MAHATMA GANDHI UNIVERSITY

KOTTAYAM

M Sc PROGRAMME

IN

ELECTRONICS

(Affiliated Colleges)

REGULATIONS, SCHEME AND SYLLABUS

(Effective from 2012 Admissions)

Mahatma Gandhi University, Kottayam

Board of Studies In Electronics (PG)

1. Prof.Mathew .Mathew, Department of Physics CMS College, Kottayam

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Preface

The P.G syllabus inElectronics is restructured to suite the credit and semester system to be followed by the affiliated colleges under M.G University, Kottayam, from the academic year 2012-2013. Now as the continuation of the credit and semester system being followed in the U.G courses in the university, the present restructuring of P.G curriculum becomes inevitable. In the restructuring of the P.G syllabus, the board of studies has taken efforts to offers in depth knowledge of the subject starting from its basic concepts to the state of art technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R&D. the course is designed with a view to catering to the present day requirements in industries, R&D field higher studies and self-employment.

The Board of studies acknowledges the contributes from teaching members of all the affiliated colleges.

Prof. Mathew C Mathew
Chairman,
P.G Board of studies in electronics
M.G University
Kottayam

M.Sc. PROGRAMME IN ELECTRONICS 2012

(Affiliated Colleges)

1. Eligibility

The eligibility for admission to M Sc Electronics programme in affiliated institutions under Mahatma Gandhi University is a B Sc Degree with Electronics/Physics one of the subjects (Main or Subsidiary) with not less than 55% marks in optional subjects.

Note: Candidates having degree in Electronics/Electronics Equipment and Maintaince/Physics shall be given a weightage of 20% in their qualifying degree examination marks considered for ranking for admission to M Sc(Electronics).

2. Admission

The admission to the M Sc programme shall be as per the rules and regulations of the University.
Students admitted under this programme are governed by the Regulations in force.

3. Programme Structure and Duration

The duration of the programme shall be 4 semesters. The duration of each semester shall be 90 working days. Odd semesters from June to October and even semesters from December to April. There shall be one month semester breaks each in November and May.

A student may be permitted to complete the programme, on valid reasons, within a period of 8 continuous semesters from the date of commencement of the first semester of the programme.

The programme shall include two types of courses, Core courses and Elective Courses .

There will be four core courses and one practical course per semester for the first three semesters. In the last semester there will be one core course, two elective courses to be selected from two separate groups and one project. At the end of the programme, there will be a comprehensive viva-voce which covers questions from all courses in the programme.

4. Attendance

The minimum requirement of aggregate attendance during a semester for appearing for the end semester examination shall be 75%. A student who does not satisfy the requirements of attendance shall not be permitted to take the end Semester examinations.

5. Promotion

A student who registers for the end semester examination shall be promoted to the next semester.

6. Examinations

There shall be University examination at the end of each semester.
Practical examinations shall be conducted by the University at the end of each semester.
Project evaluation and Viva -Voce shall be conducted at the end of the programme only.
Practical examination, Project evaluation and Viva-Voce shall be conducted by two external examiners and one internal examiner.
End-Semester Examinations: The examinations shall be normally at the end of each semester.
There shall be one end-semester examination of 3 hours duration in each lecture based course and practical course.

7. Evaluation and Grading

Evaluation: The evaluation scheme for each course shall contain two parts; (a) internal evaluation and (b) external evaluation. 25% weightage shall be given to internal evaluation and the remaining 75% to external evaluation and the ratio and weightage between internal and external is 1:3. Both internal and external evaluation shall be carried out using Direct grading system.

Internal evaluation: The internal evaluation shall be based on predetermined transparent system involving periodic written tests, assignments, seminars and attendance in respect of theory courses and based on written tests, lab skill/records/viva and attendance in respect of practical courses. The weightage assigned to various components for internal evaluation is as follows.

