ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE  
REGULATIONS – 2017  
CHOICE BASED CREDIT SYSTEM  
OPEN ELECTIVES (Offered by Other Branches)  

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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
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

UNIT III CONTROL OF PARTICULATE CONTAMINANTS

UNIT IV CONTROL OF GASEOUS CONTAMINANTS

UNIT V INDOOR AIR QUALITY MANAGEMENT
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:
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-ELECTRICALPARAMETERS 10

UNIT V BIO-CHEMICAL MEASUREMENT 8
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:

OBT552 BASICS OF BIOINFORMATICS L T P C
3 0 0 3

UNIT I BIOLOGICAL DATA ACQUISITION 9
The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information

UNIT II DATABASES 9
Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary sequence databases, protein sequence and structure databases, Organism specific databases

UNIT III DATA PROCESSING 9
Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus global. Distance metrics. Similarity and homology. Scoring matrices.

UNIT IV METHODS OF ANALYSIS 9
Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA, and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment

UNIT V APPLICATIONS 9
Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis : Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Introduction to Bioinformatics by Arthur K. Lesk, Oxford University Press.
5. Beginning Perl for Bioinformatics: An introduction to Perl for Biologists by James Tindall, O'Reilley Media.

REFERENCE
OBJECTIVES:
- 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:

OTL552 DIGITAL AUDIO ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
- To understand the concept of fundamentals of digital audio.
- To understand the concept of audio in digital TV broadcasting.
- To understand the various codes of digital coding.
- To understand the concept of digital audio tape recorder.
- To analyze the concept internet audio in digital audio engineering.

UNIT I FUNDAMENTALS OF DIGITAL AUDIO

UNIT II RECORDING AND TRANSMISSION PRINCIPLES
PCM – record processing – recording oriented codes – transmission oriented codes – audio in digital TV broadcasting – DAB.

UNIT III DIGITAL CODING & COMPRESSION

UNIT IV DIGITAL AUDIO TECHNIQUES

UNIT V APPLICATIONS OF DIGITAL AUDIO

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, students would be able to
- Analyze the type of dither.
- Analyze the recording and transmission principles in digital audio.
- Analyze the various compression techniques.
- Design and analyze the digital audio editing.
- Analyze the various application of digital audio.

TEXT BOOKS:

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

UNIT I  INTRODUCTION  9
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  9
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  9
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  9
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –
Cooling Towers – D.G. sets

UNIT V  ECONOMICS  9
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:
1. Energy Manager Training Manual (4 Volumes) available at www.energymanager
   training.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body

REFERENCES:
   1981.
OBJECTIVES:

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

UNIT I  OVERVIEW OF NUTRITION  9
Definition, six classes of nutrients, calculating energy values from food, using the RDA, nutritional status, nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning: Diet planning principles, dietary guidelines; food groups, exchange lists, personal diet analysis.

UNIT II  DIGESTION  9
Digestion, Absorption and Transport: Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption of nutrients.

UNIT III  CARBOHYDRATES  9
Glycemic and Non-glycemic carbohydrates, blood glucose 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:
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  9

UNIT II  SPATIAL DATA MODELS  9

UNIT III  DATA INPUT AND TOPOLOGY  9

UNIT IV  DATA ANALYSIS  9
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V  APPLICATIONS  9

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:
- 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  9

UNIT II   IN-VITRO CULTURE OF MEDICINAL PLANTS  9
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  9
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, Eugenol from clove oil.)

