## Open Electives (Offered by Other Branches)

### Semester V

#### Open Elective - I

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OBJECTIVE:
- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I  INTRODUCTION  7
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility - Ambient Air Quality and Emission standards.

UNIT II  METEOROLOGY  6

UNIT III  CONTROL OF PARTICULATE CONTAMINANTS  11

UNIT IV  CONTROL OF GASEOUS CONTAMINANTS  11

UNIT V  INDOOR AIR QUALITY MANAGEMENT  10
Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:
REFERENCES:

OMD551 BASICIS OF BIOMEDICAL INSTRUMENTATION L T P C

OBJECTIVES:
- To study about the different bio potential and its propagation
- To understand the different types of electrodes and its placement for various recording
- To study the design of bio amplifier for various physiological recording
- To learn the different measurement techniques for non-physiological parameters.
- To familiarize the different biochemical measurements.

CO-PO MAPPING:

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UNIT I BIO POTENTIAL GENERATION AND ELECTRODES TYPES 9
Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes

UNIT II BIOSIGNAL CHARACTERISTICS AND ELECTRODECONFIGURATIONS 9
 Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG – unipolar and bipolar mode.

UNIT III SIGNAL CONDITIONING CIRCUITS 9
Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering

UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS 10
UNIT V BIO-CHEMICAL MEASUREMENT

Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
   CO1: To Learn the different bio potential and its propagation.
   CO2: To get Familiarize the different electrode placement for various physiological recording
   CO3: Students will be able design bio amplifier for various physiological recording
   CO4: Students will understand various technique non electrical physiological measurements
   CO5: Understand the different biochemical measurements

TEXT BOOKS:

REFERENCES:

OBM551 BIO CHEMISTRY L T P C 3 0 0 3

OBJECTIVE:
- To study the structural and functional properties of carbohydrates, proteins, lipids and nucleic acids
- To discuss the impairments in metabolism of the above, including inborn errors of metabolism.

UNIT I BIOLOGICAL PRINCIPLE
Composition & properties of the cell membrane, membrane transports, permeability Coefficient & partition coefficient, body fluids, electrolytes, acid-base balance, blood viscosity and Newtonian nature, colloids, filtration, diffusion, osmosis, dialysis, ultrafiltration, ultracentrifugation, cellular fractionation, electrophoresis, radioimmunoassay, Photochemical reaction, law of photochemistry, fluorescence and phosphorescence.

UNIT II MACROMOLECULES
Classification and functions of carbohydrates, glycolysis, TCA cycle, Blood Sugar analysis and glucose tolerance test, Classification and functions of proteins, architecture of proteins, Classification of amino acids, Oxidative and non oxidative deamination, transamination, decarboxylation, urea cycle, Purification/separation of proteins, Classification and functions of lipids, biosynthesis of long chain fatty acids, oxidation and degradation of fatty acids.
UNIT III ENZYMES
Chemical Nature, General Properties, Spectrophotometric measurement of enzymes, Isolation techniques, Diagnostic enzymes.


UNIT IV METABOLIC DISORDER
Diabetes mellitus, Diabetic ketoacidosis, lactose intolerance, Glycogen storage disorders, Lipid storage disorders, obesity, atherosclerosis, Plasma proteins in health and disease, Inborn error of amino acid metabolism, Disorders associated with abnormalities in the metabolism of bilirubin – Jaundice.

UNIT V

TOTAL: 45 PERIODS

OUTCOMES:
After the successful completion of this course, the students will be able to,

- Explain the fundamentals of biochemistry
- Have in-depth knowledge about the classification, structures and properties of carbohydrates, lipid, protein and amino acid.
- Demonstrate about the mechanism of actions of enzymes and co-enzymes, clinical importance of enzymes, hormonal assay and significance.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION TO CLOUD COMPUTING


UNIT II VIRTUALIZATION


UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE


UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD


UNIT V CASE STUDIES


TOTAL: 45 PERIODS

OUTCOMES:

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

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:

REFERENCES:

OIT551 DATABASE MANAGEMENT SYSTEMS L T P C
3 0 0 3

OBJECTIVES
- To learn the fundamentals of data models
- To learn conceptual modeling using ER diagrams.
- To study SQL queries and database programming
- To learn proper designing of relational database.
- To understand database security concepts
- To understand Information retrieval techniques

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

UNIT II DATABASE QUERIES 11

UNIT III DATABASE PROGRAMMING 7
Database programming with function calls, stored procedures - views – triggers. Embedded SQL. ODBC connectivity with front end tools. Implementation using ODBC/JDBC and SQL/PSM, implementing functions, views, and triggers in MySQL / Oracle.

UNIT IV DATABASE DESIGN 9

UNIT V ADVANCED TOPICS 9

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the students will be able to:
- understand relational data model, evolve conceptual model of a given problem, its
  mapping to relational model and Normalization
- query the relational database and write programs with database connectivity
- understand the concepts of database security and information retrieval systems

TEXT BOOKS:

REFERENCES:
1. C.J. Date, A.Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth

OME551 ENERGY CONSERVATION AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
At the end of the course, the student is expected to
- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

UNIT I INTRODUCTION
Energy - Power – Past & Present scenario of World; National Energy consumption Data –
Environmental aspects associated with energy utilization – Energy Auditing: Need, Types,
Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS
Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of
Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency
Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy,
LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS
Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon
measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam
Utilization, Insulators & Refractories
UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOK:

REFERENCES:

OBT553 FUNDAMENTALS OF NUTRITION LTCP 3 0 0 3

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

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

UNIT II DIGESTION
Digestion, Absorption and Transport: Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption of nutrients.
UNIT III  CARBOHYDRATES  9
Glycemic and Non-glycemic carbohydrates, blood glucose 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 IV  PROTEINS & LIPIDS  9
Proteins; 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; Fat replacements; Food sources, functional role and uses in foods. Health effects and recommended intakes of lipids. Recommended intakes of proteins, Deficiency- short term and long term effects.