Components of Internal Evaluation

	Component	Weightage
i)	Assignment	1
ii)	Seminar	2
iii)	Attendance	1
iv)	Two Test Papers	2

Letter Grade	Performance	Grade Point (G)	Grade Range
A	Excellent	4	3.50 to 4.00
B	Very Good	3	2.50 to 3.49
C	Good	2	1.50 to 2.49
D	Average	1	0.50 to 1.49
E	Poor	0	0.0 o 0.49

Grades for Attendance

% of attendance	**Grade**
>90%	A
Between 85 and 90	B
Between 80 and below 85	C
Between 75 and below 80	D
< 75	E

Assignment

Components	Weight
Punctuality	1
Review	1
Content	2
Conclusion	1
Reference	1

Seminar

Components	Weights
Area / Topic selected	1

Review / Reference	1
Content	2
Presentation	2
Conclusion	1

Practical – Internal

Components	Weights
Attendance	1
Laboratory Involvement	2
Written / Lab Test	2
Record	2
Viva-voce / Quiz	1

Practical – External

Components	Weights
Design and Coding	2
Output	2
Record	2
Viva-voce	1

To ensure transparency of the evaluation process, the internal assessment grade awarded to the students in each course in a semester shall be published on the notice board at least one week before the commencement of external examination. There shall not be any chance for improvement for internal grade.

The course teacher and the faculty advisor shall maintain the academic record of each student registered for the course which shall be forwarded to the University through the college Principal and a copy should be kept in the college for at least two years for verification.

External evaluation: The external Examination in theory courses is to be conducted by

the University with question papers set by external experts. The evaluation of the answer scripts shall be done by examiners based on a well-defined scheme of valuation. The external evaluation shall be done immediately after the examination preferably through Centralized Valuation

8. Direct Grading System

Direct Grading System based on a 5 - point scale is used to evaluate the performance (External and Internal Examination of students)

DIRECT GRADING SYSTEM

Letter Grade	Performance	Grade point(G)	Grade Range
A	Excellent	4	3.5 to 4.00
B	Very Good	3	2.5 to 3.49
C	Good	2	1.5 to 2.49
D	Average	1	0.5 to 1.49
E	Poor	0	0.00 to 0.49

The overall grade for a programme for certification shall be based on CGPA with a 7-point scale given below

CGPA	Grade
3.80 to 4.00	A+
3.50 to 3.79	A
3.00 to 3.49	B+
2.50 to 2.99	B
2.00 to 2.49	C+
1.50 to 1.99	C
1.00 to 1.49	D

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A separate minimum of C Grade for Internal and External are required for a pass for a course. For a pass in a programme a separate minimum Grade C is required for all the courses and must score a minimum CGPA of 1.50 or an overall grade of C and above.

Each course is evaluated by assigning a letter grade (A, B, C, D or E) to that course by the method of direct grading. The internal (weightage =1) and external (weightage =3) components of a course are separately graded and then combined to get the grade of the course after taking into account of their weightage.

A separate minimum of C grade is required for a pass for both internal evaluation and external evaluation for every course.

A student who fails to secure a minimum grade for a pass in a course will be

permitted to write the examination along with the next batch.
There will be no supplementary examinations.

After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of semester, a student should pass all courses and score a minimum SGPA of **1.50.** However, a student is permitted to move to the next semester irrespective of her/his SGPA.

For instance, if a student has registered for 'n' courses of credits C1, C2 ……,Cn in a semester and if she/he has scored credit points P1, P2……,Pn respectively in these courses, then SGPA of the student in that semester is calculated using the formula.

SGPA= (P1+P2+…….+Pn)/ (C1+C2+……+Cn)

CGPA = [(SGPA)1*S1 + (SGPA)2*S2 + (SGPA)3*S3 + (SGPA)4*S4]/ (S1+S2+S3+S4)

Where S1, S2, S3, and S4 are the total credits in semester1, semester2, semester3 and semester4.

9. Pattern of Questions

Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. He/She shall also submit a detailed scheme of evaluation along with the question paper. A question paper shall be a judicious mix of short answer type, short essay type / problem solving type and long essay type questions.

Weight : Different types of questions shall be given different weights to quantify their range as follows :

Sl. No.	Type of Questions	Weight	Number of questions to be answered
1	Short Answer type questions (not exceeding 1 page)	1	5 out of 8
2	Short essay / problem solving type questions (not exceeding 2 pages)	2	5 out of 8
3	Long Essay Type questions	5	3 out of 6

The Final Grade Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme including those taken over and above the prescribed minimum credits for obtaining the degree. The Final Grade Card shall show the CGPA and the overall letter grade of a student for the entire programme.

