Vidyasagar University

Curriculum for B.Sc (Honours) in Electronics
[Choice Based Credit System]

Semester-IV

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC-8		**C8T:**Operational Amplifiers and Applications	Core Course - 8	4	0	0	6	75
		C8P: Operational Amplifiers and Application Lab		0	0	4		
CC-9		**C9T:** Digital Electronics and Verilog/VHDL	Core Course - 9	4	0	0	6	75
		C9P: Digital Electronics and Verilog/VHDL Lab		0	0	4		
CC-10		**C10T:** Signals & Systems	Core Course-10	4	0	0	6	75
		C10P: Signals & Systems Lab		0	0	4		
GE-4		**TBD**	Generic Elective - 4				4/5	75
							2/1	
SEC-2		**TBD**	Skill Enhancement Course - 2	1	1	0	2	50
Semester Total							**26**	**350**

L = Lecture, **T** = Tutorial, **P** = Practical, **CC** = Core Course, **GE** = Generic Elective, **SEC** = Skill Enhancement Course, **TBD** = to be decided

Generic Elective (GE) (Interdisciplinary) from other Department. Papers are to be taken from any of the following discipline: **Mathematics/Physics/Chemistry/Computer Science/Statistics/ Geology/ Biotechnology/Economics**

Modalities of selection of Generic Electives (GE): A student shall have to choose **04** Generic Elective (GE1 to GE4) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (GE) of a subject or discipline specified for the relevant semester.

Semester-IV
Core Course (CC)

CC-8: Operational Amplifiers and Applications — Credits 06

C8T: Operational Amplifiers and Applications — Credits 04

Course Contents:

Basic Operational Amplifier & Op-Amp Parameters:

Basic Operational Amplifier: Ideal OPAMP and its characteristics, Stages of OPAMP, block diagram of an operational amplifier (IC 741), Op-Amp parameters;, Deviations for a real OPAMP from ideal behaviour.

Op-Amp Circuits, Closed and Open Loop Applications:

Op-Amp Circuits: Open and closed loop configuration, Inverting and Non-inverting modes, Mathematical operation and Instrumentation; Voltage to current converter, Current to voltage converter.
Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger.
Signal generators: Sinusoidal and Relaxation

Timers circuits and Other Fixed & Variable IC regulators:

Multivibrators (IC 555): Block diagram, Astable and monostable multivibrator circuit, Applications of Monostable and A stable multivibrators. Phase locked loops (PLL): Block diagram, phase detectors, IC565.
Fixed and variable IC regulators: IC 78xx and IC 79xx -concepts only, IC LM317- output voltage equation. SMPS - Principle of DC-TO-DC conversion, block diagram representation of smps module
Voltage controlled oscillator (IC 566).

Signal Conditioning circuits:

Sample and hold systems, Active filters: First order low pass and high pass Butterworth filter, Second order filters, Band pass filter, Band reject filter, All pass filter, Log and antilog amplifiers.

Suggested Readings:

1. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003)
2. R. F. Coughlin and F. F. Driscoll, Operational amplifiers and Linear Integrated circuits, Pearson Education (2001)
3. A.P.Malvino, Electronic Principals,6th Edition , Tata McGraw-Hill,(2003)
4. K.L.Kishore,OP-AMP and Linear Integrated Circuits, Pearson(2011).
5. Bel, Operational Amplifiers & Linear ICS, 3/E Oxford
6. Jacob , Analog Integrated Circuit Pearson
7. Ganesh Babu et.al., Linear Integrated Circuits - 5th Edn. Scitech Publication

C8P: Operational Amplifiers and Application Lab Credits 02

Practical:

