid structures, general properties of aminoacids, peptide bonds, primary, secondary, tertiary and Quaternary structures of proteins. Properties of proteins, electrochemical properties, denaturation, nutritive value of proteins compared to fats and carbohydrates.

UNIT V NUCLEIC ACIDS:
Structure of nucleic acids, deoxyribo nucleicacid (DNA), Experimental that DNA was hereditary material, Chargaff's rule, structure of DNA – Watson crick, RNA types - mRNA, tRNA, and rRNA. Genetic code. Recombinant DNA and its technology.

TEXT BOOKS:

REFERENCES:
AIM:

- To educate the students on the importance of safe food.

OBJECTIVES:

- To expose students to the public concern of foods
- To help understand hazards in food
- To envelop awareness on food-borne illness.
- To understand low diet and good health can be obtained through safe food, supplements functional foods and nutraceuticals.

UNIT I CONCEPTS OF FOOD SAFETY
Understanding what is safe food. Definition of food safety. Adultration of food, Contamination malnutrition, obesity and metabolic syndrome. Unhygiene preparation filter, coloured foods and cancer, pesticides in food and health issues, Physical hazards, migration, cross-contamination.

UNIT II HAZARDS DUE TO FOOD PROCESSING
Trans fatty acids and Cardio vascular diseases. Plastics in packaging; presence of vinyl polymer packaged drinking water and hazard thermal decomposition during barbecuing pyrolytic products and cancer- non-nutritive sweeteners of hazards. Preservatives – chemical, sulphites phenolic antioxidants, fat substitutes antibiotics and veterinary drugs.

UNIT III BIOLOGICAL HAZARDS

UNIT IV HEALTH CLAIMS, LABELLING & SAFE FOOD
Sports nutrition, nutraceuticals, pKV formula foods, health claims, labelling of the label. HACCP, GMP consumer protection, responsibilities of the food service operator. Hygiene procedures. Cost of Illness.

UNIT V GLOBALIZATION AND FOOD SAFETY
Genetically modified food (GM), Safety and labelling, Food audit, International food Standards ISO 9000, environmental issues in packaging.

TEXT BOOKS
OBJECTIVES
The students will be able to

- infer the concepts of separation techniques
- acquire knowledge on separation by membrane and adsorption
- familiarize with ionic separation and other commercial process

UNIT - I  RECENT TRENDS IN SEPARATION TECHNIQUES:  9
Recent trends in separation techniques based on size, surface properties, ionic properties and other special characteristics of substances. Process concept, theory and equipment used in cross flow filtration, cross flow electro filtration and dual functional filter. Surface based solid – liquid separations involving a second liquid, Sirofloc filter

UNIT – II  ADSORPTION BASED AND OTHER SEPARATION PROCESSES:  9
Adsorption - Types of adsorption, nature of adsorbents, adsorption equilibria, Adsorption operations - stage wise operations, crystallization, Oil spill Management, Foam separation, Aqueous two phase extraction

UNIT – III  SOLID SEPARATION PROCESS:  9
Concept of size, Shape, Magnetic separation, Eddy-current separation, Ballistic separation, Color separation, Wet Separation Process, liquid-solid and liquid- liquid separation by hydrocyclones, Surface velocity classifier, Elutriators, Impingement separator, Electrostatic precipitation membrane.

UNIT – IV  MEMBRANE TECHNOLOGY:  9
Mechanism and equipments employed for micro-filtration, Ultrafiltration, Nanofiltration, Reverse osmosis, Concentration polarization, Operation layout of the modules, Pervaporation and Application of membrane technology in process industries.

UNIT – V  IONIC SEPARATION PROCESSES:  9
Working principle, controlling factors, equipment employed for electrophoresis, Dielectrophoresis, ion exchange chromatography, electrodialysis and permeation techniques for solids, liquids and gases.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
COURSE DESCRIPTION:
- This course aims on the students to know about technologies used for Produced Water in the Industry sector. The course will cover technologies on membranes, ion exchange, lime softening, demineralization and filtration. The course will cover separation principles on non-conventional design, commissioning of water treatment plants for next generation

OBJECTIVES:
- To select the best treatment strategy for treating water based on nature of Pollutant.
- To learn about the water treatment issues based on impurities present in water.
- To teach the students the various aspects of treatment methodologies and pollutant removal through separation processes.

