A PROFILE OF THE SYLLABI FOR M.Sc. IN ELECTRONICS

Choice Based Credit System for PG students in Electronics

I Semester:

Sl.No.	Course code	Title of the paper	HC/SC/ OE	Credit pattern			
				Lecture	Tutorial	Practical	Total
1	E1.1	Network Analysis	HC	3	1	-	4
2	E1.2	Microprocessor and ARM	HC	3	1		4
3	E1.3	Digital Communication	HC	3	1		4
4	E1.4	Semiconductor devices and Nano technology	SC	3	1		4
5	L1.1	Lab in MASM and ARM interfacing	HC	-	-	4	4
6	L1.2	Lab in Communications	HC	-	-	4	4
		Hard core subjects 4 hrs per week Total 20 credits + 4 credits			Total		24

II Semester:

Sl.No.	Course code	Title of the paper	HC/SC/ OE	Credit pattern			
				Lecture	Tutorial	Practical	Total
1	E2.1	Control System	HC	3	1	-	4
2	E2.2	Java Programming	HC	3	1		4
3	E2.3	Microwave Engineering	HC	3	1		4
4	E2.4	Instrumentation Technology	SC	3	1		4
5	L2.1	Java Programming Lab	HC	-	-	4	4
6	L2.2	Lab in Microwave and Instrumentation using LABVIEW	HC	-	-	4	4
		Hard core subjects 4 hrs per week Total 20 credits + 4 credits			Total		24

III Semester:

Sl.No.	Course code	Title of the paper	HC/SC/ OE	Credit pattern			
				Lecture	Tutorial	Practical	Total
1	E3.1	Digital Signal Processing	HC	3	1	-	4
2	E3.2	COMMUNICATION NETWORKS	HC	3	1		4
3	E3.3	VLSI and Digital design using VHDL	HC	3	1		4
4	E3.4	Thin films and MEMS technology	SC	3	1		4
5	L3.1	Lab in MATLAB	HC	-	-	4	4
6	L3.2	Lab in VHDL	HC	-	-	4	4
7	E3.OE 1	Open to other streams 1.Microcontroller 8051 with embedded C Or 2. Basic Electronics	OE	2	2		4
		Hard core subjects 4 hrs per week Total Total 20 credits + 4 credits OE = 4 credits					28

IV Semester:

Sl.No.	Course code	Title of the paper	HC/SC/ OE	Credit pattern			
				Lecture	Tutorial	Practical	Total
1	E4.1	Embedded system	HC	3	1	-	4
2	E4.2	Electives 1. Virtual Instrumentation 2. Machine Intelligence 3. Android 4.Wireless Communications 5. Avionics 6. Design of analog and mixed VLSI circuits	SC	3	1		4
3	L4	Project	HC			16	16
		Hard core subjects 4 hrs per week Total Total 20 credits + 4 credits					24
Total Credits (All four semesters)							100

I Semester

E1.1 – Network Analysis

Total Hrs: 52 hrs

Module 1: 12 Hrs

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.**

Module 2: 10 hrs

Network Theorems – 1: Superposition, Reciprocity and Millman's Theorems, Thevinin's and Norton's theorems; Maximum Power transfer theorem

Resonant Circuits: Series and parallel resonance, frequency response of series and Parallel circuits, Q –factor, Bandwidth.

Module 3: 10 hrs

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

Module 4: 10 hrs

Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis.

Module 5: 10 hrs

Two port network parameters: Definition of Z, Y, H and transmission parameters, modeling with these parameters, relationship between parameters sets.

TEXT BOOKS:

1. **"Network Analysis",** M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition. Reprint 2002.

2. **"Networks and systems",** Roy Choudhury, 2nd edition, 2006 re-print, New Age International Publications.

3. Network Analysis and Synthesis: Bakshi A V Bakshi U A, Technical Publications, 2009.

REFERENCE BOOKS:

1. **"Engineering Circuit Analysis",** Hayt, Kemmerly and DurbinTMH 7th Edition, 2010

2. **"Basic Engineering Circuit Analysis"**, J. David Irwin / R. Mark Nelms, John Wiley, 8th ed, 2006.

3. **" Fundamentals of Electric Circuits"**, Charles K Alexander and Mathew N O Sadiku, Tata McGraw-Hill, 3 ed, 2009.

4. Electronic circuits: Joseph Edminister, Schacm Series- Mc Graw Hill publication.

E1.2 – Microprocessor and ARM7 microcontroller

Total number of Hours: 52

Module 1 **10 hrs**

Architecture & Instruction set for 8086:

Architecture and pin configuration of 8086, Basic 8086/8088 system bus architecture, Minimum mode Configuration, Maximum mode configuration; memory interfacing with 8086/8088 in minimum and maximum mode; System Bus Timings, Bus Standards.

Module 2 **12 hrs**

Instruction Format; Addressing modes, Data Transfer Instruction; Arithmetic Instructions; Branching and Looping Instructions, NOP and Halt, Flag Manipulation Instructions; Logical, Shift and Rotate Instruction. Byte and String Manipulation:

String Instructions; REP Prefix, Table Translation, Number Format conversions. Assembler, Directives and Operators; Assembly Process; Assembly language programming, subroutines, macros. Interrupts of 8086.

Module 3:

ARM Embedded Systems: **10 hrs**

ARM Design philosophy, Embedded System Hardware, Embedded System Software ARM7 Processor Fundamentals: Registers, Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector table, Core Extensions, Architecture revisions. ARM Processor families.

Module 4:

Introduction to the ARM7 Instruction Set: **10 hrs**

Data processing Instructions, Branch, Instructions, Load, store instructions, Software Interrupt Instruction, Program Status, Register Instructions, Loading Constants, ARM V5E Extensions, Conditional Executions.

Introduction to the THUMB Instruction Set:

Thumb Register usage, ARM Thumb, Interworking, Data Processing Instructions, Single – Register Load – Store Instructions, Multiple Register Load - Store Instructions, Stack Instructions, Software Interrupt Instructions.

Module 5:

Exception and Interrupt Handling: **10 hrs**

Interrupts, Interrupt Handling Schemes, Nonnested, Interrupt Handler, Nested Interrupt Handler, Reentrant Interrupt Handler, Prioritized Simple Interrupt Handler, Prioritized Standard Interrupt Handler, Firm Ware for ARM based Embedded systems.

Text Books:

1. "ARM System Developer's Guide – Designing and Optimizing System

Software", Andrew N. Sloss, Dominic Symes & Chris Wright, Morgan – Kaufmann Publishers
2. ARM Architecture Reference Manual.
3. Microprocessors and Interfacing – Douglas V Hall – Tata McGraw- Hill edition.
4. microprocessor Interfacing – Udayakumar.

