CURRICULUM DESIGN ABSTRACT

Semester III

MES 3C1-OPTICAL COMMUNICATION TECHNIQUES

MES 3C2-PROGRAMMING IN C++

MES 3C3-DATA COMMUNICATION AND INTERNET TECHNOLOGY

MES 3C4-CONTROL SYSTEMS

MES 3P5-C++ PROGRAMMING LAB

MES 3C1 OPTICAL FIBER COMMUNICATION SYSTEMS

Total Hours: 72 Total Credits: 4

OBJECTIVES

- To get a basic understanding of fundamental principles of Optical Fiber Technology
- To understand different Multiplexing Techniques
- Should able to know different Testing Equipments

Module 1. Introduction, Fibre Structures & Waveguiding 18Hrs.

Overview of Optical Fiber Communications—Advantages of Optical Fibers—Optical Spectral Bands—Key Elements of Optical Fiber System—Basic Optical Laws and Definitions—Optical fiber Modes and Configurations: Fiber Types, Rays & Modes,Step Index Fiber Structure,Wave Representation—Mode Theory for Circular Waveguides: Overview of Modes, Maxwell's Equations,Waveduide Equations,Wave equations for Step-Index Fibers—Single Mode Fibers—Graded-Index Fibre Structure—Fiber Materials Fiber Fabrication--Fiber Optic Cables

Module 2. Signal Degradation in Optical Fibers &Optical Sources 18 Hrs.
Attenuation:Attenuation Units,Absorption,Scattering Losses,Bending Losses,Core and Cladding Losses—Signal Distortion in Fibers:Intramodal Dispersion,Group Delay, Material Dispersion,Waveguide Dispersion,Polarization-Mode Dispersion Light Emitting Diodes(LEDs):LED Structure,Light Source Materials—Laser Diodes:Laser Diode Modes and Threshold Conditions,Laser Diode Rate Equations,Laser Diode Structure and radiation Patterns,Single Mode Lasers—Reliability Considerations

Module 3. Power Launcing , Coupling & Photodetectors 18Hrs.
Power Launching—Source to Fiber Power Launching:Source Output Patterns—Lensing Scheme for Coupling Improvement:Nonimaging Microsphere,Laser-Diode to Fiber Coupling—Fiber-to-Fiber Joints:Mechanical Misalignment,Fiber End-Face Prepration—Fiber Splicing:Splicing Techniques—Optical Fiber Connectors:Connector Types Photo Detectors—Physical Principles of Photodiodes:The *pin* Photo-detector,Avalanche Photodiode—Detector Response Time:Depletion Layer Photocurrent,Response Time—Comparisons of Photodetectors—Solar Cells

Module 4.Optical Network,Measurement&Monitoring Techniques 18Hrs.
Optical Networks—Network Concepts:Network Terminology,Network Categories,Network Layers,Optical layers—Network Topologies—WDM&Operational Principles--SONET/SDH:Transmission Formats and Speeds—High Speed Light Wave Links—Optical Add/Drop Multipluxing;OADM Configurations—Optical Switching:Optical Crossconnect Performance Measurement and Monitoring—Basic Test Equipment:Test Support Lasers,Optical Spectrum Analyser,Multiple Function Testers,Optical Power Attenuatirs,Conformance AnalyserVisual Fault Indicator—Optical Power Measurements:Definition of Optical Power,Optical Power Meters—Eye Diagram Tests—Optical Time-Domain Reflectometer(OTDR).

Text Book

1. Optical Fiber Communication—Gerd Keiser—Fourth Edition—Mc Graw Hill Publication

(Module 1,2,3&4)

Reference Text Books

1. Optical Fiber Communications—John M.Senior—Third Edition—Pearson Education

2. Semiconductor Optoelectronics Sevices—Pallb Bhattacharya—Secod Edition—PHI Publication

3. Electronics Communication Systems--Wayne Thomasi,--5th Edition--Pearson Publication.

MES 3C2 PROGRAMMING IN C++

HOURS : 72 TOTAL CREDIT : 4

Objective: To acquire knowledge on Object-Oriented Programming concepts using C++.