CURRICULUM DESIGN ABSTRACT

Semester I

MES 1C1 - Electronic Devices and Circuit Design

MES 1C2 - Modern Communication Systems

MES 1C3 - Advanced Networks and Systems

MES 1C4 - MEMS and Power Electronics

MES 1P5 - Lab I Advanced Electronics Lab and Power Electronics Lab

Semester	Course	Teaching Hrs.		Credit	Total Credits
		Theory	Practical's		
I	MES 1C1	5	-	4	19
	MES 1C2	4	-	4	
	MES 1C3	4	-	4	
	MES 1C4	4	-	4	
	MES 1P5	-	8	3	
II	MES 2C1	4	-	4	19
	MES 2C2	4	-	4	
	MES 2C3	4	-	4	
	MES 2C4	4	-	4	
	MES 2P5	-	9	3	
III	MES 3C1	4	-	4	19
	MES 3C2	4	-	4	
	MES 3C3	4	-	4	
	MES 3C4	4	-	4	
	MES 3P5	-	9	3	
IV	MES 4C1	6	-	4	23
	MES 4EA*	5	-	4	
	MES 4EB*	5	-	4	
	Project	-	9	8	
	Viva-Voce	-		3	

SEMESTER I

MES 1C1 Electronic Devices and Circuit Design

MODULE 1:DIODES AND TRANSISTORS

PN Junction Diodes, Zener Diode, LED ,Tunnel Diode, Rectifiers, Biasing:- BJT,FET;MOSFET: Enhancement ,Depletion Types

MODULE 2:OPERATIONAL AMPLIFIER

Introduction,Charrecterstics,Inverting and Noninverting Amplifier; Applications:- Integrator,Differentiator,Schimitt Trigger,Zero crossing Detector,Phase Locked Loop,Level Detector ,Window Detector,Time marker Generator,Phase detector,

MODULE 3:FILTER AND WAVE GENERATOR

Filters:- First order low pass filter,Second order low pass filter,High pass filter and Second order band pass filter,Narrow band and wide band pass filter,Band rejection filter,notch filter and Band rejection filters

Astable and Monostable multivibrator,Traingular wave Generator,sine wave Generator,Phase shift and wien bridge oscillator,

MODULE 4:DIGITAL IC APPLICATIOS

Number system,Boolean Algebra,logic gates,combinational and sequential circuits,Synchronous and Asynchronous circuits,Digital IC's and Applications, Decade counter,Decoder,Parity Generator /Checker, sequence generatot,pattern detector

TEXT BOOKS

1. Electronic Devices and Circuit Theory, ROBERT BOYLESTAD,LOUIS NASSHELSBY.
2. Linear Integrated Circuits, D ROY CHOUDHURY
3. Op-amps and linear integrated circuits, RAMAKANT A. GAYAKWAD
4. Operational amplifiers and linear integrated circuits, ROBERT F. COUGHLIN, FREDERICK F. DRISCOLL
5. Digital and Analog techniques, G N NAVANEETH
6. Digital Integrated Electronics, HERBERT TAUB, DONALD SCHILLING

MES 1C2 **MODERN COMMUNICATION SYSTEMS**

Module 1. Digital Communication

Digital Modulation Techniques—Introduction—Pulse Code Modulation—Sampling Theorem—Quantization—Quantization Noise—Encoding—Generation and Reception—Noise in PCM Systems—Companding—DPCM—ADPCM--Delta Modulation—Digital Transmission Techniques—ASK—FSK—PSK—QPSK—DPSK—MSK—Time Division Multiplexing and Digital T1Carrier Systems.

Module 2.Fiber Optics Communication

Introduction--Total Internal Reflection-- Critical Angle and Acceptance Angle-- Fiber Classification:- Step Index, Graded Index; Modes, Cutoff wave length—Absorption--Scattering Losses--Core and Cladding Losses--Signal Distortion in Optical Wave guides:- Information capacity determination, Group delay, Material dispersion, Wave guide dispersion, Intermodal distortion--Lencing schemes for coupling improvements--Fiber endface preparation--Fiber Splicing-- Optical fiber connectors.

Module 3.Mobile Communication

Evolution of Mobile Communication—Mobile Radio System Around the World—Cordless Telephone System—Cellular Telephone System—How a Cellular Telephone Call is Made—Trends in Cellular Radio Communications—2G,2.5G and 3G Cellular Networks—WLL and WLAN—The Cellular Concept—Frequency Reuse—Channel Assignment Strategies—Handoff Strategies—Interference and System Capacity—Improving Coverage and Capacity in Cellular Systems—Propagation Problems:-Path Losses, Multipath Fading—Multiple Access Techniques:-FDMA,TDMA,CDMA,SDMA.