UNIT IV   SCREENING METHODS FOR HERBAL DRUGS  9

UNIT V   STANDARDIZATION AND CONSERVATION OF HERBAL DRUGS  9
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:

O M D 5 5 2  H O S P I T A L  W A S T E  M A N A G E M E N T  L T P C
3  0  0  3

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 9

UNIT II  BIOMEDICAL WASTE MANAGEMENT 9
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 9

UNIT IV  FACILITY SAFETY 9

UNIT V  INFECTIVE CONTROL, PREVENTION AND PATIENT SAFETY 9

TOTAL : 45 PERIODS

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:
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:
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
Biopower, Bioheat, Biofuels, advanced liquid fuels, drop-in fuels, biobased products

UNIT II FEEDSTOCKS

UNIT III CONVERSION TECHNOLOGIES
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
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
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 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 provide in depth knowledge in Principles of Environmental safety and its applications in various fields.
- To provide the knowledge of air and water pollution and their control.
- To expose the students to the basics in hazardous waste management.
UNIT I SAFETY IN METAL WORKING AND WOOD WORKING MACHINES
9
General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards. Inspection of material handling equipments.

UNIT II SAFETY IN WELDING AND GAS CUTTING
9
Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety-storage and handling of gas cylinders.

UNIT III SAFETY IN COLD FORMING AND HOT WORKING OF METALS
9
Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes - Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures - Safety in Gas Furnace Operation, Cupula, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Material Handling in Foundries, Foundry Production Cleaning And Finishing Foundry Processes.

UNIT IV SAFETY IN FINISHING, INSPECTION AND TESTING
9
Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Inspection And Testing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Vessels, Air Leak Test, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, Engineering And Administrative Controls, Indian Boilers Regulation.

UNIT V INDUSTRIAL SAFETY
9

TOTAL:45 PERIODS

OUTCOMES:
Students will be able to
- Illustrate and familiarize the basic concepts and scope of engineering safety.
- Understand the standards of professional conduct that are published by professional safety organizations and certification bodies.
- Illustrate the importance of safety of employees while working with machineries.

REFERENCES:
7. Dr. Vincent Matthew Ciriello (Prediction of the maximum acceptable weight of lift from the frequency of lift, journal of industrial ergonomics,( 2014), pg .225–237
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
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
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
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
DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT V  INTERFACES IN DCS
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
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:

REFERENCES:

OML552 MICROSCOPY

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:

OBT554 PRINCIPLES OF FOOD PRESERVATION

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
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
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
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
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
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:

REFERENCES:

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

UNIT II   CONCEPT GENERATION AND SELECTION

UNIT III   PRODUCT ARCHITECTURE

UNIT IV    INDUSTRIAL DESIGN
UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 9

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:

OAN551 ENSORS AND TRANSDUCERS L T P C
3 0 0 3

OBJECTIVES:
- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I INTRODUCTION 9

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9
UNIT V  SIGNAL CONDITIONING and DAQ SYSTEMS


TOTAL : 45 PERIODS

OUTCOMES:
The students will be able to

CO1. Expertise in various calibration techniques and signal types for sensors.

CO2. Apply the various sensors in the Automotive and Mechatronics applications

CO3. Study the basic principles of various smart sensors.

CO4. Implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

REFERENCES

OTL551  SPACE TIME WIRELESS COMMUNICATION

OBJECTIVES:
- To understand the concept of multiple antenna propagation.
- To understand the concept of capacity of frequency flat deterministic MIMO channel.
- To understand the concept of transmitter and receiver diversity technique.
- To design the coding for frequency flat channel.
- To analyze the concept of micro multi user detection.

UNIT I  MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION


UNIT II  CAPACITY OF MULTIPLE ANTENNA CHANNELS

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter – Channel known to the transmitter – capacity of random MIMO channels – Influence of ricean fading – fading correlation – XPD and degeneracy on MIMO capacity – Capacity of frequency selective MIMO channels.

UNIT III  SPATIAL DIVERSITY

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS 9

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 9

OUTCOMES:
At the end of the course, students would be able to
- Design and analyze the channel characterization.
- Analyze the capacity of random MIMO channel.
- Design and analyze the order diversity and channel variability.
- Analyze the multiple antenna coding and receivers.
- Analyze the MIMO multi user detection

TEXT BOOKS:

REFERENCES:

OTL553 TELECOMMUNICATION NETWORK MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
- To understand the concept of network management standards.
- To design the common management information service element model.
- To understand the various concept of information modelling.
- To analyze the concept of SNMPv1 and SNMPv2 protocol.
- To analyze the concept of examples of network management.