E1.3 Digital Communications

Total number of Hours: 52

Module 1: 10 hrs

Communication: Introduction, Differences between digital and analog communication systems, Block diagram of a digital communication system. Classification of signals, Information channel capacity. Digital Transmission of Analog Wave forms: Introduction, Sampling Theory and Practice, Sampling Theorem, Ideal Sampling and Reconstruction low pass signals, the uniform Sampling Theorem for Band pass signals Practical sampling.

Module 2: 10 hrs

Digital Coding of Analog Waveforms: Digital Pulse Modulation, Uniform Quantization, non-uniform Quantization. Differential Pulse Code Modulation, Delta Modulation.

Module 3: 12 hrs

Baseband transmission of binary data: The inter symbol interface problem, Ideal solution, Raised Cosine Spectrum, Correlative-level coding, Base band transmission of M-ray Data, Eye Pattern, Adaptive Equalization.

Digital modulation techniques: Binary Modulation Techniques; ASK, PSK, and FSK Generation and Detection of Binary Modulated Waves, Quadrature phase-shift Keying, Optimum (or Correlation) receivers: Matched Filter receiver, Properties of Matched Filter.

Module 4: 10 hrs

Multiplexing and Multiple accessing Techniques:

Frequency-Division Multiplexing/Multiple Access, Time-Division Multiplexing/Multiple Access, Communications Resource Channelization, Performance Comparison of FDMA and TDMA, Code-Division Multiple Access, Space-Division and Polarization-Division Multiple Access.

Source coding theorem, Prefix Coding, Huffman Coding, Channel coding.

Error Control Coding: Introduction, Linear Block Codes, Hamming Codes, Binary cyclic codes, Convolution Codes.

Module 5: 10 hrs

Analog and digital links in an optical fiber communication system:
Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.
Digital links – Introduction, point–to–point links, System considerations, link power budget, resistive budget, short wave length band, and transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.
2. **"Optical Fiber Communication"**, Gerd Keiser, 4th Ed., MGH, 2008.
3. **"Optical Fiber Communications"**, John M. Senior, Pearson Education. 3rd Impression, 2007.
4. **"Electronic Communication Systems",** Wayne Tomasi, Pearson Edition.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts,
   2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John
   Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

E1.4 – Semiconductor Devices and Nano Technology

Total number of Hours: 52

Module 1:

Introduction to semiconductor: 10 hrs

Bonding forces and Energy Bands in solids, Charge carriers in semiconductors, carrier concentrations, drift of carrier in Electric and magnetic fields

Module 2: 12 hrs

p-n junctions: equilibrium conditions, steady state conditions, reverse bias breakdown, transient and A-C conditions, metal semiconductor junctions, heterojunctions.
FET: The junction FET, Metal-Semiconductor FET, Metal - Insulator - Semiconductor FET, MOS FET.

Module 3: **10 hrs**

Introduction to Synthesis of nanomaterials: 3D, 2D, 1D, 0D Nanostructures, Nanostructure assembly: Introduction, different strategies for synthesis of **3D, 2D, 1D** (nanorods and nanowires) and 0D (Semiconductor nano dots: quantum dots, Metals nano particle/dots: plasmonics) nanomaterials. Special Nanomaterials synthesis carbon nanotube, micro and mesoporous, zeolites, core shell structures, hybrid nanomaterials.

Preparation methods: Bottom-up synthesis – Top-downm Approach: molecular self assemblies precipitation, mechanical milling, colloidal routes, self assembly, vapour phase deposition, MOCVD, sputtering, evaporation, PVD, Molecular beam epitaxy, atomic layer epitaxy, MOMBE.

Patterning and lithography for nanoscale devices: introduction to optical/ UV electron beam and x-ray lithography systems and processes, wet etching, dry (Plasma/reactive ion) etching, etch resists – dip pen lithography.

Module 4: **10 hrs**

Characterization and characterization techniques of nanomaterials:

Introduction, structural characterization: X-ray diffraction (XRD – Powder/single crystal), small angle X-ray scattering (SAXS), scanning electron microscopy (SEM), transmission electron microscopy including high resolution imaging (TEM), energy dispersive X-ray analysis(EDAX), Low Energy Electron Diffraction(LEED), small angle X-ray and neutron scattering, scanning probe microscopy (SPM) – principle of operation, instrumentation and probes, Atomic force microscopy (AFM), Optical spectroscopy, luminescence spectroscopy, UV- spectroscopy (liquid and solid state), UV Photo electron microscopy (UPS), Infrared spectroscopy, Raman Spectroscopy.

Module 5: **10 hrs**

Applications:

Applications of zero dimensional nanoparticles: Quantum dots for solar cells, Quantum dots for LED, molecular electronics, nanoparticle as catalysts.

Applications of one dimensional nanotubes and nanowires: Nanotube/nanowire based FET for biosensing, gas sensing, piezoelectric nanowires as nanogenerator, thermoelectric nanowires.

Application of carbon nano structures, Application of nano semiconductors: nanoscale electronic devices including CMOS, potentiometric sensors etc., magnetoresistive random access memory (MRAM) devices.

Text Books:

1. Solid state electronic devices – Sixth edition by Ben G Streetman, Sanjay kumar Banerjee.

2. Nanotechnology: Importance and applications by M H Fulekar, IK International 2010.
3. Nanostructures and Nanomaterials: Synthesis, Properties and Applications by Guozhong Cao, Imperial College Press, London, 2004.

Reference Books:

1. Silicon VLSI Technology, Plummer, Deal , Griffin ,Pearson Education India.
2. Encyclopedia of Materials Characterization, Editedby: Brundle, C.Richard; Evans, Charles A. Jr.;Wilson, Shaun ; Elsevier.
3. Introduction to nano electronics – Vladimir V. Mitin

L1.1 - 8086 Programming Lab

Part - A

8086 Programs

1. Addition, subtraction, multiplication and division of 8-bit, 16-bit binary and decimal numbers.
2. Addition and subtraction of two 24-bit binary and decimal numbers.
3. Average of N- 8-bit/16-bit binary and decimal numbers.
4. a) To generate the Fibonacci series up to the given limit N and also print number of elements
   in the series (both binary and decimal)
   b) Minimum and maximum out of N numbers
   c) To sort given N numbers in ascending order
   d) Find the GCD of 2 integer numbers (both binary and decimal)
   e) To calculate factorial of a given number using recursion technique.
5. To generate and print prime numbers and perfect dividing numbers up to a limit N (both
   binary and decimal). Print also the number of prime and perfect dividing numbers in the
   series.
6. a) Conversion of array of Binary code to Gray code.
   b) Conversion of array of Gray code to Binary code.
7. To generate resultant byte for a given Boolean expression.
8. a) To find the Sum and difference of two matrices of order MxN and PxQ (both binary and
   decimal)
   b) To find the transpose of given MxN matrix
9. Search for an element using binary search in an array of an 8-bit signed numbers. Array is
   sorted in ascending order.