1. Study of op-amp characteristics: CMRR and Slew rate.
2. Designing of an amplifier of given gain for an inverting and non-inverting configuration using an op- amp.
3. Designing of analog adder and sub-tractor circuit.
4. Designing of an integrator using op-amp for a given specification and study its frequency response.
5. Designing of a differentiator using op-amp for a given specification and study its frequency response.
6. Designing of a First Order Low-pass filter using op-amp.
7. Designing of a First Order High-pass filter using op-amp.
8. Designing of a RC Phase Shift Oscillator using op-amp.
9. Study of IC 555 as an Astable Multivibrator.
10. Study of IC 555 as Monostable Multivibrator.
11. Designing of Fixed voltage power supply using IC regulators using 78 series and 79 series

CC -9: Digital Electronics and Verilog/VHDL Credits 06

C9T: Digital Electronics and Verilog/VHDL Credit 04

Course Contents:

Number System & Codes, Logic Gates and Boolean Algebra, Digital Logic Families:

Number System and Codes: Decimal, Binary, Hexadecimal and Octal number systems - base conversions and arithmetic.

Logic Gates and Boolean algebra: Basic postulates and fundamental theorems of Boolean algebra, Switching equivalents of Basic gates, Circuit representation using Universal gates.

Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, TTL and CMOS families and their comparison

Combinational Logic Analysis and Design:

Standard representation of logic functions, Karnaugh map, Encoder and Decoder, Multiplexers and Demultiplexers, Implementing logic functions with multiplexer, binary Adder, binary subtractor, parallel adder/subtractor, Comparator, Parity Checker.

Sequential Logic Design, Programmable Logic devices and Memory:

Sequential logic design: Latches and Flip flops, Registers, Counters (synchronous and asynchronous and modulo-N), State Table, State Diagrams, counter design using excitation table and equations, Register counter.
Programmable Logic Devices: Basic concepts- ROM, PLA, PAL, CPLD, FPGA
Memory - Memory technology, types of memory-volatile &non-volatile, ROM, PROM, EPROM, EEPROM, Flash memory, SRAM, DRAM, SDRAM, Concept of Primary, Secondary and Cache memory

VHDL Programming:

Introduction to VHDL: History, Introduction to Simulation and Synthesis Tools, Test Benches. VHDL Modules, Delays, data flow style, behavioural style, structural style, mixed design style, simulating design. Introduction to Language Elements, entity, architectures, concurrent signal assignment, process statements, process declarative region, process statement region, process execution, sequential statements, architecture selection.

Behavioural Modelling: Introduction to behavioural modelling, Sequential Processing: Process statement, sensitivity list, signal assignment vs variable assignment, sequential statements, IF, CASE ,LOOP, NEXT, EXIT and ASSERT statements, assertion BNF, WAIT ON signal, WAIT UNTIL expression, WAIT FOR time expression, multiple wait conditions, WAIT Time - Out, Sensitivity List vs WAIT Statement Concurrent Assignment, Passive Processes.

Data types: Object types - signal, variable, constant, Data types – scalar types, composite types, incomplete types, File Type caveats, subtypes, Subprograms and functions

Suggested Readings:

1. M. Morris Mano Digital System Design, Pearson Education Asia,(Fourth Edition)
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
3. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice, Prentice Hall of India(2000)
4. Anand Kumar Fundamentals of Digital Circuits, 4th edn, PHI
5. Verilog HDL-A guide to digital design and synthesis-Samir Palnitkar, Pearson, 2nd edition.
6. Pedron, i Circuit Design and Simulation with VHDL, 2nd ed. PHI
7. D. Roychowdhury, Digital Circuits Vol 1&2 Platinum Publishers
8. Jayaram Bhasker, A VHDL Primer, 3e Pearson
9. S. Salivahanan & S. Pravin Kumar, Digital Circuits and Design, Vikas Publishing
10. Fletcher, An Engineering Approach to Digital Design
11. Wakerly, Digital Design: Principles and Practices, 4e

C9P: Digital Electronics and Verilog/VHDL Lab **Credits 02**

Hardware

1. To verify and design AND, OR, NOT and XOR gates using NAND gates.
2. To convert a Boolean expression into logic gate circuit and assemble it using logic gate IC's.
3. Design a Half and Full Adder.
4. Design a Half and Full Sub-tractor.
5. Design a seven segment display driver.
6. Design a 4 × 1 Multiplexer using gates.
7. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
8. Design a counter using D/T/JK Flip-Flop.
9. Design a shift register and study Serial and parallel shifting of data.