UNIT I FOUNDATIONS 9

UNIT II COMMON MANAGEMENT INFORMATION SERVICE ELEMENT 9
UNIT III INFORMATION MODELING FOR TMN

Rationale for information modeling—management information model—object oriented modeling paradigm—structure of management information—managed object class definition—management information base.

UNIT IV SIMPLE NETWORK MANAGEMENT PROTOCOL


UNIT V NETWORK MANAGEMENT EXAMPLES


TOTAL: 45 PERIODS

OUTCOMES:

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

- Design and analyze of fault management.
- Analyze the common management information protocol specifications.
- Design and analyze of management information model.
- Design the simple network management protocol.
- Design the various types of network management tools.

TEXT BOOKS:


REFERENCES:


OMD553 TELEHEALTH TECHNOLOGY

L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and it 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  9

UNIT III  TELEMEDICAL STANDARDS  9

UNIT IV  MOBILE TELEMEDICINE  9
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  9

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:

OTL554  WAVELETS AND ITS APPLICATIONS  L T P C
  3 0 0 3

OBJECTIVES:
  • To understand the concept of Fourier transform and short time Fourier transform.
  • To understand the concept of continuous time wavelet transform,
  • To analyze the concept of interpolation and decimation.
• To understand the types of filter bank.
• To analyze the concept of image compression.

UNIT I  FOURIER ANALYSIS  9
Fourier basis & Fourier Transform – failure of Fourier Transform – Need for Time-Frequency Analysis – Heisenberg's Uncertainty principle – Short time Fourier transform (STFT) – short comings of STFT – Need for Wavelets

UNIT II  CWT AND MRA  9

UNIT III  INTRODUCTION TO MULTIRATE SYSTEMS  9
Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor.

UNIT IV  FILTER BANKS AND DWT  9
Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubachies wavelet function.

UNIT V  APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, students would be able to
• Analyze the need for time frequency analysis..
• Design the concept of multi resolution analysis.
• Analyze the multirate system for rational factor.
• Analyze the relationship between the filter bank and wavelet.
• Analyze the application of wavelet.

TEXT BOOK:

REFERENCE BOOKS:

OIM551  WORLD CLASS MANUFACTURING  L T P C
3 0 0 3

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 COOPERATION     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  

UNIT III  
FINANCIAL INSTITUTIONS  
9  
Institutional Lending Agencies - Commercial banks: Nationalization, Agricultural Development Branches - Area Approach - Priority Sector Lending - Regional Rural Banks, Lead bank, Scale of finance - Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Microfinance and its role in poverty alleviation - Self-Help Groups - Non-Governmental Organizations - Rural credit policies 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  
9  
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  
9  

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:  
OBJECTIVES:
- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I     BASIC CIRCUITS ANALYSIS  9

UNIT II    NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS  9

UNIT III   AC CIRCUITS  9
Introduction to AC circuits , inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation – mesh and node analysis, Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV    THREE PHASE CIRCUITS  9
A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V     RESONANCE AND COUPLED CIRCUITS  9

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to introduce electric circuits and its analysis
- Ability to impart knowledge on solving circuit equations using network theorems
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams and analysis of three phase circuits

TEXT BOOKS:

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

UNIT II  BASIC STRUCTURE AND FUNCTION OF ANIMAL CELL
Structure of Cell – Structure and Function of Cell Membrane and Sub organelles. Cellular Transport Mechanism – Cell Division – Mitosis and Meiosis