UNIT I  WATER TREATMENT TECHNOLOGIES  6

UNIT II  CHEMICAL, BIOLOGICAL AND PHYSIOCHEMICAL TECHNOLOGY  12
Introduction- aeration-Coagulation- Neutralization-Precipitation- Ion exchange- Advanced oxidation process- Flocculation-adsorption- settling - Bioreactors for treatment- Advanced biological treatments

UNIT III  MEMBRANE AND NANOTREATMENT TECHNOLOGY  9
Membranes for water treatment - membrane separation process-ultra filtration- nanofiltration-nanomaterials as membrane filtration.

UNIT IV  DESIGN AND CONSTRUCTION  9
Introduction- Design and construction of wastewater treatment plants on novel technology-nanofiltration and hybrid technologies- sustainable treatment technologies

UNIT V  SELECTION OF WATER TREATMENT TECHNOLOGY  9

OUTCOMES
At the end of the course, the student should be able to:
- understand the treatment technologies available for water treatment.
- Knowledge on conventional non-conventional based technologies
- Analyze different treatment types and select based on suitability for commissioning.

TEXT BOOKS:

REFERENCES:
AS7591  BASIC CONCEPTS IN PETROLEUM ENGINEERING        L T P C
                                  3 0 0 3

UNIT I  RESERVOIR ENGINEERING                                          10
Origin, migration, accumulation of petroleum, Properties of oil & natural gas, Reservoir
deliverability, petrophysical properties of reservoir rocks, reservoir geometry, reservoir drive
mechanisms, Reserve estimation

UNIT II  OIL AND WELL DRILLING TECHNOLOGY                                10
Well planning, drilling rigs, Rig operating systems, drilling fluids - functions & properties, drill bit
types & their applications, drill string, drilling problems - their control & remedies

UNIT III  PETROLEUM PRODUCTION OPERATIONS                                9
Petroleum production system, formation damage, well stimulation techniques, artificial lift
techniques, Nodal system analysis

UNIT IV  EOR TECHNIQUES                                                  9
Basic principle & mechanism of EOR, Screening of EOR process, recovery efficiency, permeability
heterogeneity, EOR methods: chemical flooding, thermal recoveries (steam stimulation, steam
flooding, ISC), microbial EOR

UNIT V  LATEST TRENDS IN PETROLEUM ENGINEERING                           7
Coal Bed Methane, Shale gas, Oil shale, gas hydrate, heavy oil

TOTAL: 45 PERIODS

REFERENCES
   assisted approach, Gulf Professional Publishing, Burlington

AS7592  INTRODUCTION TO INDUSTRIAL SAFETY MANAGEMENT                  L T P C
                                  3 0 0 3

UNIT I  NEED FOR SAFETY IN INDUSTRIES AND REGULATION                   10
Importance & objectives of safety- Safety Programmes – components and realization; evolution of
modern safety concept- safety policy – safety organization, Implementation of safety procedures –
periodic inspection and replacement; Accidents -identification and prevention; Criteria for setting &
layout of plant, Factories Act and Safety Regulations.

UNIT II  HAZARDS & RISK ANALYSIS                                       9
Fire hazards- Chemical hazards, Toxic hazards, Explosion hazards, Electrical hazards,
Mechanical hazards, Radiation hazards, Noise hazards-Over all risk analysis—emergency
planning-on site & off site emergency planning, risk management ISO 14000, EMS models case
studies. Quantitative risk assessment

UNIT III  SAFETY AUDIT AND TECHNIQUES                                  10
Objective of safety audit- Hazard identification safety audits, checklist, what if analysis,
vulnerability models event tree analysis fault tree analysis, Hazard & Operability (HAZOP) studies-
Hazard Analysis (HAZAN)-Fault Tree Analysis, Consequence Analysis, Preliminary Hazard
Analysis (PHA), Job Safety Analysis (JSA), safety – survey, inspection, sampling
UNIT IV  SAFETY EDUCATION AND TRAINING

Importance of training - identification of training needs - training methods - programme, seminars, conferences, competitions - method of promoting safe practice - motivation - communication - role of government agencies and private consulting agencies in safety training - creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign - Domestic Safety and Training.

UNIT V  HUMAN FACTORS IN PROCESS SAFETY


TOTAL: 45 PERIODS

REFERENCES


CY7592  INDUSTRIAL CHEMISTRY

OBJECTIVES

- Elaborate study of fuels - introduction - classification, preparation, properties - alternate fuels.
- To get introduced to high polymers such as rubber and plastics and to industrial importance of cementing materials.
- To get introduction on the chemistry of various industrial processes such as sugar and leather processing.