Experiments in VHDL

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half sub-tractor and Full Sub-tractor using basic and derived gates.
4. Clocked D FF, T FF and JK FF (with Reset inputs).
5. Multiplexer (4×1, 8×1) and Demultiplexer using logic gates.
6. Decoder (2×4, 3×8), Encoders and Priority Encoders.
7. Design and simulation of a 4-bit Adder.
8. Code converters (Binary to Gray and vice versa).
9. 2-bit Magnitude comparator.
10. 3-bit Ripple counter.

CC-10: Signals & Systems — Credits 06

C10T: Signals & Systems — Credits 04

Course Contents:

Signals and Systems:

Continuous and Discrete Time signals: Types of signals (periodic-aperiodic, deterministic-nondeterministic, single and multiple valued, Signals in time, spatial and frequency domain), Transformations.

Fourier Series Representation of Periodic Signals &Fourier Transform:

Fourier Series Representation of Periodic Signals: Continuous-Time periodic signals, Convergence of the Fourier series, Properties of continuous-Time Fourier series, Discrete-Time periodic signals, Properties of Discrete-Time Fourier series. Frequency-Selective filters,

Fourier Transform: Aperiodic signals, Periodic signals, Properties of Continuous-time Fourier transform, Convolution and Multiplication Properties, Properties of Fourier transform and basic Fourier transform Pairs.

Linear Time -Invariant Systems (LTI):

Discrete Time LTI systems: Continuous time LTI system, Properties of LTI systems, Convolution, Commutative, Distributive, Associative. LTI systems with and without memory, Invariability, Causality, Stability, Unit Step response. Differential and Difference equation formulation, Block diagram representation of first order systems.

Z Transform:

Introduction to Z-Transform- relevance in discrete domain ,relation with Laplace & Fourier Transforms, condition of stability,properties of Z-Transforms, Inverse Z-Transforms, application of Z-Transforms.

Suggested Readings:

1. Anand Kumar Signals and Systems, 3rd ed. PHI
2. Rawat, Signals & Systems, Oxford
3. Lathi, Signals and Systems Oxford
4. Proakis, Signals and Systems, 4e Pearson
5. Rabiner, Theory and Application of Digital Signal Processing, 1/e Pearson.
6. Haykin, Signals & Systems.

C10P: Signals & Systems Lab Credits 02

Practical:

1. Generation of Signals: continuous time
2. Generation of Signals: discrete time
3. Time shifting and time scaling of signals.
4. Convolution of Signals
5. Solution of Difference equations.
6. Fourier series representation of continuous time signals.
7. Fourier transform of continuous time signals.
8. Laplace transform of continuous time signals.
9. Introduction to Xcos/similar function and calculation of output of systems represented by block diagrams

Skill Enhancement Course (SEC)

SEC-2: Internet and Java Programming Credits 02

SEC2T: Internet and Java Programming

Course Contents:

Internet

Introduction, Understanding the Internet, Internet Addressing, Hardware Requirements to Connect to the Internet.