MODULE I 16 hrs

Introduction to object oriented concepts, C++ programming basics, loops and decisions, structures, functions, objects and classes, constructors, objects as function arguments, structures and classes.

MODULE II 14 hrs

Arrays, arrays as class member data, arrays of objects, strings, strings as class members, operator overloading, over loading unary and binary operator, data conversion.

MODULE III 10hrs

Inheritance: Derived class and base class, derived class constructors, class hierarchies, private and public hierarchies, levels of inheritance, multiple inheritance, classes within classes.

MODULE IV 16hrs

Pointers: Memory management, new and delete, pointers to objects, pointers to pointers, virtual functions,friend functions, static functions, assignment and copy initialization, the this pointer, Polymorphism.

MODULE V 16hrs

Files and Streams: stream classes, disk file I/O with streams - string I/O, character I/O, object I/O, file pointers, command line arguments, Template and Exception handling.

Text book:

Object Oriented Programming in Microsoft C++, Robert Lafore, 3rd edition, Pearson publication.

References:

A C++ Primer, Stanely B Hippman
The C++ Programming Language, BjarneStroustrup
Teach yourself C++

MES 3C3 DATA COMMUNICATION AND INTERNET TECHNOLOGY

Total Hours:**72** Total Credits:**4**

Objective:
To get a knowledge of Data Communication Techniques and Concept of Internet Technology.

MODULE-1 Data Communication System 18 Hrs.

Basic Model of Data Communication System–Components- Data Representation-Data Flow—Networks-Criteria-Physical Structures—Categories of Networks-Internetwork—The Internet—Protocols and Standards—Network Models—Layered Tasks—The OSI Model—Layers in the OSI Model—Data & Signals—Analog&Digital--Digital Signals-Bit rate-Bit Length-Transmission of Digital Signals—Transmission Impairment—Data Rate Limits—Performance--Digital Transmission—Digital-to-Digital Conversion—Line Coding Schemes—Transmission Modes(Parrallel&Serial Transmission).

MODULE-2 Multiplexing and Switching 18 Hrs.

Multipluxing—FDM-WDM-Synchronous Time-Division Multipluxing-Statistical Time Division Multipluxing—Spread Spectrum—Transmission Media—Guided Media—Unguided media:Wireless—Switching—Circuit Switched Networks—Datagram Networks—Virtual Circuit Networks—Structure of a Switch:-Circuit&Packet Switches—Telephone Network—Dial-up Modems—Modem Standards--Digital Subscriber Line(DSL)—Cable TV Networks—Cable TV for Data Transfer--ISDN.

MODULE-3 Error Control, Data Link Control & Multiple Access 18 Hrs

Error Detection and Correction—Types of Errors—Block Coding—Error detection & Correction—Cyclic Codes—CRC—Checksum--Data Link Control—Framing—Flow and Error Control—Protocols—Noiseless Channels-Simplest Protocol-Stop and Wait Protocol—Noisy Channels-Stop and Wait ARQ--Go-back-*N* ARQ—Selective Repeat ARQ—Piggybacking—HDLC—Point-to-Point Protocol(PPP)—Multiple Access—Random Access-ALOHA (Pure &Slotted)--CSMA--CSMA/CD—Controlled Access-Reservation-Polling-Token Passing—Channelization-FDMA-TDMA-CDMA.

MODULE-4 LANs and Internetworking 18 Hrs

Wired LANs:Ethernet—IEEE Standards—Standard Ethernet—Wireless LANs—IEEE 802.11—Bluetooth—LAN connecting Devices—Hubs-Repeaters-Bridges-Two Layer Switches-Routers--Gateway—Backbone Networks—Virtual Circuit Networks--Frame Relay—ATM Internetwork Protocol (IP)--Internetworking—IPv4—Process to Process Delivery—User Datagram Protocol (UDP)—UDP Operation-Use of UDP—TCP/IP—TCP Services-TCP Features-TCP Connection-Domain Name System (DNS)—DNS in the Internet—Telnet—Electronic Mail—SMTP—FTP—World Wide Web (WWW)—HTTP—Network Management System.