UNIT III  TISSUES, MEMBRANE AND SKELETAL SYSTEM
Epithelial tissue – Connective tissue – Muscle tissue – Nerve tissue – Membrane. Types of Bone tissue - Classification of Bones – Functions of the Skeleton system – Skull, Vertebral Column. Joint - Articulation

UNIT IV  NERVOUS AND CARDIOVASCULAR SYSTEMS

UNIT V  DIGESTIVE AND URINARY SYSTEMS

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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<td>Students would be understand the basic structural and functional elements of human body</td>
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<td>Students would have knowledge on Skeletal and muscular systems</td>
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<td>Students would be able to comprehend circulatory and nervous systems and their components</td>
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<td>Students would study importance of digestive and urinary systems in Human body</td>
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OGI751 CLIMATE CHANGE AND ITS IMPACT L T P C 3 0 0 3

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
radiative fluxes - heat transport. Atmosphere and ocean systems convecting & advecting 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

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
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
Crossover design, factorial design, equivalence trials, bioequivalence trials, non-inferiority trials, cluster randomized trials, multi-center trials.

UNIT IV BASICS OF STATISTICAL ANALYSIS
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
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:

OEC751 ELECTRONIC DEVICES L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Introduce the concept of diodes, Bipolar Junction Transistors and FET
- Study the various model parameters of Transistors
- Learn the concept of special semiconductor devices, Power & Display devices
- Impart the knowledge of various configurations, characteristics and applications.

UNIT I SEMICONDUCTOR DIODE
PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS
UNIT III  FIELD EFFECT TRANSISTORS  9
JFETs – Drain and Transfer characteristics, Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT IV  SPECIAL SEMICONDUCTOR DEVICES  9
Metal-Semiconductor Junction - MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Point Contact Diode, p-i-n Diode, Avalanche Photodiode, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V  POWER DEVICES AND DISPLAY DEVICES  9
UJT, Thyristor - SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Opto Coupler, Solar cell, CCD.

TOTAL:  45  PERIODS

OUTCOMES:
After this course, the student should be able to:
- Analyze the characteristics of semiconductor diodes.
- Analyze and solve problems of Transistor circuits using model parameters.
- Identify and characterize diodes and various types of transistors.
- Analyze the characteristics of special semiconductor devices.
- Analyze the characteristics of Power and Display devices.

TEXT BOOKS:

REFERENCES:

OML752 ELECTRONIC MATERIALS L T P C
3 0 0 3

OBJECTIVE:
- Understanding the various materials and its properties contribution towards electrical and electronics field. This course covers the properties of materials behind the electronic applications.
UNIT I  INTRODUCTION

UNIT II  CONDUCTING MATERIALS
Introduction, factors affecting the conductivity of materials, classification based on conductivity of materials, temperature dependence of resistivity, Low resistivity materials (graphite, Al, Cu and steel) and its applications, high resistivity materials (manganin, constantin, nichrome, tungsten) and their applications. Superconductors: Meissner effect, classification and applications.

UNIT III  SEMICONDUCTING AND MAGNETIC MATERIALS

UNIT IV  DIELECTRIC AND INSULATING MATERIALS

UNIT V  OPTOELECTRONIC AND NANO ELECTRONIC MATERIALS

TOTAL: 45 PERIODS

OUTCOME:
• With the basis, students will be able to have clear concepts on electronic behaviors of materials

TEXT BOOKS:

REFERENCES:
2. Eugene A. Irene, Electronic Materials Science, Wiley, 2005

OCH752  ENERGY TECHNOLOGY

OBJECTIVES
• Students will gain knowledge about different energy sources
UNIT I  ENERGY  8
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  8
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  10
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  10
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  9
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:
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:
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 \hspace{1cm} PLANETARY SCIENCE

UNIT II \hspace{1cm} SATELLITE ORBIT

UNIT III \hspace{1cm} PROPERTIES OF EMR

UNIT IV \hspace{1cm} RADIOMETRY AND SCATTEROMETRY

UNIT V \hspace{1cm} 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.