Data types, Arrays, Operators, Flow control

Branching, Looping. Classes, New Operator, Dot Operator, Method Declaration and Calling, Constructors, Inheritance, Super, Method Overriding Final, Finalize, Static, Package and Import Statement, Interface and Implements

Exception Handling

Exception Types, Uncaught and Calling, Nested Try Statements, Java Thread Model, and Thread, Runnable, Thread Priorities, Synchronization, Deadlock

File Handling

Input Stream, Output Stream and File Stream. Applets-Tag, Order of Applet Initialization, Repainting, Sizing Graphics- Abstract Window Tool Kit Components

Suggested Readings:

1. Harley Hahn, The internet complete reference, Tata McGraw publicity,2nd Edition, 1997
2. Patrick Naughton, The Java hand book, Tata McGraw,1997Rohit Khurana
3. Programming with Java Vikas

Or

SEC-2: Programming with Matlab Credits 02

SEC2T: Programming with Matlab

Course Contents:

MATLAB Basics

The MATLAB environment - Basic computer programming - Variables and constants, operators and simple calculations - Formulas and functions - MATLAB toolboxes

Matrices and vectors

Matrix and linear algebra review - Vectors and matrices in MATLAB - Matrix operations and functions in MATLAB

Computer programming

Algorithms and structures - MATLAB scripts and functions (m-files) - Simple sequential algorithms - Control structures

MATLAB programming and Numerical Simulations

Matlab Programming

Reading and writing data, file handling - Personalized functions - Toolbox structure - MATLAB graphic functions

Numerical simulations

Numerical methods and simulations - Random number generation - Montecarlo methods

Suggested Readings:

1. Hanselman Mastering Matlab Pearson
2. Rudrapratap Matlab Oxford
3. Bansal Matlab Pearson
4. Navas Lab Primer through Matlab PHI

Or

SEC-2: Networking and Mobile Communications Credits 02

SEC2T: Networking and Mobile Communications

Course Contents:

Networking

Concepts of networking: network layers, network hardware components. Layered protocol architecture-OSI: TCP .Physical media-topology, switching mechanism (circuit and packet switched systems)

Comparison of various transmission media. Transport layer-Connection less and connection oriented protocols. Policies on flow control, error control, MAC-Ethernet, CSMA. CD, ALOHA, FDDI

Network layer-IPV4, ICMP, IGMP, introduction to routing and sub netting

Mobile communication

Evolution from PSTN, Cellular concept, frequency reuse, channel assignment strategies, system capacity, trucking and grade of service

GSM - architecture, protocols, handover, security

Physical layer - Wireless media - characteristics, modes of propagation, various loss mechanisms

Multiplexing and multiple access techniques - FDM, TDM, FDMA,TDMA,CDMA,WCDMA NETWORKING - Mobile IP, dynamic host configuration protocol , wireless LAN technology standards,

Studies on Blue tooth system

To understand concept of Blue tooth technology, to study RF module, RS- 232C serial communication, Blue tooth protocol, different types of Blue tooth network

GSM network

Real time Remote Monitoring System of Mobile Base Station using Quad-band GSM/GPRS modem.

Understanding of GSM technology, its network, GSM capability & data services.

Understanding RF environment & study of GSM network by actually connecting to the GSM environment by any service provider.

Command Level Study

Real Time study of GSM 07.05 & 07.07 commands in various categories : Command concerning modem & sim card hardware, Network registration, Call control, Call setting, Call information, Phone Book, Serial link control, Message setting, Storing/restoring, Error message handling & survey

Suggested Readings:

1. Garg Mobile Computing, Pearson
2. Garg Principles and Applications of GSM , Pearson
3. Schiller Mobile Communications, 2ePearson

Or

SEC-2: Circuit modelling using PSPICE Credits 02

SEC2T: Circuit modelling using PSPICE

Course Contents:

Introduction

Introduction to PSpice software, file types, netlist commands**.**

Basic Analysis

DC, AC, Transient. Analog behavioral models (ABM): equations setup, IF statement, voltage/current/ frequency dependent sources. Advanced analyses: noise, Monte-Carlo .