10. Reverse of an array of numbers, byte and word.
11. Check for authentic password, and display suitable message.
12. Program to perform print screen operation.
13. Display current time using DOS service.
14. Display system date using DOS service.

Part - B

Arm Microcontroller Interfacing Programs

1. DAC interfacing.
2. Stepper motor interfacing.
3. Key board interfacing.
4. Seven segment display interfacing.
5. Temperature interfacing.
6. LCD interfacing.
7. Elevator interfacing.
8. Traffic control interfacing.

L1.2 - Communication Lab

1. PAM, PWM and PPM.
2. To study sampling of a signal and it's reconstruction.
3. To study amplitude shift keyed (ASK generation and detection.
4. To study Frequency shift keyed (FSK) generation and detection.
5. To study phase shift keyed (PSK) generation and detection.
6. Generation of PCM signals and recovery of information.
7. To study delta modulation.
8. To study (TDM) and recovery of two band limited signals of PAM signals.
9. To study DPSK generation and detection.
10. To study QPSK generation.
11. Voltage controlled oscillator (VCO-IC 566) and phase locked loop (PLL-IC 565)
12. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
13. Analog and Digital (with TDM) communication link using optical fiber.

II Semester

E2.1- Control System

Total number of Hours: 52

Module 1: 10 hrs

Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems.

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded).

Module 2: 10 hrs

Time Response of feedback control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PI, PD and PID controllers and their applications (excluding design)

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion.

Module 3: 10 hrs

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design).

Module 4: 10 hrs

Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded).

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

Module 5: 12 hrs

Programmable logic controller and processors:

PLC operation, input and output status files, fixed PLCs. Sixteen-point I/O modules with decimal addressing, I/O interaction with input and output status files, PLC memory (system and application), data formats. Putting together a modular PLC. Conventional ladder Vs PLC ladder logic. Examples of ladder diagram development. Programming a PLC. Programming Terminals, Open PLC systems. Soft PLC or Open Architecture control.

PLC Processors:

Processor's function, Operating system. Scanning 4 general Electric series 90-30 PLC, Omron Sysmach CQMI Programmable controller, WDT, Processor Ports. Serial communication between a PC and PLC. Interfacing to non- RS232 PLC Processors, Processor Operating Modes.

Choosing the correct Processor for a particular Application. Program and data organization inside PLC processor, Understanding relay instructions and PLC in out modules. Timing and counter

Instructions. Comparison and data handling instructions. Sequencer instructions. Documenting the system.

TEXT BOOK :

1. **J. Nagarath and M.Gopal**, "Control Systems Engineering", New Age International (P) Limited, Publishers, Fourth edition – 2005.
2.

REFERENCE BOOKS:

1. **"Modern Control Engineering ",** K. Ogata, Pearson Education Asia/PHI, 4th Edition, 2002.

E2.2 – Programming in Java

Total number of Hours: 52

Module 1 – Introduction **5 Hrs**

Programming language Types and Paradigms. Computer Programming Hierarchy. Flavors of Java. Java Designing Goal. Role of Java Programmer in Industry. Features of Java Language. JVM –The heart of Java Java's Magic Byte code.

Language Fundamentals:

The Java Environment: Installing Java. Java Program Development, Java Source File Structure Compilation, Executions.

Basic Language Elements: Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Data types, Operators., Assignments.

Module 2 - Object Oriented Programming **10 Hrs**

Class Fundamentals. Object & Object reference. Object Life time & Garbage Collection. Creating and Operating Objects. Constructor & initialization code block. Access Control, Modifiers, methods, Nested , Inner Class &Anonymous Classes, Abstract Class & Interfaces, Defining Methods, Argument Passing Mechanism, Method Overloading, Recursion. Dealing with Static Members. Finalize() Method. Native Method. Use of "this " reference. Use of Modifiers with Classes & Methods. Design of Accessors and Mutator Methods, Cloning Objects, shallow and deep cloning, Generic Class Types.

Module 3 - Extending Classes and Inheritance **12 Hrs**

Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data Members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods. Use of "super". Polymorphism in inheritance. Type Compatibility and Conversion, Implementing interfaces.

Package: Organizing Classes and Interfaces in Packages. Package as Access Protection, Defining Package. CLASSPATH Setting for Packages. Making JAR Files for Library Packages, Import and Static Import, Naming Convention For Packages

Exception Handling: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow In Exceptions

JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling. In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.

Module 4 - Array & String : **15 Hrs**

Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String Mutable & Immutable String, Using Collection Bases Loop for String, Tokenizing a String, Creating Strings using StringBuffer Thread : Understanding Threads, Needs of Multi-Threaded Programming. Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, Critical Factor in Thread -DeadLock

Applet: Applet & Application, Applet Architecture. Parameters to Applet, Embedding Applets in Web page. Applet Security Policies

A Collection of Useful Classes: Utility Methods for Arrays, Observable and Observer Objects, Date & Times, Using Scanner Regular Expression.

Input/Output Operation in Java(java.io Package) Streams and the new I/O Capabilities, Understanding Streams, The Classes for Input and Output. The Standard Streams, Working with File Object, File I/O Basics, Reading and Writing to Files Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects.

Module 5 - GUI Programming **10 Hrs**

Designing Graphical User Interfaces in Java

Components and Containers:Basics of Components, Using Containers, Layout Managers, AWT Componets, Adding a Menu to Window, Extending GUI Features Using Swing Components.

Java Utilities (java.util Package)

The Collection Framework : Collections of Objects, Collection Types, Sets, Sequence, Map, Understanding Hashing, Use of ArrayList & Vector

Event Handling:Event-Driven Programming in Java, Event- Handling Process, Event-Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter, Classes as Helper Classes in Event Handling, Anonymous Inner classes a Short – cut to Event Handling, Avoiding Deadlocks in GUI Code, Event Types & Classes.

Networking Programming: Networking Basics, Client-Server Architecture, Socket Overview, Networking Classes and Interfaces, Network Protocols, Developing Networking Applications in Java.