UNIT V  METABOLISM, ENERGY BALANCE AND BODY COMPOSITION  9
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 unsafe weight loss schemes; treatment of obesity; attitudes and behaviours toward weight control. Food and Pharmaceutical grades; toxicities, deficiencies, factors affecting bioavailability, Stability under food processing conditions.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

OCE552  GEOGRAPHIC INFORMATION SYSTEM  L T P C  3 0 0 3

OBJECTIVES :
- To introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes.
UNIT I  FUNDAMENTALS OF GIS

UNIT II  SPATIAL DATA MODELS

UNIT III  DATA INPUT AND TOPOLOGY

UNIT IV  DATA ANALYSIS
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V  APPLICATIONS

TOTAL: 45 PERIODS

OUTCOME:
This course equips the student to
• Have basic idea about the fundamentals of GIS.
• Understand the types of data models.
• Get knowledge about data input and topology.
• Gain knowledge on data quality and standards.
• Understand data management functions and data output

TEXT BOOKS:

REFERENCE:
OBJECTIVES

- This course will be focused on achievement, acquisition of knowledge and enhancement of comprehension of information regarding bioenergy and biofuel technologies and their sustainable applications.

UNIT I  CONCEPTS  9
Biopower, Bioheat, Biofuels, advanced liquid fuels, drop-in fuels, biobased products

UNIT II  FEEDSTOCKS  9

UNIT III  CONVERSION TECHNOLOGIES  9
Biorefinery concept – biorefineries and end products, Biochemical conversion – hydrolysis, enzyme and acid hydrolysis, fermentation, anaerobic digestion and trans-esterification, Thermochemical conversion – Combustion, Gasification, Pyrolysis, other thermochemical conversion technologies. Scaling up of emerging technologies.

UNIT IV  BIOFUELS  9
Pros and cons of Biofuels, Algal biofuels, Cyanobacteria and producers of biofuels, Jatropha as biodiesel producer, Bioethanol, Biomethane, biohydrogen, biobutanol, metabolic engineering of fuel molecules, Engineering aspects of biofuels, Economics of biofuels

UNIT V  SUSTAINABILITY & RESILIENCE  9
Environmental Sustainability, bioenergy sustainability, emissions of biomass to power generation applications, emissions from biofuels. ILUC issues, Carbon footprint, Advanced low carbon fuels

TOTAL : 45 PERIODS

TEXTBOOKS:

REFERENCES:
2. Bioenergy: Biomass to Biofuels by by Anju Dahiya
3. Bioenergy: Principles and Applications by Yebo Li and Samir Kumar Khanal
4. Bioenergy by Judy D. Wall and Caroline S. Harwood
5. Bioenergy: Sustainable Perspectives by Ted Weyland
OBJECTIVES:
- To acquire the basic knowledge of Indian system of medicines.
- To enable the students to know about the plant tissue culture techniques and learn about
  the instruments used in the extraction, isolation, purification and identification of herbal
  drugs.

UNIT I  INDIAN SYSTEMS OF MEDICINE
Introduction, basic principles and treatment modalities of Ayurveda – Unani – Homeopathy –
Siddha –naturopathy- Introduction and streams of Yoga. Classification of herbs - Harvesting –
Post harvesting – Conditions of storage.-seasonal and geographical variation.

UNIT II  IN-VITRO CULTURE OF MEDICINAL PLANTS
Requirements – Setting up a tissue culture lab – Basic laboratory procedure – Processing of
plant tissue culture – Growth profile – Growth measurement – Plant tissue culture methods –
Callus culture – Types of tissue culture – Tissue culture of medicinal plants – Applications of
plant tissue culture.

UNIT III  PHYTO PHARMACEUTICALS
Traditional and modern extraction techniques: Successive solvent extraction- Super critical fluid
extraction – Steam distillation – Head space techniques – Sepbox –General extraction process:
Carbohydrates – Proteins – Alkaloids –Glycosides. Isolation and purification of phytochemicals
(Eg. Quinine from cinchona, vincristine from Vinca, sennoside from senna, Euginol from clove
oil.)

UNIT IV  SCREENING METHODS FOR HERBAL DRUGS
Screening methods for anti-fertility agents – Antidiabetic drugs – Anti anginal drugs – Diuretic –
Analgesic activity – Antipyretic activity – Anti cancer activity –Evaluation of hepatoprotective
agents – anticonvulsive- Anti ulcer drugs.

UNIT V  STANDARDIZATION AND CONSERVATION OF HERBAL DRUGS
Importance of standardization - Standardization of single drugs and compound formulations –
WHO guidelines for the quality assessment herbal drugs - Conservation strategies of medicinal
plants – Government policies for protecting the traditional knowledge.

TOTAL: 45 PERIODS

OUTCOMES:
The student will be able to
- Understand the basic principle, design, control and processing techniques of medicinal
  plants and their derivatives.
- Find a solution to problems, including social, scientific and ethical issues connected with the
  use of medicinal plants in the different field of applications.
- Describe the biological effects of medicinal plants with legislation and governmental policies
  for conserving medicinal plants.
TEXT BOOKS:

REFERENCES:

OMD552 HOSPITAL WASTE MANAGEMENT

OBJECTIVES:
The student should be made to:
- Know about the healthcare hazard control and accidents
- Understand biomedical waste management
- Learn the facility guidelines, infection control and patient safety.

UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS

UNIT II BIOMEDICAL WASTE MANAGEMENT
Biomedical Waste Management: Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling and disposal.

UNIT III HAZARDOUS MATERIALS
UNIT IV FACILITY SAFETY

UNIT V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY

OUTCOMES:
• After successful completion of the course, the students will be able to know the concepts of healthcare waste management, its prevention and safety.