Circuit Modelling

• I-V characteristic • Temperature Effects • Iterative solution of simple series circuit • Solution of simple series circuit using an equation solver • PSPICE solution of simple series circuit • PSPICE I-V Characteristic • PSPICE I-V Characteristic with temperature dependence • The venin solution • Diode Models • Diode Circuits • Rectifier • Clipping • Zener Circuits • Clipping • MOSFETS • PSPICE AC, DC, transient, and bias point simulations • MOSFET as a switch •Resistive pull-up. • Active pull-up. • Drive an LED. • Basic NMOS gate. • Ohmic and SAT regions • Bias with Current Source • MOSFET Small-Signal Analysis • Small-signal model. • Common-source amplifier. • Source-follower. • Input and output impedance. • Bipolar Junction Transistors • PSPICE AC, DC, transient, and bias point simulations • BJT as a switch • Drive an LED • Drive a relay • Biasing with Current Sources • BJT Small-Signal Analysis • Hybrid-pi model. • Common-emitter amplifier. • Emitter-follower. • Input and output impedance. •OPAMPS – analysis using sub circuits

Suggested Readings:

1. Rashid Programming with Pspice Pearson
2. Sedra Pspice Oxford

Generic Elective (GE)

[Interdisciplinary for other department]

GE-4: Practical Electronics — Credits 06

GE4T: Practical Electronics — Credits 04

Course Contents:

Timer and PLL and Phase Locked Loop

Timer and PLL: Functional block diagram of 555 timer, Monostable operation and its Application, Astable operation and its Applications,

Phase Locked Loop: Functional block diagram – Phase detector / Comparator, Voltage Controlled Oscillator, Low pass filter, Applications: Frequency multiplier/ Division, AM detection

Operational Amplifier

Inverting and non-inverting amplifier, Op-amp parameters, Summing Amplifier, Difference Amplifier, Integrator, Differentiator, Instrumentation Amplifier, Audio Amplifier(LM386), Voltage to current converter, Current to Voltage converter, Sample and Hold circuits.

First order active filters (Circuit diagram and formula only): low pass, high pass, band pass, band reject and all pass filters.

Phase-shift & Wein bridge oscillator using op-amp.

Transducers and A-D & D-A Conversion

Transducers (Basic Working): Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Hall effect sensors, magneto-strictive transducers, Microphone, Touch Switch, Piezoelectric sensors, light(photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature(electrical and non-electrical), Pressure sensor.

A-D and D-A Conversion: D-A conversion: 4 bit binary weighted resistor type, circuit and working. Circuit of R-2R ladder- Basic concept. A-D conversion characteristics, successive approximation ADC. (Mention the relevant ICs for all).

Data Acquisition using Arduino:

Arduino: Birth, Open Source community, Functional Block Diagram, Functions of each Pin, Arduino Development Boards: IDE, I/O Functions, Looping Techniques, Decision Making Techniques, Designing of 1st sketch, Programming of an Arduino (Arduino ISP) , Serial port Interfacing, Basic Interfacing and I/O Concept,

Interfacing LED, Switch, 7seg LED, and different sensors.

Suggested Readings:

1. Measurement Systems, 4/e, Doeblin McGraw Hill, New York, 1992.
2. Electrical Measurements & Electronic Measurements by A.K. Sawhney
3. Instrumentation- Devices and Systems By Rangan, Sarma, and Mani, Tata-McGraw Hill
4. Electronic Instrumentation by H.S Kalsi, McGraw Hill
5. Instrumentation measurements and analysis by Nakra & Choudhary
6. Measurement & Instrumentation- DVS Murthy
7. R. A. Gayakwad, Op-Amps and Linear IC's, Pearson Education (2003)
8. Electronic Sensor Circuits and Projects, III Volume, Forrest M Mims, Master Publishing Inc.
9. Timer, Op Amp, and Optoelectronic Circuits & Projects, Forrest M Mims, Master Publishing Inc.
10. Exploring Arduino, Jeremy Blum, Wiley
11. Beginning Arduino, Michael McRobetrs, Technology in Action
12. Beginning Arduino Programming, Brian Evans ,Technology in Action
13. Practical Arduino Engineering, Harold Timmis, Technology in Action