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 L T P C 3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

UNIT III COMFORTS IN BUILDING 9

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

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  
Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning - Equipment Planning – Functional Planning

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

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

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

UNIT V       COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL  

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:
OBJECTIVES:
To Provide knowledge
- About the stand alone and grid connected renewable energy systems.
- Design of power converters for renewable energy applications.
- Wind electrical generators and solar energy systems.
- Power converters used for renewable energy systems.

UNIT I INTRODUCTION
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION
Reference theory fundamentals-principle of operation and analysis: IG and PMSG

UNIT III POWER CONVERTERS
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS
Stand alone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design of power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.
- Ability to design power converters used for hybrid renewable energy systems.

TEXT BOOK:

REFERENCES:
INTRODUCTION OF CELL BIOLOGY  

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

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

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

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

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

UNIT V  
ENZYMES  
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

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

TOTAL: 45 PERIODS

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

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

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

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.

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

OEC754 MEDICAL ELECTRONICS

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OBJECTIVES:
The student should be made:
• To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters
• To study about the various assist devices used in the hospitals
• To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING
Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT
pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES
Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging
Systems, Ultrasonic Imaging Systems.

UNIT IV   PHYSICAL MEDICINE AND BIOTELEMETRY  9
Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V   RECENT TRENDS IN MEDICAL INSTRUMENTATION  9
Telemedicine, Insulin Pumps, Radio pill, Endomicroscopy, Brain machine interface, Lab on a chip.

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of this course, the student should be able to:

- Know the human body electro- physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies, and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

TEXT BOOK:

REFERENCES:

OEC756   MEMS AND NEMS  L T P C  3 0 0 3

OBJECTIVES:
- To introduce the concepts of micro and nano electromechanical devices
- To know the fabrication process of Microsystems
- To know the design concepts of micro sensors and micro actuators
- To introduce the concepts of quantum mechanics and nano systems

UNIT I   INTRODUCTION TO MEMS AND NEMS  9
Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT II   MEMS FABRICATION TECHNOLOGIES  9
Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

UNIT III   MICRO SENSORS  9
MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester
UNIT IV     MICRO ACTUATORS       9
Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys,
Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study: RF Switch.

UNIT V     NANO DEVICES           9
Atomic Structures and Quantum Mechanics, Schrodinger Equation, ZnO nanorods based NEMS
device: Gas sensor.

TOTAL: 45 PERIODS

OUTCOMES:
On successful completion of this course, the student should be able to:

- Interpret the basics of micro/nano electromechanical systems including their applications
  and advantages
- Recognize the use of materials in micro fabrication and describe the fabrication processes
  including surface micromachining, bulk micromachining and LIGA.
- Analyze the key performance aspects of electromechanical transducers including sensors
  and actuators
- Comprehend the theoretical foundations of quantum mechanics and nanosystems

REFERENCES:
4. Chang Liu, “Foundations of MEMS”, Pearson education India limited, 2006,
  Press, 2002

OBT752     MICROBIOLOGY          3 0 0 3

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

UNIT I     INTRODUCTION TO MICROBIOLOGY       9
classification and nomenclature of microorganisms, microscopic examination of microorganisms:
light, fluorescent, dark field, phase contrast, and electron microscopy.

UNIT II     MICROBES- STRUCTURE AND REPRODUCTION     9
Structural organization and multiplication of bacteria, viruses (TMV, Hepatitis B), algae
(cyanophyta, rhodophyta) and fungi (Neurospora), life history of actinomycetes (Streptomyces),
yeast (Sacharomyces), mycoplasma (M. pneumoniae) and bacteriophages ( T4 phage, Φ phage)

UNIT III    MICROBIAL NUTRITION, GROWTH AND METABOLISM     9
Nutritional classification of microorganisms based on carbon, energy and electron
sourcesDefinition 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  9
Physical and chemical control of microorganisms. Definition of sterilization, dry and moist heat, pasteurization, tyndalization, radiation, ultrasonication, filtration. Disinfection, sanitization, antiseptics, sterilants and fumigation. Mode of action and resistance to antibiotics; clinically important microorganisms.