Text Book

Data Communications and Networking-- Behrouz A .Forouzan-4th Edition-- TataMcGraw-Hill— **(Module 1,2,3,4)**

Reference Text Books

1.Data and Computer Communications-William Stallings-7th/8th Edition-Pearson Education
2.Computer Networkes --Andrew S.Tanenbaum – Pearson Education
3.Data Communication and Computer Networks--Prakash C.Guptha—PHI Publication
4.Internetworking With TCP/IP--Douglas E.Comer—4th Edition—PHI Publication
5.Electronic Communication System—Wayne Tomasi—5th Edition—Pearson Education

MES 3C4 CONTROL SYSTEMS

Total Hours: **72** Total Credits: **4**

Objectives

• To understand the open loop and closed loop systems

• To understand time response and frequency response analysis of control systems

• To understand the compensation technique that can be used to stabilize control systems

Module 1 15 hrs

Mathematical Models of Physical Systems
General Schematic Diagram of Control Systems - Open Loop and Closed Loop Systems – Review of Laplace Transform - Concept of Feedback -Transfer Function –Poles and Zeros- Block Diagrams –Block Diagram Reduction- Signal Flow Graph - Mason's Gain Formula - Examples – Control System Modelling – Electrical Analogous of Mechanical Translational Systems.

Module II 14 hrs

Time Response Analysis
Transient and Steady State Response- Input Test Signals - Time Response Analysis – First Order Systems – Impulse and Step Response Analysis of Second Order Systems –Time Domain Specifications – Steady State Errors —Static Error Coefficients - Generalised Error Coefficients.

Module III 15 hrs

Stability Analysis
Concepts of Stability –Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus – Frequency Response Analysis- Frequency Domain Specifications - Stability Analysis using Bode plots, Polar plots and NyquistStability Criterion, Gain margin and phasemargin.

Module IV 14 hrs

Compensation of Control Systems
Realization of Basic Compensators – Phase-lead Compensation - Phase-lag Compensation – Phase-lag-lead Compensation - Design of lag, lead, lag-lead Compensators using Bode plot- Introduction to P, PI, PD and PID Controllers.

Module V 14 hrs

StateVariable Analysis
State Space Representation of Systems – Block Diagram for State Equation – Transfer Function Decomposition – Solution of State Equation - Transfer Matrix - Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering, I.J. Nagrath and M. Gopal, , New Age International Publishers, 2003.
2. Modern Control Engineering**,** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.
3. Linear Control Systems, Prof.B.S.Manke, Khanna Publishers.
4. Automatic Control systems, Benjamin C. Kuo, Pearson Education, New Delhi, 2003.
5. Control Systems, A. NagoorKani, First Edition, RBA Publications.

MES 3P5 C++ PROGRAMMING LAB

PART I

1. Programs based on class, objects and manipulation of objects using member functions.
2. Programs based on constructors (copy constructor, default constructor).
3. Programs based on friend function, passing objects as arguments to function.
4. Programs based on array of objects.
5. Programs based on function overloading.
6. Programs based on operator overloading (binary & unary).
7. Programs based on inheritance.
8. Programs based on virtual functions.
9. Programs based on manipulators or ios format functions.
10. Programs based on file handling (create a file and display the contents).

*[Any **eight** programs]*

PART II - Programs using the functions in <graphics.h> file.

1. Program to draw lines using line() and linerel().
2. Program to draw a circle using circle().
3. Program to draw an ellipse using ellipse().
4. Program to draw a rectangle using the rectangle().

Use the following functions to modify the above programs:
setcolor(), setbkcolor(), fillellipse(), setfillstyle(), floodfill(), settextstyle() etc.

*[Any **three** programs]*

PART III - Programs for PC interfacing

1. Wave form generation using PC.
2. GPIB interfacing with PC.
3. Interfacing ADC with PC.
4. Interfacing DAC with PC.
5. Interfacing Opto couplers with PC.
6. Control of a motor using PC.
7. Temperature monitoring using PC.