14. Practical Arduino : Cool Projects for open source hardware, Jonathan Oxer, Hugh Blemings, Technology in Action

GE4P: Practical Electronics Lab **Credits 02**

Practical:

1. Study of basic Monostable Multivibrator.
2. Study of basic Astable Multivibrator.
3. Light detection using 555 timer.
4. Rain alarm using 555 timer.
5. Motor control by PWM using 555 timer.
6. LED flasher circuit using 555 timer.
7. Analog lightwave Transmitter/Receiver using 555 timer.
8. Study of basic inverting and non-inverting amplifier.
9. Study of basic integrator circuit.
10. Study of basic differentiator circuit.
11. Study of Instrumentation Amplifier circuit
12. Design of first order LPF.
13. Study of first order HPF.
14. Designing of fiber optic based Transmitter /Receiver using LM386.
15. Temperature to voltage converter using 741.
16. Shadow sensing using 741 and LDR
17. Light based PWM using 741 and V-F converter.
18. Test the different Arduino Boards, Open-Source and Arduino Shields.
19. Install Arduino IDE and its development tool.
20. Develop a program to Blink LED for 1second.
21. Develop a program to interface Input Switches and output LEDs with development board (Arduino).
22. Interface 7 segment display with development board (Arduino).
23. Interface LM35 temperature sensor with Arduino and monitor temperature on serial monitor.
24. Interface DC motor using L293D Motor Driver.
25. Interfacing of various sensors with Arduino development board.

Or

GE-4: Communication Systems — Credits 06

GE4T: Communication Systems — Credits 04

Course Contents:

Unit 1

Noise and Transmission lines: Noise-Introduction, internal and external noises, signal to noise ratio and noise figure

Amplitude Modulation/demodulation techniques: Block diagram of electronic communication system. Modulation-need and types of modulation-AM, FM & PM. Amplitude modulation – representation, modulation index, expression for instantaneous voltage, power relations, frequency spectrum, DSBFC, DSBSC and SSBSC (mention only). Limitations of AM.

Demodulation- AM detection: principles of detection, linear diode, principle of working and waveforms.

Block diagram of AM transmitter and Receiver.

Unit 2

Frequency Modulation/demodulation techniques: Frequency Modulation: definition, modulation index, FM frequency spectrum diagram, bandwidth requirements, frequency deviation and carrier swing, FM generator-varactor diode modulator.

FM detector – principle, slope detector-circuit, principle of working and waveforms. Block diagram of FM transmitter and Receiver. Comparison of AM and FM.

Unit 3

Digital communication: Introduction to pulse and digital communications, digital radio, sampling theorem, types- PAM, PWM, PPM, PCM – quantization, advantages and applications, digital modulations (FSK, PSK, and ASK). Advantage and disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes, classification, interfacing (RS232). TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA

Unit 4

Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G and 4G concepts.

Satellite communication: Introduction, to Orbit, types of orbits, Block diagram of satellite transponder.

Suggested Readings:

1. Electronic Communication, George Kennedy, 3rd edition, TMH.
2. Electronic Communication, Roddy and Coolen, 4th edition, PHI.
3. Electronic Communication systems, Kennedy & Davis, IV edition-TATA McGraw Hill.
4. Advanced Electronic Communication systems, Wayne Tomasi- 6th edition, Low priced edition- Pearson education

GE4P: Communication Systems Lab — Credits 02

1. Amplitude modulator and Amplitude Demodulator.
2. Study of FM modulator using IC8038.
3. Study of VCO using IC 566.
4. Study of Time Division Multiplexing and Demultiplexing.
5. Study of AM Transmitter/Receiver.
6. Study of FM Transmitter/Receiver.
7. ASK modulator and Demodulator.
8. Study of FSK Modulation.
9. Study of PWM and PPM.
10. Study of PAM Modulator and Demodulator

Or

GE- 4: Microprocessor and Microcontroller System — Credits 06

GE4T: Microprocessor and Microcontroller System — Credits 04

Course Contents:

Unit 1

Number systems: Binary, hexadecimal – conversion from binary to decimal and vice-versa, binary to hexadecimal and vice-versa, decimal to hexadecimal and vice versa, addition and subtraction of binary numbers and hexadecimal numbers. Subtraction using 2's complement, signed number arithmetic.