DataBase Programming using JDBC: Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases

REFERENCE BOOKS:

Java complete reference – Herbert Schildt 8th Edition.

E2.3 – Microwave Engineering

Total number of Hours: 52

Module 1: 12 hrs

Motion of an electron in an electric and magnetic field. Review of Guass law, Farady law, Ampere's law, Maxwells equations (differential and integral forms), boundary conditions, Poynting energy theorem

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

Module 2: 10 hrs

MICROWAVE WAVEGUIDES AND COMPONENTS:

Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

Module 3: 10 hrs

Microwave Tubes: H.F limitations of conventional tubes at microwave frequency, Klystron, multi cavity klystron, helix, coupled cavity TWT, magnetron - construction, operation performance characteristics and applications.

MICROWAVE DIODES: Transfer electron devices: Introduction, Gunn Effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, parametric amplifiers Other diodes: PIN diodes, Schottky barrier diodes.

S matrix representation of multi port networks.

Module 4: 10 hrs

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees.

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines and strip antennas (in brief).

Module 5: **10 hrs**

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar.

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar.

TEXT BOOKS:

1. Microwave Devices and circuits- Liao / Pearson Education.
2. Introduction to Radar systems-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. Microwave Engineering – Annapurna Das, Sisir K Das TMH, Publication, 2nd , 2010.

REFERENCE BOOK:

Microwave Engineering – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

E2.4 - Instrumentation Technology

Total number of Hours: 52

Module 1: **10 hrs**

Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

Measurement of resistance, inductance and capacitance:

Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wien's bridge, Wagner's earth connection

Module 2: **10 hrs**

Transducers and Data Acquisition:

Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Capacitive transducer, Piezo-electric Transducers**,** Inductive transducer, Differential output transducers and LVDT. Piezoelectric transducer, photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple. Bolometer and RF power measurement using Bolometer.

Data Acquisition: Introduction, Objectives, Signal Conditioning of the Inputs, Single channel DAS, Multi channel DAS, Computer based DAS, D/A and A/D converters, Data Loggers, Sensors based computer Data systems, Electromechanical A/D converters, Digital Transducer. Instrumentation amplifiers.

Module 3: **10 hrs**

Sensors:

Introduction to Sensors, Limit Switches ,International Limit Switches, BERO Sensors, Proximity Sensors(Inductive, Capacitive, Ultrasonic): Theory of Operation , Sensor Family, Photoelectric Sensors Theory of Operation and its Family, Atmospheric Sensors: Pressure and Density Sensors; Pitot-Static, Angle of Attack and Side-Slip, Outside Air Temperature Sensors, Barometric Sensors: Air Speed Sensor, Altitude Sensor, Vertical Speed Sensor. Electro-Mechanical Sensors: Gyroscope, Synchro, Flux Valve/Gate, Magnetic Compass, Gyromagnetic Compass. Sensors applications.

Fundamentals of biomedical instruments:

Sources of biomedical signals, Basic instrumentation system, General constraints in design of biomedical instrumentation systems

Bioelectric Signals and Electrodes:

Origin of bioelectric signals, Types of bioelectric signals, recording electrodes, Electrode-Tissue interface, Polarization, Skin contact impedance, Silver-silver chloride electrodes, Electrodes for ECG, EEG, EMG, Microelectrodes.

Module 4:Biopotential recorders: 12 hrs

Electrocardiograph: Electrical activity of the heart, Genesis & characteristics of Electrocardiogram (ECG), Block diagram description of an Electrocardiograph, ECG lead system, Multi-channel ECG machine

Electroencephalograph: Genesis of Electroencephalogram (EEG), Block diagram description of an Electroencephalograph, 10-20 electrode systems, and computerized analysis of EEG.

Electromygraphy(EMG) and Electroretinigraphy.

Patient Monitoring System: Bedside patient monitoring systems, Central monitors, Measurement of heart rate – Average heart rate meter, Instantaneous heart rate meter (cardio tachometer), Measurement of pulse rate.

Module 5: 10 HRS

Blood pressure measurement : Direct & Indirect method, Automatic blood pressure measuring apparatus using Korotkoff's method, Rheographic method, Oscillometric method, Ultrasonic Doppler shift method, Measurement of Respiration rate – Thermistor method, Impedance pnuemography, CO2 method, Apnea detectors

Blood Flow Meters: Electromagnetic blood flow meters, Ultrasonic blood flow meters, NMR blood flow meters, and Laser Doppler blood flow meters.

Cardiac Output Measurement: Fick's method, and Impedance technique.

Cardiac Pacemakers and Defibrillators: Need for cardiac pacemaker, External pacemaker, Implantable pacemaker, Types of Implantable pacemakers, Programmable pacemaker, Rate-responsive pacemakers, and AC & DC defibrillators.

TEXT BOOKS:

1. "Modern Electronic Instrumentation and Measurement Techniques", A.D. Helfric and W.D. Cooper, PHI of India ltd.,
2. Biomedical Instrumentation – Khandpur
3. Sensors and Transducers – Patranabis – EEE publications.

Reference Books:

1. Bio-Medical instrumentation- Rangan Mani Sharma
2. Bio-Medical Instrumentation- Dr. M Arumugam.

L2.1 - Java Programming Lab

List of programs (Any 20 programs)

1. WAP to display the List of even numbers
2. Factorial of a number
3. Compare Two Numbers using else-if
4. Determine If Year Is Leap Year
5. Fibonacci Series
6. Palindrome Number
7. Generate prime numbers between 1 &given number
8. Pyramid of stars using nested for loops
9. Reversed pyramid using for loops & decrement operator.
10. Calculate Circle Area using radius
11. Factorial of a number using recursion
12. Pyramid of numbers using for loops
13. To Find Maximum of Two Numbers.
14. To Find Minimum of Two Numbers using conditional operator
15. Write a program that will read a float type value from the keyboard and print the following output.
    i. ->Small Integer not less than the number.
    ii. ->Given Number.
    iii. ->Largest Integer not greater than the number.
16. Write a program to generate 5 Random nos. between 1 to 100, and it should not follow with decimal point.
17. Write a program to display a greet message according to Marks obtained by student.
18. Write a program to find SUM AND PRODUCT of a given Digit.
19. Write a program to find sum of all integers greater than 100 and less than 200 that are divisible by 7.
20. Write a program to concatenate string using for Loop.
21. Program to Display Multiplication Table.
22. Write a program to Swap the values.
23. Write a program to convert given no. of days into months and days.(Assume that each month is of 30 days)
24. Write a program to Display Invert Triangle using while loop.
25. Write a program to find whether given no. is Armstrong or not.
26. Write a program to generate Harmonic Series.
27. Write a program to find average of consecutive N Odd numbers and even numbers.
28. Display Triangle as follow: (using for loops)
    i. 1
    ii. 2 3
    iii. 4 5 6
    iv. 7 8 9 10 ... N */
29. WAP to display a color name depending on color value using switch.
30. Accepting single character, int, float, string and double value from the keyboard.
31. To grade the students using switch and if-else.
32. To compute the power of 2 using for loop
33. To find the sum of the digits of a given integer number.
34. Given the month, identify the season using switch.
35. To find perfect number.
36. Method overloading.