*[Any **four** programs]*

CURRICULUM DESIGN ABSTRACT

Semester IV

MES 4C1-ADVANCED EMBEDDED SYSTEMS

MES 4P2-VHDL PROGRAMMING LAB

MES 4EA*****

MES 4EB*

PROJECT

VIVA-VOCE

MES 4C1 ADVANCED EMBEDDED SYSTEMS

Total Hours: 72 Total Credits:4

Objectives

The aim of this course to provide the student with a detailed understanding of Advanced embedded system on the basis of ARM and VHDL programming. The course covers the details Architecture ARM processor and basic programming concept of VHDL.

Module 1: ARM Architecture 18 hrs

The ARM Architecture :- The Acorn Risc Machine , Architectural Inheritance, The arm programmers model, Arm devolopement tools. ARM Assembly Language Programming:- data processing ,data transfer, and contol flow instructions , simple programs, ARM Organization and implementation.

Module2:ARMProgramming 18hrs

ARM instruction sets, Architectural Support for High-Level Languages:-data types, floating point data type, Expressions, Conditional statement, loops, functions and procedure, use of memory, Run time environment.

MODULE 3 Basic Concepts in VHDL 14hrs.

Introduction to VHDL—Capabilities—Hardware Abstraction—Basic Terminology—Entity Declaration—Architecture Body—Configuration Declaration-- Package Declaration-- Package Body--Basic Language Elements--Data Objects--Data Types-- Operators

MODULE 4 Modeling and Features in VHDL 22hrs

Behavioral Modeling--Data Flow Modeling--Structural Modeling--Hardware Modeling Examples: Moore FSM and Mealy FSM.

Text Book:

1.ARM System-on-Chip Architecture, 2/e, steve Furber, Pearson
2.VHDL Primer Third edition by J.Bhaskar, PHI

Reference Book:

1.Embeded systems B.Kanta Rao PHI Publishers , Eastern Economy Edition
2.VHDL for Programming logic, Kevin Skahill, Pearson Education
3.Introductory VHDL : From Simulation to Synthesis, 1/e, Sudhakar Yalamanchili ,Pearson Education
4.VHDL: Basics to Programming ,Gaganpreet Kaur, Pearson Education

MES 4P2 VHDL PROGRAMMING LAB

A. Implementation of Basic Logic Gates

B. Design and simulation of Combinational Logic Circuit using VHDL

1. Adder(Half adder,full adder)

2. 4 bit parallel adder

3. Multiplier

4. Multiplexer and Demultiplexer

5. Encoder and Decoder

6. ALU

7. code converters(gray to binary ,binary to gray)

C. Design and simulation of Sequential logic circuit using VHDL

1. Flip Flop (SR, D, JK, T)

2. Synchronous counters

3. Asynchronous counters

4. Barrel shifter (4*4)

5. Shiftregisters (SISO,SIPO,PISO,PIPO)

6. Modeling of Moore FSM AND mealy FSM

7. Design various counters (decade, mode-12 etc….)

Note:Minumum 5 from combinational logic(B) and 5 from Sequential logic(C) is compulsory.Basic Logic Gates(A) also a compulsory

TOOLS: XILINX / ALTERA / MODELSIM

References Text Book:-

1. VHDL Primer Third edition by J.Bhaskar, PHI

ELECTIVE PAPERS

MES 4EA*: ADVANCED COMMUNICATION AND RECENT TECHNOLOGIES

MES 4EA1 NANOTECHNOLOGY

Aim – 72 hrs Total credit - 4

Objective

This paper is designed to provide thestudents with an overview of nanotechnology and its applications, various methods adopted for the synthesis of nanomaterials and modern instrumental techniques suited for the characterization of nanostructured materials.

Module 1 : Introduction to nanotechnology 18 hr

Foundations in nanosciences- introduction- scientific revolutions-basic science behind nanotechnology-nanometre: how big or small-nanotechnology-materials at nanoscale-quantum confinement in nanomaterials-rationale behind the downsizing of the materials-prime materials in nanotechnology-nanomaterials:natural and man made-semiconductor nanomaterials-polymers and composites-metal nanoparticles-biomaterials-unique properties of nanomaterials-microstructure and defects in nanocrystalline materials-effect of nano dimensions on material behaviour(magnetic,electrical,optical and thermal properties).