UNIT I  INORGANIC CEMENTING MATERIALS


UNIT II  FUELS AND COMBUSTION


UNIT III  RUBBER AND PLASTICS

Introduction to rubber - latex - processing latex - mastication - compounding of rubber - vulcanizations of rubber - engineering polymers thermoforming - degradation stability and environment - synthetic rubbers - preparation and applications of SBR - butyl rubber - nitrile rubber - neoprene and silicone rubber - plastic materials - classification of plastics (or resins) - moulding constituents of a plastic - fabrication techniques used for thermoplastic resin (moulding process) - important thermoplastic resins - natural resins - celluloses - polyethylene - PVC.
UNIT IV PAINTS, PIGMENTS AND INSULATING MATERIALS
Paints - ingredients and their functions required properties of a paint - paint constituents and their functions - manufacture of paint - types of pigments - characteristics of pigment - oils - uses in paint - emulsion paints - special paints - paint remover, varnishes - lacquers - enamels - electrical insulating materials - dielectric properties - requirements of an electrical insulating material - classification of insulating material - electrical rigid insulations.

UNIT V SUGAR AND LEATHER CHEMISTRY
Sugar Chemistry - introduction - manufacture of cane sugar - recovery of sugar from molasses - preparation of celotex - manufacture of sucrose from beet root - testing and estimation of sugar-leather chemistry - introduction - manufacture of leather preparation of hides for tanning - vegetable, chrome and oil tanning - byproduct.

TOTAL: 45 PERIODS

OUTCOMES
- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:

REFERENCES:

PH7591 ELECTROMAGNETIC THEORY L T P C
3 0 0 3

OBJECTIVES:
- To learn the electromagnetic theory due to the fields produced by stationary and moving charges and propagation of fields

UNIT I ELECTROSTATICS AND POLARIZATION
Gauss’s law – Field due to an infinite, straight, uniformly charged wire – Multipole expansion of a charge distribution -- Field inside a uniformly polarized sphere – Electric field inside a dielectric – Electric displacement and polarizability – Clausius-Mossotti relation – Polarization of polar molecules and Langevin equation and Debye relation – Electrostatic energy.

UNIT II BOUNDARY VALUE PROBLEMS IN ELECTROSTATICS
Boundary conditions – Potential at a point between the plates of a spherical capacitor – Potential at a point due to uniformly charged disc – Method of image charges – Point charge in the presence of a grounded conducting sphere -- Point charge in the presence of a charged, insulated conducting sphere -- Conducting sphere in a uniform electric field-- Laplace equation in rectangular coordinates.

UNIT III MAGNETOSTATICS
Magnetic scalar and vector potentials – Magnetic dipole in a uniform field – Magnetization current – Magnetic intensity – Magnetic susceptibility and permeability – Hysteresis – Correspondences in electrostatics and magnetostatics.
UNIT IV  FIELD EQUATIONS AND CONSERVATION LAWS  9

UNIT V  ELECTROMAGNETIC WAVES AND WAVE PROPAGATION  9

OUTCOMES:
At the end of the course, the students will be able to
• understand the electrostatics and polarization principles,
• acquire knowledge on boundary value problems, physics of charges and electric fields,
• get knowledge on magnetostatics, hysteresis and correspondence between electro- and magnetostatics,
• have the necessary understanding on filed equations and conservation laws, and
• gain knowledge on principles of electromagnetic wave propagation and its applications in waveguides.

TEXT BOOKS:

REFERENCES

PH7592  PHYSICS OF SEMICONDUCTOR DEVICES  L  T  P  C
3  0  0  3

OBJECTIVES:
• To learn the physics principles behind the operation of some important semiconductor devices.

UNIT I  PROPERTIES OF SEMICONDUCTORS  9
Crystal structure - reciprocal lattice - Brillouin zone and rules for band (k - space) representation. Dynamics of electrons in periodic potential: Kronig - Penny and nearly free electron models - Real methods for band structure calculations; Bandgaps in semiconductors - Holes and effective mass concept - Properties of conduction and valance bands – semiconductor defects - lattice mismatched structures – strained epitaxy.

UNIT II  ELECTRONIC LEVELS IN SEMICONDUCTORS  9
UNIT III  CHARGE TRANSPORT  9

UNIT IV  OPTICAL TRANSPORT  9

UNIT V  SEMICONDUCTOR DEVICES  9

OUTCOMES:
At the end of the course, the students will able to
- gain knowledge on various crystal structures, energy bands and semiconductor defects,
- acquire knowledge on the basics of electronic energy levels, carrier concentration and tuned electronic properties,
- get knowledge on carrier transport mechanisms,
- have the necessary understanding on the concepts of optical transport mechanisms, and
- have adequate knowledge on different functional semiconductor devices.

TEXT BOOKS:

REFERENCES