L2.2 – Lab in Microwave and Instrumentation using Labview

Part - A

List of experiments using microwave:

1. Study of microwave components and set up a microwave bench
2. Find frequency and wavelength from a given microwave source (waveguide law verification)
3. Find low and high vswr (using standing wave and double minima method)
4. Study and plot characteristics of reflex klystron (mode curves)
5. Study properties of directional coupler (coupling factor,directivity,insertion loss)
6. Study properties of magic tee (power division)
7. Plot e and h pattern of waveguide horn antenna
8. Study characteristics of gunn diode (v-i characteristics)
9. Measurement of phase shift of phase shifter
10. Measurement of insertion loss, isolation, vswr of circulator
11. Measurement of dielectric constant of homogeneous material

Part - B
INSRUMENTATION LAB USING LABVIEW

1. Wheatstone Bridge
2. Kelvin Bridge
3. Maxwells Bridge
4. Wien Bridge
5. Instrumentation amplifier.
6. Second order active LPF and HPF
7. Second order active BPF and BE
8. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP
9. Frequency synthesis using PLL.
10. Test R-2R DAC using op-amp
11. IF amplifier design
12. Amplitude modulation using transistor/FET (Generation and detection)
13. Frequency modulation using 8038/2206
14. Precision rectifiers – both Full Wave and Half Wave.

III Semester

E3.1 – Digital Signal Processing

Total number of Hours: 52

Module 1: **12 hrs**

Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.
Z-Transforms : Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms. Transform analysis of LTI Systems, unilateral Z Transform and its application to solve difference equations.

Module 2: **10 hrs**

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms.
Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties.

Module 3: **10 hrs**

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). Radix-2 FFT algorithm for the computation of DFT and IDFT– decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform.

Module 4: **10 hrs**

IIR filter design: Characteristics of commonly used analog filters –Butterworth and Chebysheve filters, analog to analog frequency transformations. Implementation of discrete-time systems:

Module 5: **10 hrs**

Structures for IIR and FIR systems direct form I and direct form II systems, cascade, lattice and parallel realization.
FIR filter design: Introduction to FIR filters, design of FIR filters using -Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique.

TEXT BOOK:

1. **Ganesh Rao and Satish Tunga**, "Signals and Systems",Pearson/Sanguine Technical Publishers, 2004.
2. Digital signal processing – Principles Algorithms & Applications, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. Discrete Time Signal Processing, Oppenheim & Schaffer, PHI,2003.
2. Digital Signal Processing, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. Digital Signal Processing, Lee Tan: Elsivier publications, 2007

E3.2 - COMMUNICATION NETWORKS

Total number of Hours: 52

Module 1: **10 Hrs**

Layered tasks, OSI Model, Layers in OSI model, TCP?IP Suite, Addressing, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission.

Module 2: **10 hrs**

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC.

MULTIPLE ACCESSES: Random access, Controlled access, Channelisation.

Module 3: **12 hrs**

Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11.

Connecting LANs, Backbone and Virtual LANs, Connecting devices, Back bone Networks, Virtual LANs

Module 4: **10 hrs**

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6.

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols.

Module 5: **10 hrs**

Transport layer Process to process Delivery, UDP, TCP, Domain name system, Resolution.

TEXT BOOK:

1. Data Communication and Networking , B Forouzan , 4th Ed, TMH 2006.

REFERENCE BOOKS :

1. Computer Networks , James F. Kurose, Keith W. Ross: Pearson education, 2 nd Edition, 2003.
2. Introduction to Data communication and Networking , Wayne Tomasi: Pearson education 2007.

E3.3 – VLSI and Digital design using VHDL

Total number of Hours: 52

Module 1: **12 Hrs**

BASIC MOS TECHNOLOGY: Integrated circuits era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks.

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter. CIRCUIT DESIGN PROCESSES:

MOS layers. Stick diagrams. Design rules and layout – lambda-based design and other rules. Examples. Layout diagrams. Symbolic diagrams. Tutorial exercises. Basic Physical Design of Simple logic gates.

Module 2: **10 Hrs**

CMOS LOGIC STRUCTURES: CMOS Complementary Logic, Bi CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic Cascaded Voltage Switch Logic (CVSL).

BASIC CIRCUIT CONCEPTS: Sheet resistance. Area capacitances. Capacitance calculations. The delay unit. Inverter delays. Driving capacitive loads. Propagation delays. Wiring capacitances.

SCALING OF MOS CIRCUITS: Scaling models and factors. Limits on scaling. Limits due to current density and noise.

Module 3: 10 hrs

INTRODUCTION TO VHDL: Entity, Architecture, Data objects, Data Types, Operators, Transport Versus Inertial Delay, Inertial delay model, Transport Delay Model, Simulation Deltas, Drivers, Driver Creation, Generics, Block Statements, Guarded Blocks.

Behavioral Modeling: Process Statement, Sensitivity list, process Example, Signal Assignment Versus, Variable Assignment, sequential statements, IF Statements, CASE Statements, LOOP Statements, NEXT Statement, EXIT Statement, ASSERT statement, Assertion BNF, WAIT ON signal, WAIT UNTIL Expression, WAIT FOR time expression, Multiple Wait Conditions, WAIT Time-Out, Sensitivity List versus WAIT Statement Concurrent Assignment Problem, Passive Processes.

Module 4: 10 hrs

Subprograms and Packages: Subprograms, subprogram overloading, operator overloading, Packages and libraries: Package Declaration, package body, Design File, Design Libraries, Order of Analysis, Implicit, Explicit Visibility.

DESIGNING WITH PROGRAMMABLE LOGIC DEVICES: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PALs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.

Module 5: 10 hrs

DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.

DIGITAL DESIGN WITH SM CHARTS: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, linked state machines.

TEXT BOOKS:

1. CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005.
2. Digital Systems Design Using VHDL,Charles H. Roth. Jr, Cengage, 2010.
3. Digital Electronics And Design With VHDL, A. Pedroni, Volnet, Elsevier, 1st edition, 2008

REFERENCE BOOKS:

1. Principles of CMOS VLSI Design: A Systems Perspective, Neil H. E. Weste, K. Eshragian, Pearson Education
2. Basic VLSI Design - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.
3. Fundamentals of Digital Logic with VHDL Design,Stephen Brwon & Zvonko Vranesic, TMH,2nd Edition 2006
4. Digital Fundamentals using VHDL,Floyd, Pearson Education, 2003,
5. VHDL Primer, J. Bhaskar , PHI, 2009.

E3.4 – Thin films and MEMS technology

Total number of Hours: 52

Module 1: 10 hrs

Physics of Thin Films - Introduction and overview - Basic Physics, Chemistry and Materials Science - Solid State Physics: Ideal solids and crystal structure, Defects in solids Bonds and Electrons, Thermodynamics and Phase Diagrams - Kinetics and Diffusion - Nucleation and Growth - Film Formation - Growth modes and Zone models

Module 2: 10 hrs

Film Deposition Methods: Vacuum and Kinetic Theory of Gasses.

Physical methods of films deposition: Evaporation – thermal, e-beam, Sputter Deposition- DC, MF, RF, Microwave, pulsed laser, Ion Beam, Arc Deposition – Cathodic, Anodic, Molecular Beam Epitaxy.

Chemical methods of Film deposition- Deposition of Inorganic Films From Solutions, Chemical Vapor Deposition - Electrolysis, Anodization, Spray pyrolysis, polymerization, Other techniques: Langmuir Blodgett, Self-Arrangement Monolayer and Spin Coating

Module 3: 12 hrs

Properties of Thin Films - optical properties, electrical properties, magnetic properties, mechanical properties.

Thin Film Characterization - Imaging Techniques, Structural Techniques, Chemical Techniques, Optical Techniques, Electrical / Magnetic Techniques, Mechanical Techniques.

Applications for Thin Film of Advanced Materials - Transparent conducting coating, Optica coating, Sensors, Superconductivity, Giant and colossal magnetoresistance, Super hard coatings, Ferro-electronic effect.

Module 4: 10 hrs

Introduction to RF MEMS: application in wireless communications, space and defense applications. RF MEMS in industry and academia. Overview of RF MEMS fabrication, design and testing.

Introduction to Microfabrication Techniques: Materials properties Bulk and surface Micromachining, Wet and dry etching, Thin-film depositions (LPCVD, Sputtering, Evaporation) Other techniques (LIGA, Electroplating)

Actuation Mechanisms in MEMS: Piezoelectric, Electrostatic, and Thermal. Magnetic MEMS Design Process: Basic review of constituent equations, static and dynamics, Fundamental equations for simple beams, FEM analysis, Basic review of lumped electrical parameters and simple LCR circuits and Parametric analysis of simple electrical circuits.

Module 5: 10 hrs

Case Study 1: MEMS Switch: Example of RF MEMS switches and applications, Mechanical design (Analytical and FEM),

Case Study 2: MEMS Resonators: Example of RF MEMS resonators and their applications, Comparison of electrostatic and piezoelectric resonators, Mechanical design of resonators, Application in oscillators: pierce oscillator overview, Application in filters.

Case Study 3: Tunable Capacitors and Inductors: Example of tunable capacitors and inductors and their applications in circuits. Mechanical Design (Analytical and FEM).

TEXT BOOKS:

1. "RF MEMS and Their Applications", Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, 2002.
2. "RF MEMS: Theory, Design, and Technology", Gabriel M. Rebeiz, Wiley, 2003.
3. Thin Film Deposition: Principles and Practice, Donald L. Smith, McGrawHill, Singapore, 2001.

REFERENCE BOOKS:

1. "Introduction to Microelectromechanical Microwave Systems, Second Edition", Hector J. De Los Santos, Artech House, 2004.
2. "RF MEMS Circuit Design for Wireless Applications", Hector J. De Los Santos, Artech House, 2002.
3. Plasma techniques for film deposition, Konuma Mitsuharu, Alpha Science, Harrow, UK, c2005.
4. Introduction to surface and thin film processes /John A. Venables, Cambridge : Cambridge University Press, c2000.

L3.1 – DSP LAB USING MATLAB

A LIST OF EXPERIMENTS USING MATLAB (Any TEN Experiments)

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.
13. Impulse response of first order and second order system

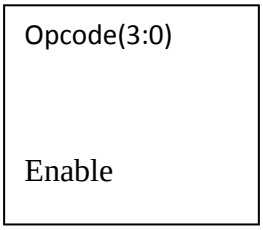
L3.2 - PROGRAMMING (using VHDL)

1. Write HDL code to realize all the logic gates

2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.

3. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

4. Write a model for 32 bit ALU using the schematic diagram shown below
   A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

5. Modulo synchronous up-down counter

6. Priority encoder

7. Parity generator

8. Develop the HDL code for the following flip-flops, SR, D, JK, T.

9. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations

6. Write HDL code to control external lights using relays.

IV Semester

E4.1 – Embedded System (Compulsory Paper)

Total number of Hours: 52

Unit 1: 10 hrs

Hardware Considerations:

Introduction: Overview - optimizing design metrics, processor technology - design technology, custom single-purpose processors, Optimizing program, FSMD, data path & FSM.

General purpose processors and ASIC's: Software and operation of general purpose processors, programmer's view - development environment - ASIP's – microcontrollers, DSP and less general ASIP environments.

Unit 2: 12 hrs

Standard processor peripherals: timers, counters and watchdog timers, applications, UART, PWM application, LCD controller, keypad controllers, stepper motor control, ADC and DAC.

Memory: Different types of ROM & RAM, cache system design.

Interfacing: introduction to interfacing, communication basics, basic protocol concepts, interrupts and DMA, arbitration, multilevel bus architectures, communication - serial parallel and wireless protocols.

Unit 3: 10 hrs

Interrupts: Microprocessor architecture, interrupt basics, the shared data problem, interrupt Latency.
Survey of software architecture: round robin, round robin with interrupts, function queues scheduling, RTOS architecture, selecting an architecture.
Introduction to RTOS: tasks and task states, tasks and data, Semaphores and Shared data.
More operating system services: Message Queues, mail boxes and pipes, timer functions, events, memory management, interrupt routines in an RTOs environment.

Unit 4: **10 hrs**

Basic design using RTOS: overview, principles, an example, encapsulating Semaphores and Ques, Hard Real time scheduling considerations, saving memory space, saving power.
Embedded software development tools: Host and target machines, linkers/locators for embedded software, getting embedded software into the target system.

Unit 5: **10 hrs**

Debugging techniques: testing on your host machine, instruction set simulators, the assert macro. Trends in the Embedded Industry: Processor Trends in Embedded System, Embedded OS Trends, Development Language Trends, Open Standards, Frameworks and Alliances, Bottlenecks.

Text Books:

1. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002
2. An Embedded Software Primer- David E. Simon, Pearson Education, 1999.
3. Introduction to Embedded Systems, Shibu K V, Tata McGraw Hill Education Private Limited, 2009
4. Embedded Systems – A contemporary Design Tool, James K Peckol, John Weily, 2008.

References:

1. Real Time System design and analysis, Phillip ALaplante, PHI, 2nd Edition.
2. Mechatronics – principles and applications, Godfrey C Onwubolu, Elsevier, 2006

Electives:

AVIONICS SYSTEMS (Elective)

Module 1: **10 Hrs**

Introduction to Electronics and Computer Technology applicable to Aircraft Systems:
Microprocessors, Digital Computers, Avionics Systems used in Civil and Military Aircraft.
Computer Architecture for Aircraft System and Interfaces, Software of Avionics System. Hardware Software Integration (HSI), Hardware & Software Reliability, System level redundancies, Failure Mode Effects and criticality analysis and Design Margin.

Module 2: **18 Hrs**

Air Data Systems, Sensors used in Aircraft:
Atmospheric Sensors: Pressure and Density Sensors; Pitot-Static, Angle of Attack and Side-Slip, Outside Air Temperature Sensors. Air Data Computer.
Barometric Sensors: Air Speed Sensor, Altitude Sensor, Vertical Speed Sensor.
Electro-Mechanical Sensors: Gyroscope, Synchro, Flux Valve/Gate, Magnetic Compass, Gyromagnetic Compass, Directional Gyro, Global Positioning System.
Data Communication in Aircraft:
Digital Data Communication: Digital Data Buses, Data Bus Protocols - ARINC 429, ARINC 629, MIL STD 1553.

Fiber Optic Communication: Glass Fiber, Time Domain Reflectometry, ARINC 573/ 615/708 and other data bus protocols.

Module 3: **10 Hrs**

Aircraft Displays and Controls
Electronic Display Technologies: CRT, LED, LCD, Plasma Panel, Touch Screen.
RMI, HIS, ADI, RNP Displays, Direct Voice Input (DVI).
Aircraft Cockpits: MFD, HMD, HUD, MFK, HOTAS. Ergonomics/Human Factors.

Module 4: **12 Hrs**

Avionics Support Systems
Electrical Power Sources: Batteries, Lighting Systems, EMI/EMC.
Recorders: Black Boxes, Voice Recorders, Flight Data Recorders, Emergency Locator Transmitter. Utility Systems Management. Electronic Warfare Systems.

Text Books

1. Avionics Fundamentals, *Jeppersen*, IAP, Incorporated, 2007
2. Practical aircraft electronic systems, *Albert D. Helfrick*, Prentice Hall Education, 2007

WIRELESS COMMUNICATION (Electives)

Module 1: **10 hrs**

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2G,3G and 4G networks.
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security (Introductory aspects).
Common Cellular System components, Common cellular network components, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment, circuit switching and packet switching.

Module 2: **10 hrs**

Multiplexing and multiple accesses: Allocation of the Communications Resource: Frequency-Division Multiplexing/Multiple Access, Time-Division Multiplexing/Multiple Access, Communications Resource Channelization, Performance Comparison of FDMA and TDMA, Code-Division Multiple Access, Space-Division and Polarization-Division Multiple Access, Multiple Access Communications System and Architecture: Multiple Access Information Flow, Demand Assignment Multiple Access, Access Algorithms, OFDM. Duplex Techniques: FDD(introduction) and TDD in detail. Random Access Methods: ALOHA, Slotted ALOHA, Reservation-ALOHA, Performance Comparison of S-ALOHA and R-ALOHA, Polling Techniques. Carrier-Sense Multiple

Access Networks, Token-Ring Networks, Performance Comparison of CSMA/CD and Token-Ring Networks,

Module 3: **15 hrs**

GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers. GPRS. GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. CDMA technology, CDMA overview, CDMA channel concept CDMA operations. Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, UWB radio techniques, Diversity techniques.

Module 4: **15 hrs**

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies and LTE.

TEXT BOOK:

1. Wireless Telecom Systems and networks, Mullet: Thomson Learning 2006.
2. Fundamentals of Wireless Communication, David Tse, Pramod Viswanath, Cambridge 2005

REFERENCE BOOKS:

1. Mobile Cellular Telecommunication, Lee W.C.Y, MGH, 2nd,2009.
2. Wireless communication - D P Agrawal: 2nd Edition Thomson learning 2007.
3. Fundamentals of Wireless Communication, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "Wireles and Mobile Network concepts and protocols", John Wiley India Pvt. Ltd, 1st edition, 2010.
5. "Wireless Communication – Principles & Practice" , T.S. Rappaport, PHI 2001.

Android(Elective)

Module 1: JAVA and SQL Concepts **10 hrs**

JAVA Concepts: OOPs Concepts, Inheritance in detail, Exception handling, Packages & interfaces, JVM & .jar file extension, Multi threading (Thread class & Runnable Interface)

SQL Concepts: DML & DDL Queries in brief

Module 2: **10 hrs**

Introduction to Android: What is Android? Setting up development environment, Dalvik Virtual Machine & .apk file extension

Fundamentals: Basic Building blocks – Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names), Application Structure (in detail), Android Manifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application

Module 3: **10 hrs**

Emulator-Android Virtual Device, Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS Second App:- (switching between activities) - Develop an app for demonstrating the communication between Intents.

Basic UI design: Form widgets o Text Fields o Layouts o [dip, dp, sip, sp] versus px o Examples

Preferences: Shared Preferences, Preferences from xml o Examples

Menu: Option menu, Context menu, Sub menu, menu from xml, menu via code, Examples

Module 4: **10 hrs**

Intents (in detail): Explicit Intents, Implicit intents, Examples.
UI design: Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup Examples.
Tabs and Tab Activity: Examples.
Styles & Themes o styles.xml: drawable resources for shapes, gradients (selectors), style attribute in layout file, Applying themes via code and manifest file, Examples.
Content Providers: SQLite Programming, SQLite Open Helper, SQLite Database, Cursor Reading and updating Contacts, Reading bookmarks Example.

Module 5: **12 hrs**

Android Debug Bridge (adb) tool,
Linkify: Web URLs, Email address, text, map address, phone numbers, MatchFilter & Transform Filter, Examples.
Adapters and Widgets: Adapters:- Array Adapters, Base Adapters, ListView and List Activity, Custom list view, Grid View using adapters, Gallery using adapters, Examples.
Notifications: Broadcast Receivers, Services and notifications, Toast, Alarms.
Custom components: Custom Tabs, Custom animated popup panels, Other components, Examples.
Threads: Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsynTask (in detail), and Examples.
Advanced: Live Folders, Using sdcards, XML Parsing, JSON Parsing, Maps, GPS, Location based Services, Accessing Phone services (Call, SMS, MMS), Network connectivity services, Sensors.

VIRTUAL INSTRUMENTATION

Module 1: Review of Digital Instrumentation: **8 Hrs**

Representation of analog signals in the digital domain – Review of quantization in amplifier and time areas, sample and hold, sampling theorem, ADC and DAC.

Module 2: Fundamentals of Virtual Instrumentation: **12 Hrs**

Concept of Virtual Instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency – Multiplexing of analog inputs – Single- ended and differential inputs – Different strategies for sampling of multi channel analog inputs. Concept of universal DAQ card – Use of timer- counter and analog outputs on the universal DAQ card.

Module 3: Cluster of Instruments in System: **8 Hrs**

Interfacing of external instruments to a PC – RS 232C, RS – 422, RS 485 and USB standards – IEEE 488 standard – ISO –OSI model for series bus – introduction to bus protocols of MOD bus and CAN bus.

Module 4: Graphical Programming Environment in VI: **12 Hrs**

Concepts of graphical programming – Lab-view software – Concept of VIs and sub VIs – Display types – Digital – Analog – Chart – Oscilloscope types – Loops – Case and sequence structures – Types of data – Arrays – Formulate nodes – Local and Global variables – String and file I/O.

Module 5: Analysis Tools and Simple Application in VI: 12 Hrs

Fourier transform – Power spectrum – Correlation – Windowing and filtering tools – Simple temperature indicator – ON/OFF controller – PID controller – CRO emulation – Simulation of a simple second order system – Generation of HTML page.

TEXT BOOKS:

1. Sanjay Gupta, "Virtual Instrumentation, LABVIEW" , TMH, New Delhi, 2003.

2. S. Gupta and J P Gupta, PC Interfacing for Data Acquisition and Process Control" , Instrument Society of America, 1994.

REFERENCE BOOKS:

1. Peter W Gofton , "Understanding Serial Communication", Sybes International, 2000.
2. Robert H. Bishop, "Learning with Lab-View" Preticee Hall, 2009.
3. Ernest O. Doeblin and Dhanesh N Manik, " Measrement Systems – Application and Design", 5th Edn, TMH, 2007.

MACHINE INTELLIGENCE

Unit 1: Introduction, Soft Computing intelligence, comparison with conventional Artificial Intelligence, soft computing characteristics, Fuzzy sets, Fuzzy rules and Fuzzy inference systems. 10 hrs

Unit 2: Different fuzzy Models: Mamdani, Sugeno, Tsu Kamoto, Fuzzy modeling, Least squares methods for system identification, Derivative based optimization. 10 hrs

Unit 3: Neural networks, Adaptive networks, Supervised learning Neural networks, Perceptron, Back propagation Multilayer perceptron , Radial basis function networks, Learning from reinforcement, Dynamic programming, Competitive learning, Kohonen's self organizing networks, Principle component networks, LVQ, Hopfield networks. 12 hrs

Unit 4: Adaptive Neuro-Fuzzy interface systems, Advanced Neuro-Fuzzy modeling, 10 hrs

Unit 5: Data clustering algorithms, Neuro-Fuzzy control, Fuzzy filtered neural network, Genetic algorithms in game playing. 10 hrs

TEXT BOOK
1. S. R. Jang, C.T. Sun, E. Mizutani,‘ Neuro-Fuzzy and Soft Computing’, Pearson Education, ISBN 81-297-0324-6.
2. B. Kosko, ‘Neural Networks and Fuzzy Systems : a dynamical systems approach’ Prentice Hall Publication.
3. Simon Haykin, ‘ Neural Networks : comprehensive foundation’, Prentice Hall, ISBN-10:0132733501.
4. Jacek M. Zurada , ‘Introduction to Artifical Neural Systems’, Jaico publications.

Open to other stream (OE)

MICROCONTROLLERS and EMBEDDED C

Total number of Hours: 52

MODULE 1 **08 hrs**

INTRODUCTION TO EMBEDDED SYSTEMS:

An embedded system, processor, hardware unit, software embedded into a system, example of an embedded system, OS services, I/O, N/W, O/S, real time and embedded operating system, processor selection for an embedded system, memory devices, memory selection for an embedded systems, allocation of memory to program segments and blocks and memory map of a system. Direct Memory Accesses.

MODULE 2 **10 hrs**

MICROPROCESSORS AND MICROCONTROLLER:

Introduction, Microprocessors and Microcontrollers,. RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture.

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input/Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts.

MODULE 3 **10 hrs**

ADDRESSING MODES AND OPERATIONS:

Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP Opcodes, Data exchanges, Example

Programs; Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs.

Jump and Call Instructions: The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns, More Detail on Interrupts, Example Problems.

MODULE 4 **06 hrs**

8051 PROGRAMMING IN C:

Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization.

MODULE 5 **10 hrs**

TIMER / COUNTER PROGRAMMING IN 8051:

Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051C

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, Interrupt programming in C.

MODULE 6 **08 hrs**

PROGRAMMABLE PERIPHERAL INTERFACE IC– 8255:
Features, Pin diagram, Functional block diagram, Ports and their modes

8051 Interfacing and Applications:

Interfacing 8051 to LCD, Keyboard, ADC, DAC, Stepper motor interfacing.

TEXT BOOKS:

1. Kenneth J. Ayala ; “The 8051 Microcontroller Architecture, Programming & Applications” 2e, Penram International, 1996 / Thomson Learning 2005
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; “The 8051 Microcontroller and Embedded Systems – using assembly and C ”- PHI, 2006 / Pearson, 2006

Reference Books:

1. Predko ; “Programming and Customizing the 8051 Microcontroller” –, TMH
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, pearson Education, 2005
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