Module 2 :Nano fabrication 18 hr

Introduction-synthesis of nanopowders using top down and bottom up methods-top down fabrication methods-arc discharge method-laser ablation method –ball miling-inert gas condensation-bottom up fabrication methods- homogenous nucleation-CVD-MBE-sol gel method-hydro thermal synthesis-microwave method-challenges in fabrication.

Module 3 :Nanoscale characterization 18 hr

Introduction-XRD(principle and theory)–SEM(principle,construction and working, advantages and disadvantages) -TEM (principle,construction and working,advantages and disadvantages)-AFM (principle,construction and working,advantages and disadvantages)-STM (principle,construction and working,advantages and disadvantages)- Raman spectroscopy (principle,construction and working)-Nanoindentation.

Module 4 : Application of nanomaterial 18 hr

Nano electronics and electronics applications-MEMS/NEMS-nanosensors-nanocatalysts and nanochemistry- nanophotonics– nanocomputers- nanobiotechnology- nanomedical applications-food and agriculture industry-cosmetics and consumer goods-structureand engineering-automotive industry-water treatment and the environment-texties-paints-energy-defence and space applications- structural applications.
Nanostructured materials with high application potential-quantum wells-quantum dots-carbon nanotubes-GaNnano wires-multilayered films.

Text books:

1. Nanotechnology : The Science Of Small-M.A Shah & K.A Shah ,Wiley Publication -First Edition 2013 (Module 1,2,3)
2. Textbook Of Nanoscience And Nanotechnology -B S Murty,P Shankar, Baldev Raj, B BRath And James Murday- Universities Press,First Edition 2012.(Module 1,2,3,4)
3. Introduction To Nanotechnology-Charles P .Poole, Jr., Frank J. Owens- Wiley India Edition 2012 .(module 4)

Reference text books:

1. Introduction To Nanoscience And Nanotechnology- K.K. Chattopadhyay,A.N. Banerjee-Phi Publication ,Fourth Printing 2012.(module 2,3,4)
2. Nano : The Essentials- T.Pradeep- Mcgraw Hill Education, Seventh Reprint 2012. (module 1,3,4)
3. Nanotechnology: Basic Science And Emerging Technologies-Mick Wilson, KamaliKannangara,GeoffSmith,michelleSimmons,BurkhardRaguse-Overseas Press 2005.(Module 1,2,3,4)

MES 4EA2 SECURE COMMUNICATION

Time: 72 hrs Total Credit:4

Objective: To provide a practical survey of the principles and practice of cryptography and network security.

Module 1 12 hrs

Introduction- Security Trends, OSI Security Architecture. Security attacks-Passive attacks, Active attacks. Security Services-Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Availability Service, Security Mechanisms-Model for Network Security

Module 2 16 hrs

Classical Encryption Techniques -Symmetric Cipher model-Cryptography, Cryptanalysis. Substitution Technique -Caeser Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One time Pad, Transposition Techniques, Rotor Machines, Steganography

Module 3 16 hrs

Block Cipher Principles, Data Encryption Standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles. Finite Fields-Groups, Rings and Fields, Modular Arithmetic, The Euclidian Algorithm, Finite fields of the form GF(p),Polynomial arithmetic, Finite fields of the form GF(2n)

Module 4 18 hrs

Advanced Encryption Standard. Confidentiality Using Symmetric Encryption -Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation

Module 5 10 hrs

Firewall Design Principles -Firewall Characteristics, Types of Firewalls, Firewall Configurations. Trusted systems -Data Access Control, The Concept of Trusted Systems, Trojan Horse Defense. Common Criteria for Information Technology Security Evaluation

Text Books:

1.”Cryptography and Network Security”, William Stallings,4th Edition, Pearson Education Inc.
2.”Cryptography Theory and Practice”, Douglas A Stinson,2nd Edition, Chapman & Hall, CRC press Company, Washington
3. ”Security in Computing” Charles P. Pfleeger, Shari Lawrence Pfleeger, 4th Edition, Prentice Hall.
4.”Computer Security Basics” Debby Russell, G.T. Gangemi , 1st Edition O'Reilly Media