Module 4.Satellite Communication

Satellite Communication Fundamentals—Satellite Orbits—Satellite Positioning—Frequency Allocations—Antennas—Power Systems—Attitude Control—Satellite Station Keeping—Polarization—Transponders—Digital Satellite Communication Techniques—Multiple Access Techniques—Geostationary Satellite communication—VSAT—Satellite Path/Link Budget—Earth Stations—Satellite TV Systems.

Module 5. Radar Systems

Basic Principles and Radar Systems—Radar Performance Factors—Radar Range Equation--Pulsed Radar Systems—Antennas and Scanning—Display Methods—Moving Target Indication—Radar Beacons—CW Doppler Radar—Frequency Modulated CW Radar—Phased Array Radars—Planar Array Radars--Radar Coolant.

Text Books

1. Electronics Communication Systems by Wayne Thomasi, Pearson Publication, 5th Edition, (Module-1).
2. Optical Fibre Communications by Gerd Keiser(Module-2).
3. Wireless Communication Principles and Practice by Theodore S Rappaport, Person Publication, 2nd Edition, (Module-3).
4. Telecommunication Transmission Systems by Robert G Winch,McGrawHill Publication,2nd edition,(Module-4).
5. Electronic Communication Systems by Kennedy/Davis, Mc Graw Hill Publication, 4th edition,(Module-5).

Reference Text Books

1. Electronic Communications by Roody/Coolen, ,Pearson Publication,4th edition.
2. Satellite Communications by Dennis Roddy,Mc Graw Hill Publication,3rd edition.
3. Introductions to RADAR Systems by Skolnik, McGraw Hill, 3rd edition

MES 1C3 ADVANCED NETWORKS AND SYSTEMS

Module I

Review of basic circuit concepts

Circuit elements and Kirchoff's laws, Review of network theorems- Superposition Theorem, Substitution Theorem, Compensation Theorem, Thevenin's, Norton's, Millman's, Maximum Power Transfer theorem, Reciprocity Theorem.

Module II

Properties of Signals and Systems.

Characteristics of signals- Unit step function, Impulse and Ramp functions. Linearity-Time invariance, Stability and Causality- Special properties of Linear Time Invariant systems- Relation between Transfer function and impulse response- Network functions- Poles and Zeros- Pole-zero plot. Electrical systems- Mechanical systems- D'ALEMBERT'S Principle- Analogy systems- Force voltage analogy- Force current analogy.

Module III

Laplace and Fourier Transform Analysis

Network Analysis using Laplace Transform- Laplace transformation- Inverse Laplace Transformation- Important theorems regarding Laplace Transformation- Applications of Laplace Transformation in analyzing simple series and parallel networks (RL, RC and RLC circuits)- Laplace and Fourier Transforms of different signal waveforms.

Module IV

Passive network synthesis

Hurwitz polynomials- Positive real functions- Synthesis of RL, LC and RC networks by I^{st} and II^{nd} Foster and Couer methods.

Text Books

1. Network and systems, ROY CHOUDHARY
2. Network Analysis, G.K MITHAL
3. Circuits and Networks, A. Sudhakar,SHYAM MOHAN
4. Basic Circuit Theory, DESOR,KUO
5. Network Analysis, VAN VALKENBERG
6. Network Lines and Fields, RYDER
7. Principle of Network Synthesis, , VAN VALKENBERG

MES 1C4 **MEMS AND POWER ELECTRONICS**

MODULE I: OVERVIEW AND WORKING PRINCIPLES OF MEMS

MEMS and Microsystems – Typical MEMS and Microsystems products – Microsystems and Microelectronics –Miniaturization – Applications of Microsystems –Micro sensors, Micro actuation, Micro grippers, Micro motors, Micro accelerometer.

MODULE II: FABRICATION & MICROSYSTEM DESIGN

Ions and Ionization – Doping – Diffusion process – Scaling Laws for Electrical design –Substrate and wafers – Silicon as a substrate – Silicon compounds – Piezoresistors –Piezocrystals - Photolithography – Ion implantation – Diffusion – Oxidation – PVD – Etching –Surface micro aching – LIGA process - Microsystem Design Considerations – Use of CAD tool in Microsystems design.