REFERENCES:

OCH551 INDUSTRIAL NANOTECHNOLOGY

OBJECTIVES
• To elucidate on advantages of nanotechnology based applications in each industry
• To provide instances of contemporary industrial applications of nanotechnology
• To provide an overview of future technological advancements and increasing role of nanotechnology in each industry

UNIT I NANO ELECTRONICS

UNIT II BIONANOTECHNOLOGY

UNIT III NANOTECHNOLOGY IN CHEMICAL INDUSTRY

UNIT IV NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY
Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry.
UNIT V  NANOTECHNOLOGY IN TEXTILES AND COSMETICS

Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application– Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair-conditioners

TOTAL: 45 PERIODS

REFERENCES:

OEI551  LOGIC AND DISTRIBUTED CONTROL SYSTEMS  L T P C

OBJECTIVES:
• To give an introductory knowledge on Programmable Logic Controller (PLC) and their programming languages
• To give adequate knowledge about applications of PLC
• To give basic knowledge about Computer Controlled Systems
• To give basic knowledge on the architecture and local control unit of Distributed Control System (DCS)
• To give adequate information with respect to interfaces used in DCS

UNIT I  PROGRAMMABLE LOGIC CONTROLLER 9
Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages -Ladder diagram – Function block diagram (FBD) - Programming timers and counters

UNIT II  APPLICATIONS OF PLC 9
Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC

UNIT III  COMPUTER CONTROLLED SYSTEMS 9
Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control- SCADA:- Hardware and software, Remote terminal units, Master Station and Communication architectures.
UNIT IV  DISTRIBUTED CONTROL SYSTEM  9
DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT V  INTERFACES IN DCS  9
Operator interfaces - Low level and high level operator interfaces – Displays - Engineering interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

REFERENCES:
1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005

OBM552  MEDICAL PHYSICS  L T P C
3 0 0 3

OBJECTIVES:
- To study the complete non-ionizing radiations including light and its effect in human body.
- To understand the principles of ultrasound radiation and its applications in medicine.
- To learn about radioactive nuclides and also the interactions of radiation with matters and how isotopes are produced.
- To study the harmful effects of radiation and radiation protection regulations.
UNIT I  NON-IONIZING RADIATION AND ITS MEDICAL APPLICATIONS  9

UNIT II  ULTRASOUND IN MEDICINE  9

UNIT III  PRINCIPLES OF RADIOACTIVE NUCLIDES AND DECAY  9

UNIT IV  INTERACTION OF RADIATION WITH MATTER  9

UNIT V  RADIATION EFFECTS AND REGULATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Analyze the low frequency and high frequency effects of non-ionizing radiation and physics of light.
- Define various clinical applications based on ultrasound wave.
- Explain the process of radioactive nuclide production using different techniques
- Analyze radiation mechanics involved with various physiological systems
- Outline the detrimental effects of radiation and regulations for radiation safety.

TEXT BOOKS:
OBJECTIVE:
This course will cover the basic principles and techniques of optical and electron microscopy. This course also deals with the sample preparation techniques for the microstructural analysis.

UNIT I  INTRODUCTION

UNIT II  MICROSCOPY

UNIT III  ELECTRON MICROSCOPY

UNIT IV  SAMPLE PREPARATION FOR MICROSTRUCTURAL ANALYSIS

UNIT V  CHEMICAL ANALYSIS

TOTAL: 45 PERIODS
OUTCOMES:
• Able to understand the physics behind the microscopy.
• Ability to describe the principle, construction and working of light microscopy.
• Ability to appreciate about electron microscopy.
• Ability to understand about the important of sample preparation technique.
• Ability to identify the appropriate spectroscopy technique for chemical analysis.

TEXT BOOKS

REFERENCES:

OEI552 SCADA SYSTEM AND APPLICATIONS MANAGEMENT L T P C
                                                    3 0 0 3

COURSE OBJECTIVE:
• To understand about the SCADA system components and SCADA communication
  protocols
• To provide knowledge about SCADA applications in power system

UNIT I INTRODUCTION TO SCADA
Evolution of SCADA, SCADA definitions, SCADA Functional requirements and Components,
SCADA Hierarchical concept, SCADA architecture, General features, SCADA Applications,
Benefits

UNIT II SCADA SYSTEM COMPONENTS
Remote Terminal Unit (RTU), Interface units, Human- Machine Interface Units (HMI), Display
Monitors/Data Logger Systems, Intelligent Electronic Devices (IED), Communication Network,
SCADA Server, SCADA Control systems and Control panels

UNIT III SCADA COMMUNICATION
SCADA Communication requirements, Communication protocols: Past, Present and Future,
Structure of a SCADA Communications Protocol, Comparison of various communication
protocols, IEC61850 based communication architecture, Communication media like Fiber optic,
PLCC etc. Interface provisions and communication extensions, synchronization with NCC, DCC.

UNIT IV SCADA MONITORING AND CONTROL
Online monitoring the event and alarm system, trends and reports, Blocking list, Event
disturbance recording. Control function: Station control, bay control, breaker control and
disconnector control.
UNIT V  SCADA APPLICATIONS IN POWER SYSTEM  9
Applications in Generation, Transmission and Distribution sector, Substation SCADA system
Functional description, System specification, System selection such as Substation configuration,
IEC61850 ring configuration, SAS cubicle concepts, gateway interoperability list, signal naming

CASE STUDIES:
SCADA Design for 66/11KV and 132/66/11KV or 132/66 KV any utility Substation and IEC
61850 based SCADA Implementation issues in utility Substations

TOTAL: 45 PERIODS

OUTCOME:
• This course gives knowledge about various system components and communication
  protocols of SCADA system and its applications.