MES 4EA3 ADVANCED DIGITAL COMMUNICATION

Unit 1: Information Theory 15 hrs

Introduction to Information Theory, Measure of Information, Information Sources, Information Content of a Discrete MemorylessSource, Average Information or Entropy, Information Rate,Discrete Memoryless Channels, Channel Representation and Channel Matrix, Special Channels, Mutual Information, Conditional and Joint Entropies, Additive White Gaussian Noise Channel, Shannon's Theorem, Channel Capacity, Capacity of a Guassian Channel, Bandwidth S/N Trade–off, Source Coding, Code Length, Entropy Coding, Shannon- Fano Coding, Huffman Encoding, Examples.

Text Book 1: Chapter 13, Text Book 2

Unit II: Pulse Code Modulation and Delta Modulation 14hrs

The Sampling Theorem: Low Pass Signals and Band Pass Signals, Aliasing Error, Digital Representation of Analog Signal - Quantization of Signals, Quantization Error , Pulse Code Modulation, Electrical Representation of Binary Digits, PCM System, Companding, A-Law and μ- Law Companding,Differential PCM, Delta Modulation,Slope Overload and Granular Noise, Adaptive DM, PCM Transmission, Calculation of Quantization Noise, Output Signal Power, Output Signal to Quantization Noise Ratio in PCM and DM, Comparison of PCM and DM.

Text Book 1: Chapters 5 and 12

Unit III: Bandpass Modulationand Demodulation 15hrs

Digital Modulation Techniques: Phase Shift Keying, Amplitude Shift Keying, Frequency Shift Keying,Coherent Detection of PSK and FSK, Non Coherent Detection of Differential Phase Shift Keying, Binary Differential Phase Shift Keying and FSK, Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK), M-ary Signalling, Probability of Error in each Scheme, Comparison of Digital Modulation Techniques.

Text Book 3 : Chapter 4 and Text Book 4 : Chapter 2

Unit IV: Error Control Coding 14hrs

Overview, Redundancy for Error Correction, Linear Block Codes, Hamming Codes, Cyclic Codes, BCH and Reed Solomon Codes, Burst Error Detecting and Correcting Codes, Convolutional Codes, Convolutional Encoder, Code Tree, State Transition Diagram Representation, Trellis Diagram, Decoding Convolutional Codes, The Viterbi Algorithm.

Text Book 5: Chapter 14

Unit V: Spread Spectrum Techniques 14hrs

Overview of Spread Spectrum Techniques, Pseudonoise (PN) Sequences, Properties of Pseudonoise Sequences, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS) Systems: Generation and Detection, Example of Direct Sequencing, Processing Gain and Performance, Frequency Hopping Spread-Spectrum (FHSS) Systems: Example, Robustness, Frequency Hopping with Diversity, Fast Hopping versus Slow Hopping, FFH/MFSK Demodulator, Processing Gain, Synchronization : Acquisition and Tracking.

Text Book 3: Chapter 12

Text Books:

1. Taub's Principles of Communication Systems by H Taub, D L Schilling and G Saha, Third Edition 2008, TMH Education Pvt Ltd, New Delhi.
2. Analog and Digital Communications by Hwei P. Hsu, Schaum'sOutline Series, McGraw Hill Education Pvt. Ltd.
3. Digital Communication Fundamentals and Applications byBernard Sklar and Pabitra Kumar Ray, PearsonEducation, 2006
4. Advanced Electronic Communication Systems by Wayne Thomasi, Sixth Edition, PHI.
5. Modern Digital and Analog Communication Systems by B. P. Lathi, Oxford University Press, Fourth Edition.

Additional Readings:

1.Digital Communication byJohn G. Proakis, McGraw Hill., Fourth Edition.

2.Digital and Analog Communication Systems by K Sam Shanmugam, John Wiley and Sons Pvt. Ltd.