MODULE III: POWER ELECTRONIC DEVICES & CIRCUITS

Review of operations: SCR, TRIAC, DIAC, IGBT, Power Diodes, MOSFET and UJT. Thyristor communication techniques: Introduction – Natural commutation –Forced commutation – Self commutation – Impulse commutation – Response pulse commutation – External pulse commutation – complementary commutation. Controlled Rectifiers: Principle of Phase controlled converter – Single-Phase full converter –Single-phase semi converter – Principle of Three phase half wave converter.

MODULE IV: AC VOLTAGE CONTROLLER AND DC CHOPPERS

AC Voltage Controller: Introduction – Principle of On / Off Control – Principle of Phase Control – Single Phase Bi-Directional Controllers with Resistive Loads - Cyclo Converters – Single Phase Cyclo converters.

DC Choppers: Introductions – Principles of Step down Operation – Step down With RL load –Principle of Step up Operation-Switch Mode Regulators: Buck Regulator – Boost Regulator –Buck Boost Regulator – Cuk Regulator.

Inverters: Introduction – Principle of Operation – Single Phase Bridge Inverter – Three-Phase Inverter – PWM voltage control.

TEXT BOOKS

1. “MEMS & Micro Systems Design and Manufacture” – Tai-Ran-Hsu, TMH, 2002

Edition.

2. “Power Electronics, Circuits, devices and Applications”, MUHAMMED RASHID,

Prentice Hall Edition, 2nd Edition, 1999.

3. “Power Electronics”,SEN

MES 1P5 Advanced Electronics Lab and Power Electronics Lab

ADVANCED ELECTRONICS LAB

PART 1-DIGITAL LAB

1. Shift register using IC.
2. Ripple counter using IC.
3. Ring counter using IC.
4. Decade counter using IC.
5. A/D Converter
6. D/A Converter

PART 2-OP AMP LAB

7. Operational Amplifiers Characteristics
8. Design of filters (low pass, High pass, Band pass, Band Rejection, Notch)
9. Wave Generators (Sine Wave, Triangle and Square wave)
10. Wave shaping circuits and Precision Rectifiers
11. Schimmit Trigger
12. Multivibrators
13. Log amplifiers

PART 3-Power Electronics Lab

14. SCR Characteristics
15. TRIAC Characteristics
16. Single Phase Inverter
17. UJT Relaxation Oscillator
18. Commutation Techniques

PART 4-Communication Lab

19. AM
20. FM
21. VCO & Frequency Multiplier
22. PCM
23. Time Division Multiplexing
24. BFSK

Note: Choose any 15 experiments from above list

Semester II

MES 2C1 - DSP AND APPLICATIONS

MES 2C2 – MICROCONTROLLERS AND EMBEDED SYSTEM

MES 2C3 – ROBOTICS AND MECHATRONICS

MES 2C4 - VLSI DESIGN AND ANALYSIS

MES 2P5 – MICROCONTROLLER AND SIGNAL PROCESSING LAB

MES 2C1 - DIGITAL SIGNAL PROCESSING AND APPLICATIONS

MODULE 1

Introduction to signals, Classification of signals, Discrete time systems, Digital signal Processor systems, Advantages and limitations of Digital signal Processing systems, Operation of signals

Book : 1

MODULE 2

Z transform definition, properties, inverse Z transform – Partial fraction, convolution method, Solution different equations using one sided Z transform.

Book: 1

MODULE 3

Image processing, Image representation, Stages of Image processing, Application of Image processing, Colour Image. RGB, YUV, Image Enhancement, DCT, DST, Image compression standard – JPEG, JPEG 2000, Image processing software – an overview.

Book : 3,4

MODULE 4

Video coding, motion estimation, Search for Motion Vectors, video coding standards, MPEG 1 standards, H.261 standards, H.264 standards

Book : 5

Reference

1. Ramesh Babu, Digital Signal Processing, Fourth edition, Scitech Publications (India), Chennai
2. Nagoorkani, Digital Signal Processing, MC Graw – Hill Edition
3. K.Sayood, Introduction to Data Compression, Harcout India Pvt. Ltd. &Morgan Kautmann Publishers, 1996
4. S.Jayaraman, , Digital Image Processing, Tata MC Graw – Hill Edition
5. Z.Li and M.S Drew, “Fundamentals of Multimedia”. Pearson Education (Asia) Pte. Ltd
6. Mark Nelson, Data Compression book, B.P.B Publishers, Newdelhi, 1998.
7. Jan Vozer, Video compression for Multimedia, Newyork, 1995
8. Digital Signal Processing – Principles, algorithms and application – John C, Proakis - PHI.