REFERENCES:
1. Stuart A. Boyer: SCADA-Supervisory Control and Data Acquisition, Instrument
   Society of America Publications,USA,2004
2. Gordon Clarke, Deon Reynders: Practical Modern SCADA Protocols: DNP3, 60870.5 and
4. David Bailey, Edwin Wright, Practical SCADA for industry, Newnes, 2003
5. Michael Wiebe, A guide to utility automation: AMR, SCADA, and IT systems for electric
   Power, PennWell 1999

OBT554  PRINCIPLES OF FOOD PRESERVATION  L T P C
3  0  0  3

OBJECTIVE:
• The course aims to introduce the students to the area of Food Preservation. This is
  necessary for effective understanding of a detailed study of food processing and
  technology subjects.

UNIT I  FOOD PRESERVATION AND ITS IMPORTANCE  9
Introduction to food preservation. Wastage of processed foods; Shelf life of food products;
Types of food based on its perishability. Traditional methods of preservation

UNIT II  METHODS OF FOOD HANDLING AND STORAGE  9
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.retort pouch packing, Aseptic packaging.

UNIT III  THERMAL METHODS  9
Newer methods of thermal processing; batch and continuous; In container sterilization-
canning; application of infra-red microwaves; ohmic heating; control of water activity;
preservation by concentration and dehydration; osmotic methods
UNIT IV          DRYING PROCESS FOR TYPICAL FOODS                                      9
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, dehydro-
freezing, freeze drying, IQF; calculation of refrigeration load, design of freezers and cold
storages.

UNIT V          NON-THERMAL METHODS                                        9
Super Critical Technology for Preservation - Chemical preservatives, preservation by ionizing
radiations, ultrasonics, high pressure, fermentation, curing, pickling, smoking, membrane
technology. Hurdle technology,

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course the students are expected to
• Be aware of the different methods applied to preserving foods.

TEXT BOOKS:
1. Karnal, Marcus and D.B. Lund “Physical Principles of Food Preservation”. Rutledge,
   2003.
2. VanGarde, S.J. and Woodburn. M “Food Preservation and Safety Principles and

REFERENCES:
2. Zeuthen, Peter and Bogh-Sarensen, Leif. “Food Preservation Techniques”. CRC / Wood

OMF551          PRODUCT DESIGN AND DEVELOPMENT                     L T P C
                                                            3 0 0 3

OBJECTIVE:
The course aims at providing the basic concepts of product design, product features and its
architecture so that student can have a basic knowledge in the common features a product
has and how to incorporate them suitably in product.

UNIT I          INTRODUCTION                                         9
Need for IPPD – Strategic importance of Product development – integration of customer,
designer, material supplier and process planner, Competitor and customer – Behaviour
analysis. Understanding customer – prompting customer understanding – involve customer in
development and managing requirements – Organization – process management and
improvement – Plan and establish product specifications.

UNIT II          CONCEPT GENERATION AND SELECTION                        9
Task – Structured approaches – clarification – search – externally and internally – explore
systematically – reflect on the solutions and processes – concept selection – methodology –
benefits.
UNIT III PRODUCT ARCHITECTURE

UNIT IV INDUSTRIAL DESIGN

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

TOTAL: 45 PERIODS

OUTCOME:
• The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOK:

REFERENCES:

ORO551 RENEWABLE ENERGY SOURCES

OBJECTIVES:
• To get exposure on solar radiation and its environmental impact to power.
• To know about the various collectors used for storing solar energy.
• To know about the various applications in solar energy.
• To learn about the wind energy and biomass and its economic aspects.
• To know about geothermal energy with other energy sources.
UNIT I PRINCIPLES OF SOLAR RADIATION 10
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT II SOLAR ENERGY COLLECTION 8
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS 7
Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT IV WIND ENERGY 10

UNIT V GEOTHERMAL ENERGY: 9
Resources, types of wells, methods of harnessing the energy, potential in India. OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC.

TOTAL : 45 PERIODS
OUTCOMES:
- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To understand the phases in a software development project
- To learn project management concepts
- To understand the concepts of requirements analysis and modeling.
- To understand software design methodologies
- To learn various testing methodologies
- To be familiar with issues related to software maintenance

UNIT I  SOFTWARE PROCESS

UNIT II  PLANNING AND ESTIMATION

UNIT III  REQUIREMENTS ANALYSIS AND SPECIFICATION

UNIT IV  SOFTWARE DESIGN AND IMPLEMENTATION

UNIT V  TESTING AND MAINTENANCE

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students will be able to
- Understand different software life cycle models.
- Perform software requirements analysis
- Apply systematic methodologies for software design and deployment.
- Understand various testing approaches and maintenance related issues.
- Plan project schedule, and estimate project cost and effort required.

TEXT BOOKS:
REFERENCES

7. http://nptel.ac.in/

OMD553 TELEHEALTH TECHNOLOGY

OBJECTIVES:
The student should be made to:
- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and its applications

UNIT I TELEMEDICINE AND HEALTH
History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II TELEMEDICAL TECHNOLOGY

UNIT III TELEMEDICAL STANDARDS

UNIT IV MOBILE TELEMEDICINE
Tele radiology: Image Acquisition system Display system, Tele pathology, Medical information storage and management for telemedicine- patient information, medical history, test reports, medical images, Hospital information system

UNIT V TELEMEDICAL APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Apply multimedia technologies in telemedicine.
- Explain Protocols behind encryption techniques for secure transmission of data.
• Apply telehealth in healthcare.

TEXT BOOK:

REFERENCES:

OIM551 WORLD CLASS MANUFACTURING

OBJECTIVES
• Understanding of the concept and importance of strategy planning for manufacturing industries
• To apply principles and techniques in the identifiable formulation and implementation of manufacturing strategy for competitive in global context.