3. Digital Communicationsby SimanHaykin, 4th Edition, John Wiley & Sons, Inc.

MES 4EB*: ADVANCED INSTRUMENTATION AND SYSTEMS

MES 4EB1 BIOMEDICAL ELECTRONICS AND BIOSENSORS

Total Hours: 72 Total Credits: 4

OBJECTIVES

- To get a basic understanding of fundamental principles of Biomedical Instrumentation
- To understand different Measurement Techniques
- Should able to know different Biosensors

Module 1. Biomedical Signals & Instrumentation 18 Hrs.

Physiological Systems of the Body(Cardiovascular ,Respiratory &Nervous Systems)—Source of Biomedical Signals—Basic Medical Instrumentation System—Performance Requirements of Medical Instrumentation System—Intelligent Medical Instrumentation System (Microprocessor,Microcontroller&PC Based Instruments)—General Constraints in Design Medical Instrumentation System—Regulation of Medical Devices—Origin of Bioelectric Signals—Recording Electrodes—Electrodes for ECG,EEG&EMG--Electrical Conductivity of Electrode Jellies and Creams—Microelectrodes

Module 2. Physiological Transducers & Biosensors 18 Hrs.

Introduction—Classification of Transducers—Performance Characteristics of Transducers—Displacement, Position and Motion Transuders (Potentiometric,Variable Capacitance, Variable Inducta-nce, LVDT,Linear Encoders, Piezo-electric) — Pressure Trans-ducers (LVDT,StrainGauge)—Transducers for Body Temperature Measurement (Thermocouples Electric Resistance Thermometer)—Thermistors(Radiation Thermometery,Silicon Diode,Chemical Ther-mometery)—Photoelectric Transducers (Photovoltaic, Photo-emissive,Silicon Diode,Dode Arrays)—Optical Fiber Sensors (Advantages&Types)—Biosensors—Smart sensors

Module 3. Biomedical Recording &Measurement Systems 20 Hrs.

Basic Electronic Recording System—General Considerations for Signal Conditioners—Pre Amplifiers -Electrocardiograph-Vectrocardiograph-Phonocardiograph- Electroencephalograph – Electromyograph-Biofeedback Instrumentation-- Measurement of Heart Rate—Measurement of Pulse Rate—Blood Pressure Measurement (Direct & Indirect Methods)—Pulse Oximeter—Basis of Diagnostic Radiology(X-Ray)—Computed Tomography(CT Scanners) ;Basic Principle—Laser Applications in Biomedical Field—Basics of Biotelemetry and Telemedicine

Module 4. Environmental Engineering & Biosensors 16 Hrs.

What is Environmental Engineering—The Environmental Engineering Process-Modeling—Activities of Environmental Engineering—Environmental Hazards and their Management—Global Hazards—Air Pollutions;Introduction—Water Pollutions and Their Effects; Introduction—Management of Environmental Hazards; Approaches &Assement Criteria—Management of Pollutant Releases Biosensors for Environmental Applications Introduction—Environmental Pollution due to Heavy Metals --Examples of Biosensors for Heavy Metal Determination.

Text Books

1.Hand Book of Biomedical Instrumentation—R.S.Khandpur,Second Edition-Mc Graw Hill Education **(Module 1,2&3)**

2.Biomedical Instrumentation and Measurements—Leslie Cromwell,Second Edition—PHI Publication **(Refer forModule 1,2&3)**

3.Fundamentals of Environmental Engineering—Danny D. Reible—Lewis Publishers **(Module 4-First Part)**

4. Environmental Biosensors--Edited by Vernon Somerset--Published by InTech—Open Access—www.intechopen.com **(Module 4-Second Part)**

Reference Text Books

1.Introduction to Biomedical Instrumentation—Mandeep Sing—PHI Publication

2.Medical Instrumentation Application &Design—John G.Webster,Third Edition—Wiley Publication

3.Biosensors and their Applications—Victor c.Yang—Springer International Edition

4.Elements of Environmental Science & Engineering—P.Meenakshi,Second Edition—PHI Publication

MES 4EB2 RF SIGNALS AND APPLICATIONS

Time: 72 hours Total Credit:4

Objective: The main objective is to provide students with a thorough understanding of RF components and to acquaint them with some of the methods used in circuit analysis and application.