MES 2C2 MICROCONTROLLERS AND EMBEDDED SYSTEM

MODULE 1

Introduction to Embedded systems – Microcontroller and Embedded Processor – Introduction to 8051 – Architecture, Hardware – Oscillator & clock program C – Data pointer – registers – Memory Organisations – Program Memory – Data Memory – Input/Output Ports – External Memory – Counter – Timer – Serial Data – Input Output Interrupts

Book : 1

MODULE 2

8051 Assembly language programming – Structure of assembly language – Assembling & running an 8051, Addressing Mode – Accessing memory using various addressing modes – Instruction set – Arithmetic Operation & programs – Logical Operation and Programs – Jump & Call instructions and Programs – I/O port programs – Single bit call instructions & Programs – Timer and counter & programs.

Book : 1

MODULE 3

UART – Serial Protocols: 12 C bus, TWI, SPI, CAV bus – Wireless protocols: IrdA – RS -232 – Input Capturing and Output Compare – Pulse Width Modulation – Wave Generation – Watch Dog Timers –JTAG

Book : 4,5

MODULE 4

AVR Microcontroller – AVR Family – AVR RISC Microcontroller Architecture (AT Mega -32) – ALU & Registers – Memory Access & Instruction Execution – Program & Data Addressing Modes – AVR Instruction Set – Serial Communication: UART, SPI, 12C, TWI – Timers –PWM – Watch Dog Timers – Interrupts

Book : 5,6

MODULE 5

Overview of PIC Microcontrollers – PIC Architecture and assembly language programming – Comparison of 8051, PIC & AVR Microcontrollers - Introduction to MPLAB simulator - AVR Simulator : AVR Studio – Programming the AVRs - Introduction to AVR C- Programming

Book : 2,5,6

Reference

1. Muhamed Ali Mazidi, Rolin D Mickinkay, The 8051 Microcontroller and Embedded systems, Second edition, Persons Education.Inc

2. Martin Bater, PIC Microcontroller, an Introduction to microelectronics, 3rd Edition

3. Frank Vahid and Tony Givargis, Wiley Embedded system design : A unified hardware/ software Introduction

4. Dhananjay V. Gadre, programming and Customizing the AVR Microcontroller, McGraw Hill

5. Muhamed Ali Mazidi,Sarmad Naimi, Sepehr Naimi, The AVR Microcontroller Embedded systems, Prentice Hall

MES 2C3 ROBOTICS AND MECHATRONICS

MODULE 1

Introduction: Definitions. Robot classification – Cartesian, Cylindrical, Spherical Work envelop, repeatability, Precision, Accuracy, types of joints, Prismatic, Revolute, Ball and Socket, Degree of Freedom, Joint Variables

Book : 1

MODULE 2

Sensors and actuators : Sensors, Position Sensors – Potentiometric, Velocity and Speed measurements, Proximity Sensors, Touch and slip sensors, Force and torque sensors,Actuators – Hydraulic and Pneumatic, DC motor and Stepper motors

Book : 2,3

MODULE 3

Robot Programming : tech In, tech Through, High level Languages – robot talk, Comparison of Teaching and Programming methods, Software and speed up. Industrial applications: Loading and Unloading, Die casting, Spot and Arc welding, Assembly applications, Selection of Robots

Book : 5,2,6

MODULE 4

Introduction to mechatronics – systems – control systems – history – structure of robotics and mechatronics projects-systems-mesurement systems control systems-microprocessor-based controllers – response of systems- themechatronics approach

Book : 8

REFERENCE

1. Schilling, Robert J. “Fundamentals of Robotics” PHI, 1996
2. Klafter, richardd, “ robotic engineering” PHI, 1996
3. Fu, Gonzalez, Lee “Robotics: Control, Sensing, vision and intelligence” Mcgraw hill
4. Moshe Shoham, “ a text book of robotics – basic concept”, koganpage, London - 1982
5. Groover, Weiss, Nagel and Ordey “Industrial robotics technology, programming & applications” Mcgraw hill
6. R.K.Mittal, I j nagrath “ robotics and control”, Mcgraw hill
7. Devdas shetty, Richard a.kolk, mechatronics system design-pws publishing company, 1997
8. Bardley, d.dawson, n.c. burd and a.j. loader. Mechatronics : electronics in products and processes, chapman and hall. London, 1991
9. Bolton, Mechatronics : Electronic Control systems in Mechanical and Electrical Engineering, 2nd Edition, Addison Wesley Longman Ltd. 1999.
10. Devdas shetty, Richard A.Kolk, Mechatronics System Design-PWS publishing company, 1997
11. Brian Morris, Automated Manufacturing Systems – Actuators, Controls, Sensors and Robotics, Me Graw Hill International Edition, 1995.