UNIT I INDUSTRIAL DECLINE AND ASCENDANCY 9
Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade – American decade - Global decade

UNIT II BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED PRINCIPLES 9
Customer - Focused principles - General principles - Design - Operations - Human resources - Quality and Process improvement - Promotion and Marketing

UNIT III VALUE AND VALUATION 9
Product Costing - Motivation to improve - Value of the enterprises QUALITY - The Organization - Bulwark of stability and effectiveness - Employee stability – Quality Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

UNIT IV STRATEGIC LINKAGES 9
Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

UNIT V IMPEDIMENTS 9
Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole Plant Associates - Facilitators - Teamsmanship - Motivation and reward in the age of continuous improvement
TOTAL : 45 PERIODS

OUTCOMES:
- Able to understand the concept and the importance of manufacturing strategy for industrial enterprise competitiveness.
- Apply appropriate techniques in the analysis and devaluation of company's opportunities for enhancing competitiveness in the local regional and global context.
- Identify formulation and implement strategies for manufacturing and therefore enterprise competitiveness.

TEXT BOOKS:

OAI751 AGRICULTURAL FINANCE, BANKING AND CO-OPERATION L T P C
3 0 0 3

OBJECTIVES:
- To make the students aware about the agricultural Finance, Banking and Cooperation.
- To acquaint the students with the basic concepts, principles and functions of management.
- To understand the process of finance banking and cooperation.

UNIT I AGRICULTURAL FINANCE - NATURE AND SCOPE 9
Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning, Definition, Need and Classification - Sources of credit - Role of institutional and non-institutional agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural indebtedness - History and Development of rural credit in India.

UNIT II FARM FINANCIAL ANALYSIS 9
Principles of Credit - 5C’s, 5R’s and 7P’s of Credit - Project Cycle and Management - Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and Discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans - Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement - Financial Ratio Analysis.

UNIT III FINANCIAL INSTITUTIONS 9
followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme - Relief Measures and Loan Waiver Scheme and Know Your Customer (KYC).

UNIT IV CO-OPERATION
Co-operation: Philosophy and Principles - History of Indian Cooperative Credit Movement: Pre and Post-Independence periods and Cooperation in different plan periods - Cooperative credit institutions: Two tier and three tier structure, Functions: provision of short term and long term credit, Strength and weakness of cooperative credit system, Policies for revitalizing cooperative credit: Salient features of Vaithiyananthan Committee Report on revival of rural cooperative credit institutions, Reorganisation of Cooperative credit structure in Andhra Pradesh and single window system and successful cooperative credit systems in Gujarat, Maharashtra, Punjab etc. - Special cooperatives: LAMPS and FSS: Objectives, role and functions - National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd., (NAFSCOB) - Objectives and Functions.

UNIT V BANKING AND INSURANCE

OUTCOME: After completion of this course, the students will
- Be familiar with agricultural finance, Banking, cooperation and basic concepts, principles and functions of management.

REFERENCES:

OBM751 BASICS OF HUMAN ANATOMY AND PHYSIOLOGY

OBJECTIVES
- To learn the basic components of formation of systems
- To identify all the organelles of an animal cell and their function.
- To understand structure and functions of the various types of systems of human body.
- To demonstrate their knowledge of importance of anatomical features and physiology of human systems.
UNIT I  INTRODUCTION  9

UNIT II  BASIC STRUCTURE AND FUNCTION OF ANIMAL CELL  9

UNIT III  TISSUES, MEMBRANE AND SKELETAL SYSTEM  9

UNIT IV  NERVOUS AND CARDIOVASCULAR SYSTEMS  10

UNIT V  DIGESTIVE AND URINARY SYSTEMS  8

TOTAL:45 PERIODS

OUTCOMES:
At end of the course
- Students would be familiar with the requirements for formation of systems
- Students would be understand the basic structural and functional elements of human body
- Students would have knowledge on Skeletal and muscular systems
- Students would be able to comprehend circulatory and nervous systems and their components
- Students would study importance of digestive and urinary systems in Human body

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**OGI751 CLIMATE CHANGE AND ITS IMPACT**

**OBJECTIVES:**
- To understand the basics of weather and climate
- To have an insight on Atmospheric dynamics and transport of heat
- To develop simple climate models and evaluate climate changes using models

**UNIT I BASICS OF WEATHER AND CLIMATE** 9

**UNIT II ATMOSPHERIC DYNAMICS** 9
heat. Surface and boundary layer – smaller scale weather system – larger scale weather system.

UNIT III  GLOBAL CLIMATE

UNIT IV  CLIMATE SYSTEM PROCESSES

UNIT V  CLIMATE CHANGE MODELS

TOTAL:45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The concepts of weather and climate
- The principles of Atmospheric dynamics and transport of heat and air mass
- The develop simple climate models and to predict climate change

TEXTBOOKS:

OPY751  CLINICAL TRIALS  L T P C
3 0 0 3

OBJECTIVES:
- To highlight the epidemiologic methods, study design, protocol preparation
- To gain knowledge in the basic bio-statistical techniques involved in clinical research.
- To describe the principles involved in ethical, legal and regulatory issues in clinical trials.

UNIT I  ROLE OF CLINICAL TRIALS IN NEW DRUG DEVELOPMENT
Drug Discovery, regulatory guidance and governance, pharmaceutical manufacturing, nonclinical research, clinical trials, post-marketing surveillance, ethical conduct during clinical trials.

UNIT II  FUNDAMENTALS OF TRIAL DESIGN  9
Randomised clinical trials, uncontrolled trials. Protocol development, endpoints, patient selection, source and control of bias, randomization, blinding, sample size and power.

UNIT III  ALTERNATE TRIAL DESIGNS  9
Crossover design, factorial design, equivalence trials, bioequivalence trials, non-inferiority trials, cluster randomized trials, multi-center trials.

UNIT IV  BASICS OF STATISTICAL ANALYSIS  9
Types of data and normal distribution, significance tests and confidence intervals, comparison of means, comparison of proportions, analysis of survival data, subgroup analysis, regression analysis, missing data.

UNIT V  REPORTING OF TRIALS  9
Overview of reporting, trial profile, presenting baseline data, use of tables, figures, critical appraisal of report, meta-analysis.

TOTAL: 45 PERIODS

OUTCOMES:
The student will be able to

- Explain key concepts in the design of clinical trials.
- Describe study designs used, identify key issues in data management for clinical trials.
- Describe the roles of regulatory affairs in clinical trials.

TEXT BOOKS:

REFERENCES:

OCS751  DATA STRUCTURES AND ALGORITHMS  L T P C
3 0 0 3

OBJECTIVES:
- To understand the various algorithm design and analysis techniques
- To learn linear data structures – lists, stacks, and queues
- To learn different sorting and searching algorithms
- To understand Tree and Graph data structures
UNIT I  ALGORITHM ANALYSIS, LIST ADT

UNIT II  STACKS AND QUEUES

UNIT III  SEARCHING AND SORTING ALGORITHMS

UNIT IV  TREES

UNIT V  GRAPHS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students should be able to:
• Implement linear data structures and solve problems using them.
• Implement and apply trees and graphs to solve problems.
• Implement the various searching and sorting algorithms.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To impart knowledge on various types of experimental designs conduct of experiments and data analysis techniques.

UNIT I  FUNDAMENTALS OF EXPERIMENTAL DESIGNS  9
Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, F-test, terminology, basic principles of design, steps in experimentation – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression, testing using Analysis of variance.

UNIT II  SINGLE FACTOR EXPERIMENTS  9
Completely Randomized Design- effect of coding the observations- model adequacy checking- estimation of model parameters, residuals analysis- treatment comparison methods-Duncan’s multiple range test, Newman-Keuel’s test, Fisher’s LSD test, Tukey’s test- testing using contrasts- Randomized Block Design – Latin Square Design- Graeco Latin Square Design –Applications.

UNIT III  FACTORIAL DESIGNS  9
Main and Interaction effects - Two and three factor full factorial designs- Fixed effects and random effects model - Rule for sum of squares and Expected Mean Squares- $2^K$ Design with two and three factors- Yate’s Algorithm- fitting regression model- Randomized Block Factorial Design - Practical applications.

UNIT IV  SPECIAL EXPERIMENTAL DESIGN  9
Blocking and Confounding in $2^K$ Designs- blocking in replicated design- $2^K$ Factorial Design in two blocks- Complete and partial confounding- Confounding $2^K$ Design in four blocks- Two level Fractional Factorial Designs- one-half fraction of $2^K$ Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of $2^K$ Design

UNIT V  TAGUCHI METHODS  9
Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Response Graph Method, ANOVA- attribute data analysis- Robust design-noise factors, Signal to noise ratios, Inner/outer OA design.

TOTAL: 45 PERIODS

OUTCOME:
- Able to apply experimental techniques to practical problems to improve quality of processes / products by optimizing the process / product parameters.

TEXT BOOK:

REFERENCES:
OBJECTIVES

- Students will gain knowledge about different energy sources

UNIT I  ENERGY
Introduction to energy – Global energy scene – Indian energy scene - Units of energy, conversion factors, general classification of energy, energy crisis, energy alternatives.

UNIT II  CONVENTIONAL ENERGY
Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion.

UNIT III  NON-CONVENTIONAL ENERGY
Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Gravian rotor, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy.

UNIT IV  BIOMASS ENERGY
Biomass origin - Resources – Biomass estimation. Thermochemical conversion – Biological conversion, Chemical conversion – Hydrolysis & hydrogenation, solvolysis, biocrude, biodiesel power generation gasifier, biogas, integrated gasification.

UNIT V  ENERGY CONSERVATION
Energy conservation - Act; Energy management importance, duties and responsibilities; Energy audit – Types methodology, reports, instruments. Benchmarking and energy performance, material and energy balance, thermal energy management.

TOTAL : 45 PERIODS

OUTCOMES:

- Understand conventional Energy sources, Non- conventional Energy sources, biomass sources and develop design parameters for equipment to be used in Chemical process industries. Understand energy conservation in process industries

TEXTBOOKS:

REFERENCES:

OCE751 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

OBJECTIVE:
- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

UNIT I INTRODUCTION

UNIT II ENVIRONMENTAL ASSESSMENT
Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN

UNIT IV SOCIO ECONOMIC ASSESSMENT
Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

UNIT V CASE STUDIES

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have ability to
- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

REFERENCES:

OGI752 FUNDAMENTALS OF PLANETARY REMOTE SENSING

OBJECTIVES:
- To provide an insight to the basics of planetary Remote Sensing
- To demonstrate how the Remote Sensing technique is applied to explore the surface characteristics of the planets and its environ.

UNIT I PLANETARY SCIENCE

UNIT II SATELLITE ORBIT

UNIT III PROPERTIES OF EMR

UNIT IV RADIOMETRY AND SCATTEROMETRY
UNITV PLANETARY APPLICATION
Planetary Imaging Spectroscopy - USGS Tetracoder and Expert system - Mars Global Surveyor Mission (MGS) – Digital Elevation Model (DEM) of Mars – Mars Orbiter Camera (MOC) – Stereo and photoclinometric techniques for DEM.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students have
- Exposure to fundamentals of planetary science or orbital mechanics
- The principles of observing the planets
- Knowledge of Remote Sensing methods for determining surface elevation and mapping of planets.

REFERENCES:

OEN751 GREEN BUILDING DESIGN

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS

UNIT III COMFORTS IN BUILDING

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS

UNIT V GREEN COMPOSITES FOR BUILDINGS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

OBM752 HOSPITAL MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- To understand the fundamentals of hospital administration and management.
- To know the market related research process
- To explore various information management systems and relative supportive services.
- To learn the quality and safety aspects in hospital.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 9
Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning

UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL 9
Principles of HRM – Functions of HRM – Profile of HRD Manager –Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING 9
Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV SUPPORTIVE SERVICES 9
Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL 9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Explain the principles of Hospital administration.
• Identify the importance of Human resource management.
• List various marketing research techniques.
• Identify Information management systems and its uses.
• Understand safety procedures followed in hospitals

TEXT BOOKS:

REFERENCES:

OME754 INDUSTRIAL SAFETY

OBJECTIVES :
To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS
Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

UNIT V SAFETY REGULATIONS
OUTCOMES:
- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:

REFERENCES:

OBT753 INTRODUCTION OF CELL BIOLOGY

AIM
- To provide knowledge on cell structure and its function.