UNIT V  INDUSTRIAL MICROBIOLOGY  9
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:

OCH751  PROCESS MODELING AND SIMULATION  L T P C
3 0 0 3

OBJECTIVE:
- To give an overview of various methods of process modeling, different computational techniques for simulation.

UNIT I  INTRODUCTION  7
Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxiliary relations.

UNIT II  STEADY STATE LUMPED SYSTEMS  9
Degree of freedom analysis, single and network of process units, systems yielding linear and non-linear algebraic equations, flow sheeting – sequential modular and equation oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT III  UNSTEADY STATE LUMPED SYSTEMS  9
Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT IV  STEADY STATE DISTRIBUTED SYSTEM  7
Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT V  UNSTEADY STATE DISTRIBUTED SYSTEM & OTHER MODELLING APPROACHES  13

TOTAL: 45 PERIODS
OUTCOME:
- Upon completing the course, the student should have understood the development of process models based on conservation principles and process data and computational techniques to solve the process models.

TEXT BOOKS:

REFERENCES:

OIE751 ROBOTICS

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
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load-
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 13
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 5
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 able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

REFERENCES:

OEC753 SIGNALS AND SYSTEMS L T P C
4 0 0 4

OBJECTIVES:
• To understand the basic properties of signal & systems
• To know the methods of characterization of LTI systems in time domain
• To analyze continuous time signals and system in the Fourier and Laplace domain
• To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 12
Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and properties

UNIT III LINEAR TIME IN Variant CONTINUOUS TIME SYSTEMS 12
Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in
Analysis of CT systems - Systems connected in series / parallel.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 12
Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 12

TOTAL: (L:45+T:15): 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- To be able to determine if a given system is linear/causal/stable
- Capable of determining the frequency components present in a deterministic signal
- Capable of characterizing LTI systems in the time domain and frequency domain
- To be able to compute the output of an LTI system in the time and frequency domains

TEXT BOOK:

REFERENCES:

OME752 SUPPLY CHAIN MANAGEMENT

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:
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:**

**OTL751 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION**

**OBJECTIVES:**
- To gain knowledge in modeling of different communication systems.
- To know the techniques involved in performance estimation of telecommunication systems.
- To learn the use of random process concepts in telecommunication system simulation.
- To study the modeling methodologies of a telecommunication system.
- To study about the QAM digital radio link environment.

**UNIT I SIMULATION OF RANDOM VARIABLES RANDOM PROCESS**
9
Generation of random numbers and sequence – Gaussian and uniform random numbers

**UNIT II MODELING OF COMMUNICATION SYSTEMS**
9
Radio frequency and optical sources – Analog and Digital signals – Communication channel and model – Free space channels – Multipath channel and discrete channel noise and interference.

**UNIT III ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION**
9
Quality of estimator – Estimation of SNR – Probability density function and bit error rate – Monte Carlo method – Importance sampling method – Extreme value theory.

**UNIT IV SIMULATION AND MODELING METHODOLOGY**
9
Simulation environment – Modeling considerations – Performance evaluation techniques – Error source simulation – Validation.

**UNIT V CASE STUDIES**
9
Simulations of QAM digital radio link environment – Light wave communication link – Satellite system.

**TOTAL: 45 PERIODS**

**OUTCOMES:**
At the end of the course, students would be able to
- Apply the constituents of a telecommunication systems.
- Analyze various modeling methodologies and simulation techniques.
- Estimate the performance measures of telecommunication systems.
- Apply system modeling in telecommunication.
- Demonstrate light wave communication and satellite communication systems.

**TEXTBOOKS:**
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 understandings 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: