PSG College of Arts & Science

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Since 1947

M.Sc. APPLIED ELECTRONICS

2015 - 2017

MSc APPLIED ELECTRONICS PROGRAMME
SCHEME OF EXAMINATIONS
(For the students admitted in June 2014 - 2015 & onwards)

CODE NO.	SUBJECT	EXAM DURA-TION (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
First Semester						
14ELP01	Analog and Digital Circuit Design	3	25	75	100	4
14ELP02	Power Electronics	3	25	75	100	4
14ELP03	Communication Protocols	3	25	75	100	4
14ELP04	8051 Microcontroller	3	25	75	100	4
14ELP05	Practical – I - Analog and Digital Circuit Design Lab	4	40	60	100	3
14ELP06	Practical – II - Power Electronics Lab	4	40	60	100	3
14ELP07	Practical – III – 8051 Microcontroller Lab	4	40	60	100	3
Second Semester						
14ELP08	Real Time Operating System	-	100	-	100	4
14ELP09	PIC Microcontroller	3	25	75	100	5
14ELP10	Advanced Digital System Design	3	25	75	100	5
14ELP11	Wireless Communication Systems	3	25	75	100	4
14SBP01	**Skill Based Subject:** Cyber Security	-	100	-	100	2
14ELP12	Practical – IV - Advanced Digital System Design Lab	4	40	60	100	3
14ELP13	Practical – V – PIC Microcontroller Lab	4	40	60	100	3

CODE NO.	SUBJECT	EXAM DURA-TION (Hrs)	Max. Marks			Credit points
			CA	CE	Total	
	Third Semester					
14ELP14	Digital Signal Processing	3	25	75	100	5
14ELP15	ARM Processor	3	25	75	100	5
14ELP16A 14ELP16B	***Core Elective – I*** **:** Sensors and Signal Conditioning **OR** Wireless Sensor Networks	3	25	75	100	5
14ELP17A/ 14ELP17B/ 14ELP17C/ 14ELP17D	***Cluster IDC**** **:** Professional English (EN) **OR** Fashion and Visual Merchandising (CD) **OR** Introduction to Multimedia (EM) **OR** Intellectual Property Rights (IB)	3	25	75	100	4
14ELP18	Practical – VI- Digital Signal Processing Lab	4	40	60	100	3
14ELP19	Practical – VII - ARM Processor Lab	4	40	60	100	3
Fourth Semester						
14ELP20A 14ELP20B	***Core Elective – II*** **:** Automotive Electronics **OR** Product Design and Quality Management	3	25	75	100	5
14ELP21	Practical – VIII – Virtual Instrumentation Lab	4	40	60	100	3
14ELP22	Project Work	-	80	120	200	6
					TOTAL	**90**

ALLIED / CLUSTER IDC offered by the Department

ALLIED

14CHP04	Basic Electronics for Chemists (for M.Sc., Chemistry)
14SSP23	Microprocessor and Interfacing (for M.Sc., Software Systems)
14SSP26	Microprocessor and Interfacing Lab (for M.Sc., Software Systems)

CLUSTER IDC

14ENP14A/14CDP227B/ 14EMP17B/14MIB21B	Computer Hardware and Maintenance (for English, Costume Design and Fashion, Electronic Media and International Business)

14ELP01 ANALOG AND DIGITAL CIRCUIT DESIGN ***I Semester***

Objective

- *To understand the designing knowledge of the analog and digital circuits.*
- *To estimate the performance of digital systems.*
- *To know the concept of PLDs used in the VLSI Design.*

Unit – I Linear Circuits (11 Hrs)

Introduction to Op-amp - Adder – Subtractor – Multiplier – Divider - Integrator – Differentiator – V to I and I to V Converters - Log and Antilog Amplifiers – Active Filters: First Order Low Pass and High Pass Filters – Band Pass Filter – PLL - VCO.

Unit – II Non-Linear Circuits (11 Hrs)

Introduction to Comparator – Level Detectors – Schmitt Trigger – Waveform Generators: Triangular, Sawtooth and Sinewave – Precision Rectifiers - IC 723 Voltage Regulator – Low Voltage and High Voltage Regulators.

Unit – III Combinational Arithmetic Circuits (11 Hrs)

Signed Binary Arithmetic, Binary Adders and Subtractors – Parity Generators and Checkers - Multiplexers - Demultiplexers - Decoders - Encoders - Magnitude Comparators.

Unit – IV Sequential Logic Circuits (11 Hrs)

Mealy Machine - State Diagrams - State Table Minimization - Incompletely Specified Sequential Machines - State Assignments - Design of Synchronous and Asynchronous Sequential Logic Circuits.

Unit – V Programmable Logic Device (11 Hrs)

Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays - Types of FPGA – Logic Cell Array (LCA) - Configurable Logic Blocks (CLB) - Input/Output Block (IOB) – Introduction to OrCAD – Analysis of Analog and Digital Circuit using OrCAD.

Text Books

1. Roy Choudhury. D, Shail Jain, "***Linear Integrated Circuits***", New Age International (P) Limited, 1991.
2. David Floyd, "***Digital Fundamentals***", Pearson Education.
3. Charles.H.Roth, Jr, "***Digital Systems Design using VHDL***", PWS Publishing Company, 2001.
4. Volnei A. Pedroni, "***Digital Electronics and Design with VHDL***", Morgan Kaufmann Publishers, 2008.
5. Stephen Brown, Zvonko Vranesic, "***Fundamentals of Digital Logic with Verilog Design***", Tata McGraw Hill Ltd., 2nd Edition, 2011.

14ELP02 **POWER ELECTRONICS** ***I** Semester*

Objective

- *To learn the characteristics of different types of semiconductor devices and the operation of controlled rectifiers.*
- *To understand the operation of choppers and inverters.*

Unit - I Introduction (11 Hrs)

Theory and operation of SCR, UJT, DIAC, TRIAC – Phase Control – Design of relaxation oscillator using UJT – UJT's in SCR and TRIAC triggering circuits – PUT –SCS – Speed control of DC shunt motor using thyristors – Power MOSFET – IGBT - GTO – SIT - Optosiolators.

Unit – II Commutation Techniques and Controlled Rectifiers (11 Hrs)

Introduction – Natural commutation – Forced commutation – Self commutation – Impulse commutation – Resonant pulse commutation – Complementary commutation - External pulse commutation – Load side commutation – Line side commutation.

Controlled Rectifiers: Introduction – Principles of phase controlled converters – Single-phase:- Semi converters – Full converters – Dual converters – Series Converters.

Unit – III Static Switches and AC Voltage Controller (11 Hrs)

Introduction – Single phase AC switches – 3- phase: AC switches – Reversing switches - AC switches for Bus transfer – Solid state relays.

AC voltage controller: Introduction – Principles of ON - OFF control – Principle of phase control – Single phase bidirectional controllers with resistive loads and inductive loads – Cyclo converters – Single phase cyclo converters.

Unit – IV Chopper (11 Hrs)

Introduction – Basic Scheme - Output Voltage Control Techniques - One, Two and Four Quadrant Choppers – Step-up Chopper - Voltage Commutated Chopper - Current Commutated Chopper - MOSFET and Transistor based Choppers - Switching mode Regulators – Buck Regulators – Boost Regulators – Buck and Boost Regulators.

Unit – V Inverters and Drives (11 Hrs)

Introduction – Principles of operation – Single phase bridge inverters – 3- phase Inverters – Voltage Control of Single Phase Inverters – Current Source Inverters. **Introduction to Electric Drives:** DC Drives – Converter and Chopper fed DC Drives, AC Drives - Stator Voltage Control - V/F Control - Rotor Resistance Control.

Text Books

1. Rashid M.H, "***Power Electronics: Circuits Devices and Application***", PHI, 2nd Edition, 1996.
2. Timothy J. Maloney, "***Industrial Solid State Electronic Devices and Circuits***", PHI, 2nd Edition, 1986.
3. A.K.Gupta and L.P.Singh, "***Power Electronics and Introduction to Drives***", Dhanpat Rai Publication.
4. Singh . M.D., "***Power Electronics***", Tata Mc-Graw Hill, 1998.

14ELP03 COMMUNICATION PROTOCOLS *II Semester*

Objective

- *To know the basic concept of computer networks.*
- *To make the students learn the fundamentals of protocols.*
- *To learn the basics of embedded networking*

Unit – I OSI Reference Model and Network Architecture (9 Hrs)

Layering architecture of Networks - OSI model - Functions of each Layer - Services and Protocols of each Layer - Introduction to Computer Networks – ARPANET – Internet - Private Networks - Network Topologies: Bus, Star, Ring, Hybrid, Tree, Complete and Irregular - Types of Networks: Local Area Networks, Metropolitan Area Networks, Wide Area Networks.

Unit – II Networking (9 Hrs)

Introduction – Serial/Parallel Communication – Serial Communication Protocols - RS232 Standard– RS485 – Synchronous Serial Protocols - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel Port Programming - ISA/PCI Bus Protocols – Firewire.

Unit – III Local Area Networks I (9 Hrs)

Introduction to LANs - Features of LANs - Components of LANs - Usage of LANs - LAN Standards - IEEE 802 standards - Channel Access Methods – Aloha – CSMA - CSMA/CD - Token Passing.

Unit – IV Local Area Networks II (8 Hrs)

Ethernet - Layer 2 & 3 Switching - Fast Ethernet and Gigabit Ethernet - Token Ring - LAN interconnecting devices: Hubs, Switches, Bridges, Routers, Gateways.

Unit – V TCP/IP (9 Hrs)

History of TCP/IP - Layers of TCP/IP – Protocols - Internet Protocol - Transmission Control Protocol - User Datagram Protocol - IP Addressing - IP address classes - Subnet Addressing - Internet Control Protocols - ARP - RARP - ICMP - Application Layer - Domain Name System - Email – SMTP – POP – IMAP – FTP – NNTP – HTTP - Overview of IP version 6 - IOT.

Text Books:

1. Tanenbaum Andrew S., David J Wetherall, "***Computer Networks***", Prentice Hall, 5th Edition, 2010.
2. Behrouz Forouzan, "***Data Communication and Networking***", Mc-Graw Hill, 5th Edition, 2012.
3. Halsall Fred, "***Data Communications, Computer Networks and Open Systems***", Addison Wesley, 4th Edition, 2000.

14ELP04 8051 MICROCONTROLLER *I Semester*

Objective

- *To know the architecture and programming of 8051 Microcontroller.*
- *To make the students to understand the concept of interfacing I/O device and other peripheral device with Microcontroller.*

Unit – I Introduction (9 Hrs)

Microprocessor vs Microcontrollers - Microcontrollers and Embedded Processors – Overview of 8051 family – Inside 8051 – Assembling and running an 8051 program - 8051 Instruction set - Addressing modes.

Unit – II Architecture (9 Hrs)

Program counter and ROM - Data types and directives – Flag bits and PSW register – Register bank and Stack - Loop and jump instructions – CALL instructions – Time delay generation.

Unit – III I/O Port Programming (9 Hrs)

Pin description of 8051 - I/O port programming - Single bit instructions and programming – Programming 8051 timers - Counter programming .

Unit – IV Peripherals (9 Hrs)

8051 serial communication – Basics of serial communication - 8051 connection to RS232 - 8051 serial communication programming – 8051 interrupts - Programming timer interrupts - Programming external hardware interrupts – Programming with serial communication interrupts – Interrupt priority in 8051.

Unit – V Applications (8 Hrs)

Interfacing an LED – LCD - Sensors – ADC Interface - Keyboard Interface – Stepper Motor Interface – DAC Interface – RTC – EPROM Interface.

Text Books

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "***The 8051 Microcontroller and Embedded Systems using Assembly and C***", Pearson Education Limited, New Delhi, 2nd Edition, 2008.
2. Kenneth Ayala, "***The 8051 Microcontroller and its Applications***", Penram Publishers.
3. Arnold S Berger**, "*Embedded Systems Design: An Introduction to Processes, Tools and Techniques***", CMP Books, 1st Edition, 2001.

14ELP05 *I Semester*

PRACTICAL - I ANALOG AND DIGITAL CIRCUIT DESIGN LAB

Any 10 Experiments

1. Design of Converters using Op-amp
2. Design of Filters using Op-amp
3. Waveform Generation using Op-amp
4. Sine wave Generator using Op-amp
5. Schmitt Trigger
6. Design of Regulated Power Supply using IC 723
7. Design of Encoder
8. Design of Decoder
9. Design of Synchronous Counter
10. Design of Mod – n Counter
11. Study of OrCAD Tool
12. Design of Analog Circuit using OrCAD
13. Design of Digital Circuit using OrCAD

PRACTICAL - II POWER ELECTRONICS LAB

Any 10 Experiments

1. Triggering Circuits using R, RC methods
2. Application of Optoisolator
3. Cyclo Converter
4. Switching Regulators
5. Commutation Circuits
6. Single Phase Inverter
7. Solid State Relays
8. Servo Stabilizer
9. Sequencer using Thyristor
10. Single Phase Controller
11. Zero Voltage Switch
12. Speed Control of AC/DC motor using Thyristor
13. DC to DC Converter/DC Chopper

PRACTICAL – III 8051 MICROCONTROLLER LAB

Any 10 Experiments

1. Initializing of 8051 microcontroller and Introduction to IDE
2. LED/7-Segment Interface
3. LCD Interface
4. Keyboard Interface
5. Timer Interface with all Modes
6. Serial Port Interface Stepper Motor Interface
7. Interrupt and Relay Interface
8. Speed Control of DC Motor using PWM
9. Stepper Motor Interface
10. Temperature Measurement using ADC
11. Automotive Dashboard Interface
12. Memory Interface
13. Object Counter

14ELP08 REAL TIME OPERATING SYSTEM *II Semester*

Objective

- *To study on programming logic of modeling Process based on range of OS features.*
- *To compare types and Functionalities in commercial OS.*
- *To discuss the application development using RTOS.*

Unit –I – Introduction (9 Hrs)

OS vs RTOS - Introduction to RTOS – History – Definition – Scheduler – Objects – Services – Characteristics of an RTOS - Task – Task States and Scheduling – Task Operation – Task Structure – Synchronization, Communication and Concurrency.

Unit – II – Features of RTOS (8 Hrs)

Semaphores - Definition – Operation – Usage - Message Queues - Definition - States - Content – Storage – Operation – Use.

Unit – III – Interrupts and Timers (9 Hrs)

Pipes – Event Registers – Signals – Condition Variables – Exceptions and Interrupts – Applications – Classification – Priorities - Real-time Clocks and System Clocks – Programmable Interval Timers.

Unit – IV – Memory Management (9 Hrs)

Memory Management – Introduction – Dynamic Memory Allocation – Deadlocks – Deadlock Recovery – Deadlock Avoidance – Priority Inversions.

Unit – V – Features of µC/OS-II (9 Hrs)

Introduction - Features of µC/OS-II – Use of µC/OS-II – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Functions – Semaphores Related Functions.

Text Books

1. Qing Li, "***Real Time Concepts for Embedded Systems***", CMP Books, 1st Edition, 2003.
2. Prasad. K.V.K.K., "***Embedded Real Time Systems***", Dreamtech, 2003.
3. Charles Crowley, ***"Operating System – A design oriented approach***" McGraw-Hill, 1997.
4. Jean J. Labrosse, "***MicroC OS II: The Real Time Kernel***", CMP Books, 2nd Edition, 2002.

14ELP09 **PIC MICROCONTROLLER** ***II** Semester*

Objective

- *To understand the architecture of the PIC microcontrollers*
- *To write high-level/assembly language and embed the code in flash memory for stand-alone system for embedded system designs.*

Unit – I Origin of PIC Microcontroller (10 Hrs)

Introduction to PIC microcontroller – PIC micro family – CISC vs RISC - RISC concepts – Hardware description of PIC micro over other micro controllers.

Unit – II Architecture and Hardware (12 Hrs)

Block diagram – Working registers – Program memory – Data memory – File registers – Program concepts – Status register – Stack file selection register – Option register – Indirect data addressing register – Digital I/O port – Clock oscillators – Timer modules – Prescalar – Watch dog timer – Reset circuitry – Instruction cycle – Long word instruction – Power down mode / sleep – Configuration fuses.

Unit – III Instruction Set and Program Development (11 Hrs)

Instruction set types – MPASM – Source code formats – Labels – Mnemonics – operands – Comments – Files with default extension – Lists file format – Error file format (EPR) – Operators – Procedure – Radix – Text strings – Numeric constants and radix key to PIC 16/17 form instruction sets.

Unit – IV Design Application (12 Hrs)

Configuration techniques – Input, interface – Variable and selectable monostable – Interface to a stepper motor – Multi channel ADC – Baud rate generator – IR transmitting and receiving – 4 digit up/down counter – Interfacing with LCD modules – DAC interface – DC motor driving via H bridge.

Unit – V Applications (10 Hrs)

Blind temperature controller – Single digit counter / timer – Remote relay control – Designing a 2 digit timer with a PIC micro – Hardware – Operation – Software.

Text Books

1. Ravi Pailoor "***The Beginners guide to PIC micro with more than 40 application Ideas***" CHIP technologies – Bangalore 1998.
2. PIC 16/17 microcontroller Data Book, Volume 1996/1997
3. MPASM online hELPfiles.

14ELP10 ADVANCED DIGITAL SYSTEM DESIGN *II Semester*

Objective

- *As FPGA's are becoming more important part of VLSI Design, it is essential for a VLSI Design engineer/developer to know Verilog.*
- *To make the student learn, Verilog language, programming and its applications to design digital circuits.*

UNIT – I Introduction to VHDL (10 Hrs)

Introduction to VHDL – Entity Declaration - Architecture Body – Data Objects – Data Types – Package Declaration – Package Body - Dataflow Modeling - Behavioral Modeling - Structural Modeling.

UNIT – II Verilog Data Types and Operators (11 Hrs)

Introduction to Verilog – Module - Identifiers – Comments – Format – Keywords - Value set - Data types. Operators: Arithmetic, Relational, Equality, Logical, Bitwise, Reduction, Shift, Conditional, Concatenation and Replication Operators.

UNIT – III Gate-Level Modeling (11 Hrs)

Built-in primitive gates – Multiple input gates – Multiple output gates – Tristate gates – Pull gates – MOS switches – Bidirectional switches - Gate delays – Array of instances – Implicit nets – Examples – User defined primitives: Defining a UDP – Combinational UDP - Sequential UDP.

UNIT – IV Dataflow and Behavioral Modeling (11 Hrs)

Continuous assignment – Net declaration assignment – Delays - Examples.
Procedural constructs – Procedural assignments – Timing controls – Block statement – Conditional statement – Case statement – Loop statement – Procedural continuous assignment – Examples.

UNIT – V Structural Modeling, Tasks and Verification (12 Hrs)

Module – Ports – Module instantiation – External ports – Examples.
Tasks – Functions – System tasks – Disable statement – Named events – Mixing structure with behavior – Sharing task and functions.
Writing a test bench – Waveform generation – Reading vectors from a text file – Writing vectors to a text file – Examples.

Text Books

1. J. Bhasker, "***A VHDL Primer***", Pearson Education (Low Price Edition), 3rd Edition, 2006.
2. J. Bhasker, "***A Verilog HDL Primer***", BS Publications, 2nd Edition, 2001.
3. Joseph Cavanagh, "***Verilog HDL – Digital Design and Modeling*"**, CRC Press, 2012.
4. Zainalabedin Navabi, "***Verilog Digital System Design***", McGraw Hill, 2nd Edition, 2008.

14ELP11 WIRELESS COMMUNICATION SYSTEMS *I Semester*

Objective

- *To introduce the concepts of mobile wireless communication systems.*
- *To make the student learn, fundamentals of wireless communications, and systems which operate on wireless principles.*

Unit – I Introduction (11 Hrs)

Evolution of Mobile Radio Communications – Mobile Radio Systems around the World – Examples of Wireless Communication Systems – 2nd generation (2G) Cellular Networks – Evolution to 2.5G Mobile Radio Networks – Evolution for 2.5G TDMA Standards.

Unit – II Cellular Concept (11 Hrs)

Introduction – Frequency reuse – Channel Assignment Strategies – Handoff Strategies – Interference and System Capacity – Improving Coverage and Capacity in Cellular Systems – Multiple Access Techniques: Introduction – FDMA – TDMA – Spread Spectrum Multiple Access – SDMA – CDMA.

Unit – III Digital Cellular Systems (11 Hrs)

GSM Architecture – Layer Modeling – Transmission – Data Service – Multiple Access Scheme – Channel Coding Interleaving – Radio Resource Management – Mobility Management – Communication Management – Network Management – GPRS Network Architecture.

Unit – IV 3G (11 Hrs)

Introduction – UMTS Architecture – UMTS Interfaces – UMTS Channels – UMTS Timeslots – UMTS Network Protocol Architecture – UMTS Bearer Model - Mobility Management for UMTS – UMTS Handover - Introduction to 4G.

Unit – V WiMAX (11 Hrs)

Introduction – WiMax Architecture – MAC Layer - IEEE 802.16 Protocol – Channel Acquisition – IP Connectivity – Radio Link Control (RLC) – Interferences – Security in WiMax Networks – PKM Protocol.

Text Books

1. Theodore S Rappaport, "***Wireless Communications – Principles and Practice***", Pearson Education, 2nd Edition, 2002.
2. ITI Saha Misra, "***Wireless Communications and Networks***", Tata McGraw Hill, 2nd Edition, 2013.
3. Frank Ohrtman, ***"WiMAX Handbook (McGraw-Hill Communications)",*** McGraw-Hill Professional; 1st Edition, 2005.

PRACTICAL - IV ADVANCED DIGITAL SYSTEM DESIGN LAB

Any 10 experiments

1. Design of Half and Full Adders/Subtractors
2. Design of Multiplexer, Demultiplexer, Encoder and Decoder
3. Design of 4-bit Comparators
4. Design of Flip flops
5. Design of Asynchronous and Synchronous Counters
6. Design of 8-bit Shift Register
7. Design of Barrel Shifter
8. Design of 8-bit Multiplier
9. Design of Frequency Multipliers and Dividers
10. Design of ALU
11. Design of MAC unit
12. DC Motor Control using PWM
13. Modeling of Moore and Mealy Machine

PRACTICAL – V PIC MICROCONTROLLER LAB

Any 10 Experiments

1. LED/7-Segment Interface
2. Keyboard Interface
3. Single Digit Timer / Counter
4. DAC Interface
5. DC Motor Control
6. ADC Interface
7. LCD Interface
8. Up/Down Counter
9. RTC Interface
10. EPROM Interface
11. Temperature Control
12. Stepper motor Control
13. Serial Interface

14ELP14 DIGITAL SIGNAL PROCESSING *III* Semester

Objective

- *Digital signal processing has become a part of many embedded systems.*
- *To make the student learn, Theory of DSP, design of digital signal processing applications and an introduction to DSP processors.*

Unit – I Signals and Systems (12 Hrs)

Introduction – Signals, System and Signal Processing – Classification of Signals – Representation of discrete time signals – Elementary discrete time signals – Operation on signals – Classification of discrete time systems – Examples of continues and discrete time system models - Interconnection of LTI systems – Time response analysis of discrete time system – frequency analysis of discrete time signals and discrete time systems.

Unit – II Computation of Discrete Fourier Transform (10 Hrs)

Introduction – Properties of the discrete Fourier series and discrete Fourier transform – Comparison between circular and linear convolution – linear convolution from circular convolution - DFT – FFT algorithms – Radix 2 DIT and DIF, FFT.

Unit – III Filter Design Techniques (12 Hrs)

Introduction – Ideal filters – Simple digital filters – Simple FIR digital filters – Comb filters – All pass filter – FIR and IIR systems – Design of IIR filters from analog filters - Design of FIR filters by windowing – Realization of digital filter – Realization of FIR filters – Comparison of IIR and FIR filters.

Unit – IV TMS 320C 5416 overview (11 Hrs)

Introduction – TMS320C5416 overview – Key features – Architectural overview – Functional block diagram - Internal Memory organization – CALU – System Control – PLU – Interrupts.

Unit - V Introduction to MATLAB (10 Hrs)

M-files – Inline functions – Control Flow – Relations & Logical Operators – Strings – Cell arrays – Functions – MATLAB Graphics: 2D graphics – 3D graphics – Animations. MATLAB Programming: MATLAB Editor – Function Subprograms – Types of functions – Function Handling – Errors and Warnings – MATLAB Debugger.

Text Books

1. P. Ramesh Babu, "***Digital Signal Processing***", Scitech Publications, 2nd Edition, 2003.
2. Rajkumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, "***MATLAB and its Applications in Engineering***", Pearson Education, 1st Edition, 2009.
3. MATLAB Manual from Mathworks.
4. TMS 320C5X - Users guide, Texas instruments, 1993.

14ELP15 **ARM PROCESSOR** ***III*** *Semester*

Objective

- *To introduce ARM processor which is widely used in embedded systems.*
- *To make the student learn RISC and CISC architectures of processors, ARM processor and its programming.*

Unit – I Introduction to ARM (11 Hrs)

Introduction to ARM7TDMI Core – Pin Diagram - Architecture – Instruction Pipeline- Memory Access and Interface - Registers – ARM State and Thumb State Register Set - Program Status Registers.

Unit – II Data Types and Signals (11 Hrs)

Program's Model – Memory Formats – Data Types — Exceptions – Interrupt Latencies – Reset – Memory Interface – Bus Cycle – Addressing Signals – Address Timing – Data Timed Signals - Power-up Mode.

Unit – III Coprocessor and Debugging Techniques (11 Hrs)

Introduction – Coprocessor Interface Signals – Pipeline Signals – Interface Handshaking – Connecting Coprocessor – Undefined Instructions – Privileged Instructions - Debug Systems – Debug Interface Signals – Enabling and Disabling Embedded ICE – Communication Channels.

Unit – IV Introduction to LPC 2378 (11 Hrs)

Introduction – Features of LPC 2378 – Block Diagram – Pin Description – Functional Description: On-chip Flash Program Memory – On-chip SRAM – Memory Map – Interrupt Controller – External Memory Controller – General Purpose DMA Controller – Fast General Purpose Parallel I/O.

Unit – V Features of LPC 2378 (11 Hrs)

Ethernet – USB Interface – CAN Controller – ADC – DAC – UART – SPI Serial I/O Controller – SSP – I^2C Bus Serial I/O Controllers – I^2S Bus Serial I/O Controllers General Purpose 32-bit Timers/Counters – PWM – Watchdog Timer – RTC.

Text Books

David Seal, ***"ARM Architecture Reference Manual"***, Addison Wesley, 2nd Edition, 2000.
Steve Furber, ***"ARM System On-Chip Architecture"***, Addison Wesley, 2nd Edition, 2000.
ARM7TDMI Technical and Reference Manuals.
LPC 2378 User Manual.

14ELP16A **CORE ELECTIVE - I**

SENSORS AND SIGNAL CONDITIONING **III** *Semester*

Objective

- *To know the static and dynamic characteristics of measurement systems.*
- *To study about the various types of sensors viz. Resistive, Reactive, Self- generating.*
- *To know the different types digital and semiconductor sensors.*

Unit - I Introduction to Measurement Systems (11 Hrs)

General Concepts and Terminology - Measurement Systems - Sensor Classification - General I/O Configuration - Methods of Correction Performance Characteristics: Static Characteristics of Measurement Systems - Accuracy - Precision - Sensitivity.

Unit - II Resistive Sensors (11 Hrs)

Potentiometers - Strain Gauges and Types - Resistive Temperature Detectors, Thermistors, Magneto Resistors, Light-Dependent Resistors, Signal conditioning for Resistive Sensors: Measurement of Resistance, Voltage Dividers, Wheatstone Bridge.

Unit - III Reactive Sensors (11 Hrs)

Capacitive Sensors – Variable and Differential - Inductive Sensors – Reluctance Variation, Eddy Current, LVDT - Electromagnetic Sensors –Signal conditioning for Reactance Variation Sensors - AC Bridges - Carrier Amplifiers.

Unit - IV Self-generating Sensors (11 Hrs)

Thermoelectric Sensors - Piezoelectric Sensors - Pyroelectric Sensors - Photovoltaic Sensors - Electrochemical Sensors - Signal Conditioning for Self-generating Sensors: Chopper and Low-drift Amplifiers - Offset and Drifts Amplifiers.

Unit – V Digital and Semiconductor Device Sensors (11 Hrs)

Position Encoders - Variable Frequency Sensors – Quartz Digital Thermometer - Vibrating Wire Strain Gauges, Vibrating Cylinder Sensors - Magneto Transistors, Photodiodes and Phototransistors - Charge-coupled Sensors – Fiber-optic Sensors.

Text Books

1. Ramon Pallás Areny, John G. Webster, "***Sensors and Signal Conditioning***", 2nd Edition, John Wiley and Sons, 2000.
2. D. Patranabis, "***Sensors and Transducers***", TMH, 2004
3. Jon Wilson , "***Sensor Technology Handbook***", Newnes, 2004.
4. Herman K.P. Neubrat, "***Instrument Transducers – An Introduction to Their Performance and Design***", Oxford University Press.
5. E.O. Doeblin, "***Measurement System: Applications and Design***", McGraw Hill Publications.
6. Graham Brooker, "***Introduction to Sensors for Ranging and Imaging***", Yesdee, 2009.
7. Ian Sinclair, "***Sensors and Transducers***", Elsevier, 3rd Edition, 2011.

14ELP16B **CORE ELECTIVE - I**

WIRELESS SENSOR NETWORKS **III Semester**

Objective

- *To expose the students to the fundamentals of wireless sensor technology*
- *To teach the infrastructure of WSN processor and its functions*
- *To study the classification of commercial family of wireless technology*

UNIT – I Introduction (11 Hrs)

Cellular and Adhoc Wireless Networks - Applications of Adhoc Wireless Networks - Medium Access Scheme – Routing – Multicasting - Transport Layer Protocols - Pricing Scheme - Quality of Service Provisioning - Security - Addressing and Service Discovery - Energy management- Scalability - Ad Hoc Wireless Internet.

Unit – II Sensor Networks (11 Hrs)

Comparison with Adhoc Wireless Networks - Challenges for WSNs - Difference between Sensor Networks and Traditional Sensor Networks – Types of Applications –Enabling Technologies for Wireless Sensor Networks – Single Node Architectures –Hardware Components – Energy Consumption of Sensor Nodes - Issues in Designing a Multicast Routing Protocol.

Unit – III Sensor Network Architecture (11 Hrs)

Data Dissemination - Flooding and Gossiping - Data gathering Sensor Network Scenarios – Optimization Goals and Figures of Merit – Design Principles for WSNs - Gateway Concepts – Need for gateway – WSN to Internet Communication – Internet to WSN Communication – WSN Tunneling.

Unit – IV MAC Protocols (11 Hrs)

MAC Protocols for Sensor Networks - Location Discovery - Quality of Sensor Networks - Evolving Standards - Other Issues - Low duty cycle and wake up concepts - The IEEE 802.15.4 MAC Protocols - Energy Efficiency - Geographic Routing Mobile nodes.

Unit – V Routing (11 Hrs)

Gossiping and Agent based Unicast Forwarding - Energy Efficient Unicast - Broadcast and Multicast - Geographic Routing - Mobile nodes – Security - Application Specific Support - Target detection and tracking - Contour/edge detection - Field Sampling.

Text Books:

1. Holger Karl and Andreas Wiilig, "***Protocols and Architectures for Wireless Sensor Networks***" John Wiley & Sons Limited, 2008.
2. I.F .Akyildiz and Weillian, "***A Survey on Sensor Networks***", IEEE Communication Magazine, August 2007.
3. Anna Hac "***Wireless Sensor Networks Design***," John Wiley & Sons Limited Publications, 2003.
4. C. Siva Ram Murthy and B.S.Manoj "***Adhoc Wireless Networks***," Pearson Edition, 2005.

PRACTICAL – VI DIGITAL SIGNAL PROCESSING LAB

Any 10 Experiments

1. LED Interface and DIP switch Interface
2. Solving second order Differential Equation
3. Waveform Generation
4. DFT and FFT Computation
5. FIR and IIR Filter Design
6. Generation of Discrete Time Sequences and Convolution of two Sequences
7. Circular Convolution of two sequences
8. Cross Correlation using FFT
9. 2D, 3D and Animation graphics in MATLAB
10. To Plot Magnitude and Phase Response of First Order LPF, HPF and Second Order BPF and BSF.
11. To Plot Magnitude and Phase Response of FIR LPF and HPF.
12. To Design a Filter that elements High Frequency Component in a CT Signal.
13. Simulating a combination of FIR and IIR filter using Simulink

PRACTICAL – VII ARM PROCESSOR LAB

Any 10 Experiments

1. LED / Seven Segment Interface
2. Keypad Interface
3. Relay Interface
4. LCD Interface
5. ADC Interface
6. DAC Interface
7. Stepper Motor Interface
8. Serial Interface
9. RTC Interface
10. I^2C Interface
11. Multitasking
12. Priority Scheduling
13. Generation of PWM

14ELP20A **CORE ELECTIVE - II**
AUTOMOTIVE ELECTRONICS *IV Semester*

Objective

- *To know fundamentals of Automotive Electronics, fuel injection and ignition systems.*
- *To provide knowledge about application of electronics in Automobile engineering.*
- *To impart knowledge about automotive engines.*

Unit – I – Fundamentals of Automotive **(12 Hrs)**

Automotive Fundamental – Evolution – Physical Configuration – Automotive Systems - Engine – Engine Block – Cylinder Head – 4 Stroke Cycle - Engine Control – Ignition System – Ignition Timing – Suspension – Brakes – Steering System.

Unit – II – Ignition Systems **(12 Hrs)**

Starting Systems - Requirements of the Starting Systems - Ignition Systems: Fundamentals – Types – Generation – Timing – Fuel Consumption – Conventional Ignition Components – Plug Leads – Ignition Coil Cores - Introduction to Electronic Ignition system.

Unit – III – Fuel Injection **(10 Hrs)**

Overview of Programmed Ignition - Electronics Control of Carburetion – Basics – Areas of Control - Fuel Injection - System Overview - Advantages of Fuel Injection.

Unit – IV – Chassis Electrical System **(11 Hrs)**

Chassis Electrical Systems: Anti-lock Brakes – Introduction – Requirements of ABS – General System Description – ABS components – Anti-lock Brake System Control - Traction Control – Functions – System Operation – Safety Systems : Central Locking - Electric Windows – Airbags and Belt Tensioners.

Unit – V - Technologies **(10 Hrs)**

Introduction to CAN – LIN- Flexray – J 1850 – KWP 2000 – MOST – Bluetooth.

Text Books

1. William B. Ribbens, "***Understanding Automotive Electronics***", Society of Automotive Engineers Inc, 6th Edition, 2003.
2. Tom Denton, "***Automobile Electrical and Electronic Systems***", Elsevier Publications Ltd., 3rd Edition, 2004.
3. www.flexray.com
4. www.can-cia.org
5. www.interfacebus.com

14ELP20B **CORE ELECTIVE - II**

PRODUCT DESIGN AND QUALITY MANAGEMENT

***IV** Semester*

Objective

- *Developing students basic knowledge, understanding and skills related to research, reading and synthesis of design and management.*
- *Developing students knowledge of a range of business and management principles.*
- *Helping students of design and management building up their strengths and create competitive products.*

Unit – I Product Design and Development I (11 Hrs)

Development processes, Identifying customer needs, Establishing product specifications, Concept generation, Concept selection, Product architecture, Industrial design.

Unit – II Product Design and Development II (11 Hrs)

Design for Manufacturing, Prototyping, Robust Design, Patents and Intellectual property, Product Development Economics, Managing Product Development Projects.

Unit – III Total Quality Management I (11 Hrs)

Principles and Practices: Definition of quality, Customer satisfaction and Continuous improvement.

Unit – IV Total Quality Management II (11 Hrs)

Tools and Techniques: Statistical Process Control, Quality Systems, Bench Marking.

Unit – V Total Quality Management III (11 Hrs)

Quality Function Deployment, Product Liability, Failure Mode and Effect Analysis, Management Tools.

Text Books

1. Dale H. Besterfield, "***Total Quality Management***", Pearson Education Asia, 2nd Edition.
2. Karl T Ulrich and Steven D Eppinger, "***Product Design and Development***", Mc Graw Hill, 3rd Edition.

PRACTICAL VIII – VIRTUAL INSTRUMENTATION LAB

Any 10 Experiments

1. Basic arithmetic and Boolean operations
2. Sum of 'n' numbers using 'for' loop and Factorial of a given number using for loop
3. Sum of 'n' natural numbers using while loop and Factorial of a given number using while loop
4. Sorting even numbers using while loop in an array and Array maximum and minimum
5. Bundle and unbundle cluster
6. Flat and stacked sequence
7. Application using formula node
8. Median filter
9. Microphone Interface with ELVIS II
10. Discrete cosine transform
11. Convolution of two signals
12. Windowing technique
13. Instrumentation of an amplifier to acquire an ECG signal

14CHP04 **BASIC ELECTRONICS FOR CHEMISTS** ***I Semester***

(For MSc Chemistry)

Unit – I Semiconductor Devices (9 Hrs)

Introduction – AC and DC – Passive component – Ohm's Law - Semiconductor -Intrinsic semiconductor – Extrinsic semiconductor - PN junction diode and its characteristics - Half wave , full wave rectifier – Zener diode and its characteristics – Zener voltage regulator - Transistor characteristics – Transistor biasing - Principle of transistor amplifier.

Unit – II Operational Amplifier (9 Hrs)

Op-amp and it's parameters – Non-inverting amplifier – Inverting amplifier – Adder – Subtractor - Comparator – Integrator – Differentiator – Optoelectronics devices – Automatic street light – 555 timer - Astable multivibrator – Monostable multivibrator.

Unit – III Digital Electronics (9 Hrs)

Number system - Binary – Octal and hexadecimal – Logic gates:- AND, OR, NOT, NAND & NOR gates - Half and full Adder – Four bit binary adder – Flip flops:- RS – clocked RS , D & JK types – JK master slave flip flop – Flip flop as frequency divider – Digital clock.

Unit – IV Counters (9 Hrs)

Synchronous and asynchronous counters – Binary up/down counter – Decade counter - Ring counter – D/A converter:- Weighted resister - A/D converter:– Counter type – Accuracy – Resolution.

Unit – V Instruments (8 Hrs)

Ammeter – Voltmeter – Potentiometer – pH meter – Conductivity bridge – Electrophoresis – Photoelectric colorimeter – Spectrophotometer – Flame photometer – Atomic absorption spectroscope – Electronic single pan balance digital thermometer.

Text Books

1. V. K. Mehta, "***Principles of Electronics***", S.Chand & Company, New Delhi, 4th Edition, 1995
2. K. R. Botkar, "***Integrated Circuits***", Khanna Publishers, New Delhi, 8th Edition.
3. Albert Paul Malvino and Donald P Leach, "***Digital Principles and Applications***", McGraw Hill, 4th Edition, 1986.
4. R. Gopalan "***Elements of Analytical Chemistry***".
5. A. K. Srinivasthav and P. L. Jain, "***Chemical analysis an Instrumental Approach***".
6. C. S. Rangan, G. R Serma,V. S. V. Mani., "***Instrumentation Devices and Systems***".

14SSP23 *IV Semester*

MICROPROCESSOR AND INTERFACING
(FOR MSc SOFTWARE SYSTEMS)

Objective

- *To develop programming skills in 8085ALP.*
- *To understand the concept of microprocessor based system design and interfacing*

Unit – I Microcomputer System (8 Hrs)

Microprocessor architecture and its operations – Microprocessor initiated operations and 8085 bus organization- Internal data operations and the 8085 registers - Peripheral initiated operations – Memory classifications.

Unit – II Microprocessor Architecture and Memory Interfacing (9 Hrs)

8085 microprocessor-microprocessor communications and bus timing - Demultiplexing the bus - Generating control signals - The 8085 MPU and its architecture - Memory interfacing - Memory structure and its requirements - Basic concepts in memory interfacing - Address decoding and memory addresses.

Unit –III Instruction and Programming Techniques (10 Hrs)

Data transfer instruction – Arithmetic operations – Logic operations – Branch operations – Programming techniques – Looping, counting and indexing - Additional data transfer and 16-bit arithmetic instruction – Arithmetic operations related to memory – Rotate logic operations – Compare instruction.

Unit – IV Software Development (9 Hrs)

Addition of two 8 bit numbers - addition of two 16 bit numbers - Subtraction of two 8 bit numbers- subtraction of two 16 bit numbers - ones and twos complement of 8 bit numbers - ones and twos complement of 16 bit numbers - To find largest number in an array - To find smallest number in an array – sorting numbers in Ascending order - sorting numbers in descending order - Sum of series of 8-bit numbers - Multiplication of two 8-bit data - Division of two 8-bit data - Block data transfer.

Unit – V Interfacing (8 Hrs)

8255 PPI – Block diagram – Control word – I/O mode operation - Masking of least significant bits an 8-bit data – Masking of most significant bits an 8-bit data - Design of binary counter - Design of ring counter - Water level indicator using 8255 PPI.

Text Books

1. Ramesh S Gaonkar, "***Microprocessor Architecture, Programming and Applications with 8085/8080A***", Wiley Eastern Ltd, 2nd Edition, 1995. (Unit-I,II,III,IV)
2. B. Ram, "***Fundamental of Microprocessor and Microcomputers***", Dhanpat Rai Publications, 5th Edition, 2003. (Unit-IV,V)

MICROPROCESSOR AND INTERFACING LAB
(FOR MSc SOFTWARE SYSTEMS)

ANY 10 EXPERIMENTS

1. Addition of two 8-bit numbers
2. Subtraction of two 8-bit numbers
3. Multiplication of two 8-bit numbers
4. Division of two 8-bit numbers
5. 1's and 2's complement of a given 8-bit data
6. Largest/smallest in an array
7. Positive/negative numbers in an array
8. Number of ones and zeros in a data
9. ODD/EVEN numbers in an array
10. Ascending/ Descending order
11. Block data transfer
12. Reading/writing of data using 8255 PPI
13. Binary counter/ring counter using 8255 PPI

14ENP14A/14CDP227B/14EMP17B/14MIB21B

COMPUTER HARDWARE AND MAINTENANCE

(Cluster IDC for MA English, MSc Costume Design, MSc Electronic Media & MCom International Business)

Objective

- *To Study about the various parts of computer.*
- *To understand the concept of interfacing in PC.*

Unit – I Personal Computer (8 Hrs)

Evolution – Specifications – PC system – I/O ports – Inside a PC – Motherboard – CPU -BIOS – SMPS.

Unit – II Memory Devices (9 Hrs)

PC memory organization – Memory packages – Magnetic storage fundamentals – Diskette basics – Disk organization in DOS – FDD – HDD – Interface types.

Unit – III Peripherals (9 Hrs)

CD-ROM – Principles of operations – Types – Sound blaster – Input devices – Keyboard – Mouse – Scanner.

Unit – IV Output Devices (9 Hrs)

Display – Video basics – Display Adapter – Dot Matrix Printer - Laser Printer – Ink Jet Printer – Plotter.

Unit – V Trouble Shooting and Servicing (9 Hrs)

Motherboard – SMPS – FDD – HDD - CD-ROM - Key board – Mouse.

Text Book

Balasubramaniam. D, "Computer Installation and Servicing", Tata McGraw Hill Publishing Company, New Delhi, 2001.