Introduction to Microprocessor: Introduction, applications, basic block diagram, speed, word size, memory capacity, classification of microprocessors (mention different microprocessors being used)

Microprocessor 8085: Features, architecture -block diagram, internal registers, register pairs, flags, stack pointer, program counter, types of buses. Multiplexed address and data bus, generation of control signals, pin description of microprocessor 8085.

Unit 2

8085 Instructions: Operation code, Operand & Mnemonics.

Instruction set of 8085, instruction classification, addressing modes, instruction format.

Data transfer instructions, arithmetic instructions, increment & decrement instructions, logical instructions, branch instructions and machine control instructions.

Stack operations, subroutine calls and return operations. Delay loops, use of counters, timing diagrams-instruction cycle, machine cycle, T- states, time delay

Interrupt structure of 8085A microprocessor, processing of vectored and non-vectored interrupts, latency time and response time

Interfacing of memory chips, address allocation technique and decoding; Interfacing of I/O devices, LEDs and toggle-switches as examples, memory mapped and isolated I/O structure; Input/output techniques: CPU initiated unconditional and conditional I/O transfer.

Unit 3

Introduction to Microcontrollers: Basic block diagram, comparison of microcontroller with microprocessors, comparison of 8 bit, 16 bit and 32 bit microcontrollers.

MICROCONTROLLER 8051- architecture -internal block diagram, key features of 8051, pin diagram, memory organization, Internal RAM memory, Internal ROM. General purpose data memory, special purpose/function registers, external memory.

Counters and timers: 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input / output ports and circuits/ configurations, serial data input / output – SCON, PCON, serial data transmission modes.

Unit 4

8051 Interrupts, Addressing modes and Instruction set: Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts.

Addressing modes, immediate addressing, register addressing, direct and indirect addressing,Data transfer instructions, internal data move, external data move, code memory read-only data move, Push and Pop and data exchange instructions.

Logical Instructions, byte level logical operations, bit level logical operations, rotate and swap operations.

Arithmetic Instructions, flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic, simple programs in assembly language.

Timer / Counter Programming in 8051: Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 C.

Suggested Readings:

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S.Gaonkar - Wiley Eastern Limited- IV Edition.
2. Fundamentals of Microprocessor &Microcomputer: B. Ram - Danpat Rai Publications.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education 2008.
4. Muhammad Ali Mazidi, "Microprocessors and Microcontrollers", Pearson, 2006

GE4P: Microprocessor and Microcontroller System Lab **Credits 02**

Microprocessor and Microcontroller System Lab

1. Program to transfer a block of data.
2. Program for multibyte addition.
3. Program for multibyte subtraction.
4. Program to multiply two 8-bit numbers.
5. Program to divide a 16 bit number by 8 bit number.
6. Program to search a given number in a given list.
7. Program to generate terms of Fibonacci series.
8. Program to sort numbers in ascending/descending order.
9. Program to find the square root of an integer.
10. To study interfacing of IC 8255.
11. Program to verify the truth table of logic gates.

8051 Microcontroller Programming

1. Program to find the sum of N 8-bit numbers.
2. Program to find largest of N numbers.
3. Program to find smallest of N numbers.
4. Program to find whether the given data is palindrome.
5. Program to arrange the numbers in ascending order.
6. Interfacing of stepper motor and Rotating stepper motor by N steps clockwise/ anticlockwise with speed control.
7. LCD interfacing.
8. Speed control of DC motor using PWM (pulse delay to be implemented using timers).