MODULE 1 16 hrs

Introduction to microwave, Microwave region and band designation, Advantages, Application. Wave guides-TE, TM, TEM mode field patterns, Guide wavelength, Group velocity, Phase velocity. Microwave components-Microwave T-junction- H plane Tee junction, E plane Tee, EH plane Tee, Magic Tee, Scattering parameters (Book 1-Chapter 1 & 5)

MODULE 2 18 hrs

Transmission Line Analysis Importance, Examples of transmission line-Two wire line, Coaxial line. Transmission line parameters, Transmission line equation, Lossless line, Distortionless line, Input impedance, Standing wave ratio, power, Shorted line, Open circuit line, Matched line, Smith chart (Book 2-Chapter 10)

MODULE 3 14 hrs

Microwave Measurements Microwave benches, Frequency measurements, Power measurements, Attenuation measurements, Phase shift measurements, VSWR measurements, Impedance measurements (Book 1-Chapter 6)

MODULE 4 12 hrs

Active RF Components Schottky contact, RF diodes, Schottky diode, PIN diode,Varactor diode, IMPATT diode, Tunnel diode, TRAPATT,BARRITT and Gunn diode, RF transistor (Book 3-Chapter 8)

MODULE 5 12 hrs

Antennas Introduction, Types of antenna-Wire antenna, Aperture antenna, Microstrip, Array, Reflector, Lens antenna. Antenna parameters - Radiation power density, Radiation intensity, Directivity, Radiation pattern, Bandwidth,Gain, Input impedance, Efficiency (Book 4-Chapter 1).

TEXT BOOKS:

1.”Microwave and Radar Engineering” M Kulkarni,1 edition, Umesh Publications

2.”Principles of Electromagnetics” Matthew N.O Sadiku,4 edition, Oxford University Press

3.”Microwave Devices and Circuits” Samuel Y Liao,3rd edition, Prentice-Hall, Inc

4.”Antenna Theory Analysis and Design” Constantine A Balanis, 2nd edition, John Wiley and Sons

REFERENCE BOOKS:

1.”RF Circuit Design-Theory and Applications” Reinhold Ludwig & Powel Bretchko, 1st edition, Pearson Education Ltd.

2.”Microwave Engineering” David M Pozar, 2nd edition, John Wiley and Sons, inc.

MES 4EB3 ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

HOURS: 72 ` TOTAL CREDITS:4

MODULE I Fundamentals of Artificial Intelligence
Introduction: AI approach, AI problems, Foundation of AI and history of AI, Intelligent agents: Agents and Environments, structure of agents, concept of rationality, Expert system, Searching: searching for solution-Breadth first search, depth first search. Knowledge representation and reasons logical agents, Knowledge based agents, Wumpus world logic, propositional logic, Resolution, Forward and Backward chaining.
Book 3.

MODULE II Fundamental Concepts of ANN
Introduction of ANN, Concept of ANN and its basic mathematical model, McCulloch-Pitts neuron model, Simple perceptron, Adaline and Madaline, Feed –forward multilayerperceptron, Learning and training the neural network, Leaning Process, Delta learning rules for multi perceptron layer, back propogation algorithm.
Book 1.

MODULE III Feed Forward and Feed Back Neural Network
Feed Forward: Introduction, Analysis of pattern Association Networks, analysis of Pattern classification network, analysis of pattern storage network, Feed Back: Introduction, Analysis of linear auto associative FF network.
Book.2

MODULE IV Competitive Learning and Pattern Recognition
Introduction, Analysis of Pattern Clustering Networks, Analysis of feature mapping network, Associative memory, Application of ANN.
Book.2

Text books:

1. Introduction to Artificial Neural Systems: J.M. Zurada, Jaico Publishing House, New Delhi
2. Artificial Neural Network : B.Yagna Narayana, PHI
3. Artificial Intelligence- A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.

References:

1. Artificial Intelligence, 2nd Edition , E.Rich and K.Knight(TMH)
2. KOSKO, B. " Neural Networks and Fuzzy Systems" , Prentice-Hall of India Pvt.Ltd.
3. Artificial Neural Networks: K.Mehrotra, C>K Mohan and Sanjay Ranka, Penram International Publications, New Delhi.