UNIT I CELL STRUCTURE 9
Cell organization, structure of organelles, extra cellular matrix and cell junctions.

UNIT II CELL ORGANELLE AND FUNCTION 9
Nuclei, Mitochondria, Lysosomes, Endoplasmic reticulum, Golgi apparatus, vesicles, centrosomes, cell membranes, ribosomes, cytosol, chloroplasts, flagella, cell wall.

UNIT III DIVISION 9
Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT IV MACROMOLECULES 9
DNA, RNA and Proteins – basic units, architectural hierarchy and organisation, functions.

UNIT V ENZYMES 9
Enzymes – Structure, Mechanism of action, Factors that affect enzyme activity, Common enzymes used in industrial setup of plant and animal origin.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
OBJECTIVES
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions and structures

UNIT I INTRODUCTION
Structure of C program – Basics: Data Types – Constants – Variables - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers
Text Book: Reema Thareja (Chapters 2,3)

UNIT II ARRAYS
Introduction to Arrays – One dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Exercise Programs: Print the number of positive and negative values present in the array – Find whether the given is matrix is diagonal or not.
Text Book: Reema Thareja (Chapters 5)

UNIT III STRINGS
Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Deletion – Replacement – Array of strings – Introduction to Pointers – Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names.
Text Book: Reema Thareja (Chapters 6 & 7)

UNIT IV FUNCTIONS
Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by ‘n’ devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function)
Text Book: Reema Thareja (Chapters 4)

UNIT V STRUCTURES
Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions)
OUTCOMES
Upon completion of this course, the students will be able to

- Develop simple applications using basic constructs
- Develop applications using arrays and strings
- Develop applications using functions and structures

TEXT BOOK

REFERENCES:

OMF751 LEAN SIX SIGMA

OBJECTIVE:
- To gain insights about the importance of lean manufacturing and six sigma practices.

UNIT I LEAN & SIX SIGMA BACKGROUND AND FUNDAMENTALS
Historical Overview – Definition of quality – What is six sigma - TQM and Six sigma - lean manufacturing and six sigma - six sigma and process tolerance – Six sigma and cultural changes – six sigma capability – six sigma need assessments - implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing – assessment questions

UNIT II THE SCOPE OF TOOLS AND TECHNIQUES

UNIT III SIX SIGMA METHODOLOGIES
Design For Six Sigma (DFSS), Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN) - Six Sigma and Leadership, committed leadership – Change Acceleration Process (CAP) - Developing communication plan – Stakeholder
UNIT IV       SIX SIGMA IMPLEMENTATION AND CHALLENGES

Tools for implementation – Supplier Input Process Output Customer (SIPOC) – Quality Function Deployment or House of Quality (QFD) – alternative approach – implementation – leadership training, close communication system, project selection – project management and team – champion training – customer quality index – challenges – program failure, CPQ vs six sigma, structure the deployment of six sigma – cultural challenge – customer/internal metrics

UNIT V       EVALUATION AND CONTINUOUS IMPROVEMENT METHODS

Evaluation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, poor project estimates – continuous improvement – lean manufacturing – value, customer focus, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people – Kaizen – 5S

OUTCOME:
- The student would be able to relate the tools and techniques of lean sigma to increase productivity

REFERENCES:
3. Fred Soleimannejad, Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004

OAN751       LOW COST AUTOMATION

OBJECTIVES
- To give basic knowledge about automation
- To understand the basic hydraulics and pneumatics systems for automation
- To understand the assembly automation

UNIT I       AUTOMATION OF ASSEMBLY LINES

Concept of automation - mechanization and automation - Concept of automation in industry - mechanization and automation - classification, balancing of assembly line using available algorithms - Transfer line-monitoring system (TLMS) using Line Status - Line efficiency - Buffer stock Simulation in assembly line

UNIT II      AUTOMATION USING HYDRAULIC SYSTEMS

Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. - Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis - Servo valves, electro hydraulic valves, proportional valves and their applications.
UNIT III            AUTOMATION USING PNEUMATIC SYSTEMS
Pneumatic fundamentals - control elements, position and pressure sensing - logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods - step counter method - compound circuit design - combination circuit design. Pneumatic equipments - selection of components - design calculations - application - fault finding - hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

UNIT IV            AUTOMATION USING ELECTRONIC SYSTEMS
Introduction - various sensors - transducers - signal processing - servo systems - programming of microprocessors using 8085 instruction - programmable logic controllers

UNIT V            ASSEMBLY AUTOMATION
Types and configurations - Parts delivery at workstations - Various vibratory and non vibratory devices for feeding - hopper feeders, rotary disc feeder, centrifugal and orientation - Product design for automated assembly.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to do low cost automation systems
- Students can do some assembly automation

TEXT BOOKS:

REFERENCES
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) themathematics 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 sanitation, antiseptics sterilants and fumigation. mode of action and resistance to antibiotics; clinically important microorganisms

UNIT V INDUSTRIAL MICROBIOLOGY
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

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

TEXT BOOKS:

OMV751 MARINE VEHICLES L T P C
3 0 0 3

OBJECTIVES:
• To provide the students a basic knowledge about various types of marine vehicles
• To provide the students basic theory behind the design and development of marine vehicles

UNIT I MARINE VEHICLES
Types – general – by function – commercial marine vehicles- passenger ship, cargo ships, oil and chemical tankers, cattle carriers, harbor crafts, off shore platform, container ships