MES 2C4 VLSI DESIGN AND ANALYSIS

Module 1. Introduction to MOS Technology

Basic MOS Transistors--Enhancement Mode Transistor action—Depletion Mode Transistor Action—nMOS Fabrication--Silicon Wafer Preparation—Summary of an nMOS process— Basic CMOS Technology—The p-well Process—The n-well Process—The Twin-Tub Process—SOI Process—BiCMOS Technology-- Moor's Law

Module 2. Basic Electrical Properties of MOS and CMOS Circuits

nMOS and pMOS Enhancement Mode Transistors--V-I Characteristics of MOSTransistors—MOS Device Equations—Basic DC Equations--Threshold Voltage—Body Effect—The Pass Transistor—The nMOS Inverter—Pull-Up to Pull-Down Ratio—The CMOS Inverter—DC Characteristics—Switching Characteristics of CMOS Inverter

Module 3. MOS Circuit Design Process

Why Design Rules—MOS Layers—Stick Diagrams—nMOS Design Styles—CMOS Design Styles—Design Rules and Layout—Scaling of MOS Circuits—Scaling Models and Scaling Factors—Scaling Factors for Device Parameters—Limitations of Scaling

Module 4. Subsystem Design and Layout

Architectural Issues—Switch Logic:-Pass Transistors and Transmission Gates—Gate Logic:- The Inverter,Two-input nMOS and CMOS Nand & Nor Gates—Examples of Structured Design(Combinational Logic):-Parity Generator, Multipluxers,General Logic Function Block Progammable Logic Array—Clocked Sequential Circuits:-Two-phase clocking, Charge Storage,Dynamic Register Element, Dynamic Shift Register—Design of 4*4 Barrel Shifter

Module 5.Ultra-fast VLSI Technology and Introduction to VHDL

Ultra-fast Systems—Submicron CMOS Technology—GaAs VLSI Technology—Technology Development—Comparison between Si and GaAs Technology About VHDL—History—Capabilities—Hardware Abstraction—Basic Terminology—Entity Declaration—Architecture Body—VHDL vs.Verilog—XILINX

Text Books

1. Basic VLSI Design- -Douglas A.Pucknell-Third Edition-PHI Publication**(Module- 1,2,3,4,5)**
2. Principles of VLSI Design-Neil H.E.Weste&Kamaran-Second Edition-Pearson Education**(Module-1,2)**
3.A VHDL Primer-J.Bhasker-Third Edition-Pearson Education**(Module-5)**

Reference Books

1.VLSI Design-Albert Raj&T.Latha-PHI Publication
2.Integrated Circuit-K.R.Botkar-Khanna Publishers
3.Modern VLSI Design-Wayne Woolf—Third Edition—PHI Publication
4. Introduction to VLSI Design – Carver Mead & Conway – BS Publications

MES 2P5 MICROCONTROLLER AND SIGNAL PROCESSING LAB

Part I : Microcontroller Lab

Part 1 : Basic AVR Programming using Assembly and C in AVR Studio

Addition, Subtraction, Multiplication, ascending Order, Descending Order, Code Conversion, Memory Swapping, etc.

Part 2 : Interfacing Experiments (Using AVR KIT)

1. LED Interfacing and Delay Programming
2. Speed Control of DC Motor
3. PC Key Board and LCD Interfacing
4. Wave form Generator Using PWM
5. DS 1307 RTC Interfacing
6. Temperature Display Using DS 18B20
7. Interfacing of GSM Module SIM 300

Part II : Signal Processing Lab

1. Familiarisation of Mat lab
2. Matrix addition
3. Generation of Simple signals
4. Plot pole zero plot
5. Plot impulse response of a system analytically and using Matlab
6. Generation of AM signals

Tool : MATLAB, **OCTAVE**

Reference: Ramesh Babu , Digital Signal Processing

Note : Do any 10 experiments from above list

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.