UNIT II REEFERS AND GAS CARRIERS
Introduction – Types, design considerations, safety – operation and controls, precaution during bunkering

UNIT III REMOTELY OPERABLE VEHICLE (ROV), UMS SHIPS

UNIT IV SUBMERSIBLES AND AUTONOMOUS UNDERWATER VEHICLE (AUV)

UNIT V MANNED AND UNMANNED SUBMERSIBLE

TOTAL : 45 PERIODS

OUTCOMES:
- Students will be able understand the types of marine vehicles
- Students should get a preliminary knowledge in marine vehicle design, construction and its components

TEXT BOOKS:
1. Jonathan M. Ross, human factors for naval marine vehicle design and operation
3. R. Frank Busby, Manned Submersibles, Office of the oceanographer of the Navy, 1976

REFERENCES

OAE752 PRINCIPLES OF FLIGHT MECHANICS

OBJECTIVE:
- To make the student understand the performance of airplanes under various flight conditions like take off, cruise, landing, climbing, gliding, turning and other maneuvers.

UNIT I GENERAL CONCEPTS
International Standard atmosphere, IAS, EAS, TAS, Propeller theory- Froude momentum and blade element theories, Propeller co-efficients, Use of propeller charts, Performance of fixed and variable pitch propellers, High lift devices, Thrust augmentation

UNIT II DRAG OF BODIES
Streamlined and bluff body, Types of drag, Effect of Reynold’s number on skin friction and pressure drag, Drag reduction of airplanes, Drag polar, Effect of Mach number on drag polar. Concept of sweep-effect of sweep on drag.
UNIT III  STEADY LEVEL FLIGHT  10
General equation of motion of an airplane. Steady level flight, Thrust required and Power required, Thrust available and Power available for propeller driven and jet powered aircraft, Effect of altitude, maximum level flight speed, conditions for minimum drag and minimum power required, Effect of drag divergence on maximum velocity, Range and Endurance of Propeller and Jet aircrafts. Effect of wind on range and endurance.

UNIT IV  GLIDING AND CLIMBING FLIGHT  9
Shallow and steep angles of climb, Rate of climb, Climb hodograph, Maximum Climb angle and Maximum Rate of climb- Effect of design parameters for propeller jet and glider aircrafts, Absolute and service ceiling, Cruise climb, Gliding flight, Glide hodograph

UNIT V  ACCELERATED FLIGHT  9
Estimation of take-off and landing distances, Methods of reducing landing distance, level turn, minimum turn radius, maximum turn rate, bank angle and load factor, Constraints on load factor, SST and MSTR. Pull up and pull down maneuvers, V-n diagram.

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
• Understand concepts of take-off, climb, cruise, turn, descent and landing performance.
• understand the performance characteristics of the different types of power plants
• Understand and predict the behavior of fixed wing aircraft undertaking a typical flight profile
• Understand the factors that influence aircraft design and limit aircraft performance.

TEXT BOOKS:

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OBJECTIVES:
• To understand the functions of the basic components of a Robot.
• To study the use of various types of End of Effectors and Sensors
• To impart knowledge in Robot Kinematics and Programming
• To learn Robot safety issues and economics.

UNIT I  FUNDAMENTALS OF ROBOT  6
Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification - Specifications - Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Payload - Robot Parts and their Functions - Need for Robots - Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS
Pneumatic Drives - Hydraulic Drives - Mechanical Drives - Electrical Drives - D.C. Servo Motors, Stepper Motors, A.C. Servo Motors - Salient Features, Applications and Comparison of all these Drives, End Effectors - Grippers - Mechanical Grippers, Pneumatic and Hydraulic - Grippers, Magnetic Grippers,

Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) - Jacobians, Velocity and Forces - Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design - Derivations and problems. Lead through Programming, Robot programming Languages - VAL Programming - Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS
RGV, AGV; Implementation of Robots in Industries - Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

REFERENCES:

OME752 SUPPLY CHAIN MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
- To provide an insight on the fundamentals of supply chain networks, tools and techniques.

UNIT I INTRODUCTION 9
Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN 9

UNIT III LOGISTICS IN SUPPLY CHAIN 9

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN 9
Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY 9
The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL: 45 PERIODS

OUTCOME:
- The student would understand the framework and scope of supply chain networks and functions.

TEXTBOOK:

REFERENCES:

OME753                                         SYSTEMS ENGINEERING        L T P C
                                                  3 0 0 3

OBJECTIVE:
- To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effective functioning.

UNIT I  INTRODUCTION
Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT II  SYSTEMS ENGINEERING PROCESSES
Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT III  ANALYSIS OF ALTERNATIVES– I
Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure.

UNIT IV  ANALYSIS OF ALTERNATIVES– II
Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models.

UNIT V  DECISION ASSESSMENT
Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management,

TOTAL : 45 PERIODS

OUTCOMES:
- The Student must be able to apply systems engineering principles to make decision for optimization.
- Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.

TEXT BOOK:
OBJECTIVE:
To understand the various destructive and non-destructive testing methods of materials and its industrial applications.

UNIT I  INTRODUCTION TO MATERIALS TESTING  9
Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II  MECHANICAL TESTING  9
Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III  NON DESTRUCTIVE TESTING  9

UNIT IV  MATERIAL CHARACTERIZATION TESTING  9
Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT V  OTHER TESTING  9

TOTAL: 45 PERIODS

OUTCOMES:
- Identify suitable testing technique to inspect industrial component
- Ability to use the different technique and know its applications and limitations

TEXT BOOKS:
REFERENCES:

OCY751 WASTE WATER TREATMENT  L T P C
3 0 0 3

OBJECTIVES
- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic understations about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT

UNIT II INDUSTRIAL WATER TREATMENT

UNIT III CONVENTIONAL TREATMENT METHODS

UNIT IV WASTEWATER TREATMENT

UNIT V ADSORPTION AND OXIDATION PROCESSES

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: