# PEA305:ANALYTICAL SKILLS-I

L:2 T:1 P:0 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: demonstrate procedural fluency with number system and mathematical operations to solve the stated problems.

CO2 :: select an appropriate approach to solve problems related to percentage, profit and loss.

CO3 :: observe the data given and interpret given number and alphanumeric series

CO4 :: apply the analytical concepts learnt to solve the questions of ratio and proportion

CO5 :: use the concepts of permutation, combination and probability to handle various problems.

CO6 :: analyze the reasoning aptitude problems such as blood relation and direction sense to solve related problems.

**Unit I**

**Number system** : HCF & LCM, divisibility rules, classification of numbers, factors, factorials, unit digit calculation, remainder properties

**Simplification and approximation** : BODMAS rule, calculation and approximation based on percentage, problem based on digit sum

**Average** : basic average calculations, average increase and decrease, weighted average

**Unit II**

**Percentage** : basic percentage calculations, percentage to fraction, percentage comparison, percentage increase and decrease, population change in percentage

**Profit loss discount** : basic concepts of cost price selling price and marked price, calculations of profit and loss percentage, types of discount and discount percentages, comparison of profit or loss with discount percentage

**Simple and compound interest** : basic concepts of interest calculations, comparison of simple and compound interest

**Unit III**

**Logical reasoning** : number series with introduction of AP and GP, alphabet series, alphabet test, coding and decoding, language coding

**Unit IV**

**Ratio and proportions** : basic concepts of ratio and proportions and ages, problems based on ratio and proportions and ages, problems based on partnerships and profit sharing

**Alligation and mixtures** : conceptual knowledge of alligation and mixtures, problems based on alligation and mixtures

**Unit V**

**Permutation** : basic principle of counting, numerical permutation(formation of numbers and sum of numbers), alpha permutation(rearrangement of words and rank of a word), linear and circular permutation, logical permutation

**Combination** : basic formulas of combination, formation of committee, combination of identical objects

**Probability** : concept of probability, classification of events, conditional probability, problems based on coins dices and cards

**Unit VI**

**Analytical reasoning** : blood relations, direction sense test

**Text Books:**

1. QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS by DR.R.S. AGGARWAL, S Chand Publishing

2. A MODERN APPROACH TO VERBAL AND NON-VERBAL REASONING by DR. R.S. AGGARWAL, S Chand Publishing

**References:**

1. MAGICAL BOOK ON QUICKER MATHS by M.TYRA, BANKING SERVICE CHRONICLE

2. MAGICAL BOOK SERIES ANALYTICAL REASONING by M.K. PANDEY, BANKING SERVICE CHRONICLE

# ECE318:CMOS VLSI DESIGN

L:3 T:0 P:0 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: Draw CMOS Logic Circuits and CMOS Transmission gates

CO2 :: Apply static CMOS combinational and sequential logic at the transistor level, including mask layout.

CO3 :: Focus on the greater depth with the operation of MOS and its structure.

CO4 :: Analyze the frequency response of amplifier.

CO5 :: Compose new designs for different logical circuits with MOSFET

CO6 :: Develop in-depth analytical and design capabilities in digital CMOS circuits and chips

**Unit I**

**MOS Transistor** : Basic Principle of MOS transistor, The Metal Oxide Semiconductor (MOS) Structure, The MOS system under External Bias, Structure and Operation of MOS Transistor (MOSFET), The Threshold Voltage, MOSFET current-voltage characteristics, Substrate Bias Effect (Body Effect)

**Unit II**

**Fabrication of MOSFET and Scaling** : Fabrication process flow, The CMOS n-Well process, Layout design rules, Full-Custom Masks Layout Design, MOSFET scaling & small -geometry effects, MOSFET Capacitances

**Unit III**

**MOS Inverters (Static and Switching Characteristics)** : Introduction to static characteristics, Voltage Transfer Characteristics, Noise Immunity & Noise Margin, Power & Area Consideration, Resistive-Load Inverter, Enhancement-Load Inverter, Depletion-Load Inverter, CMOS Inverter, Delay-Time Definitions, Propagation Delay Time, Calculation of Delay Times, Inverter Design with Delay Constraints

**Unit IV**

**Combinational MOS Logic Circuits** : CMOS Logic Circuits, Complex Logic Circuits, Pass Transistor Circuits, CMOS Transmission gates

**Unit V**

**Sequential MOS Logic Circuits** : Behavior of Bi-stable elements, SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, Schmitt Trigger Circuit

**Unit VI**

**Dynamic and BiCMOS Logic Circuits** : Basic Principles of Pass Transistor Circuits, Dynamic CMOS Circuit Techniques, High-Performance Dynamic CMOS, BJT Structure & Operation, Basic BiCMOS Circuit Behavior, Switching Delay

**Text Books:**

1. CMOS DIGITAL INTEGRATED CIRCUITS by SUNG-MO-KANG & YUSUF LEBLEBICI, MC GRAW HILL

**References:**

1. CMOS VLSI DESIGN by NEIL H.E.WESTE ,DAVID HARRIS & AYAN BANERJEE,, PEARSON

# ECE310:FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS

L:3 T:0 P:0 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: describe the basics of Microprocessor 8085, its internal architecture and functioning

CO2 :: familiar about the architecture and organization of advanced processors

CO3 :: interpret different technique and methods to design a program for 8051 microcontroller

CO4 :: develop different programming methods using 8051

CO5 :: analyze different interfacing module using 8051 microcontroller

CO6 :: understand different interfacing modules using advanced processor ARM

**Unit I**

**8085 Microprocessor architecture** : RISC & CISC Architecture, 8085 pin diagram and block diagram, signal descriptions, timing and control unit, Timing diagrams, status flag

**Unit II**

**8085 programming, 8086 and advanced processors** : Addressing mode, Instruction set, Instruction type of 8085, 8086 architecture and pin diagram, register organization, Comparison of 8085 and 8086, power PC, introduction to system-on-a-Chip

**Unit III**

**8051 Microcontroller Architecture** : Microprocessor Vs Microcontroller, 8051 Architecture, Registers used, Pin diagram, I/O ports functions, Internal Memory organization

**Unit IV**

**Instruction Set and it's Programming** : Addressing Modes, Instruction set, Stack and Subroutine instructions, Assembly language program examples on subroutine and involving loops, Delay subroutine, Addition of 8 bit numbers, Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status

**Unit V**

**Timers, Serial Port and interrupts** : 8051 Timers and Counters, Operation and language programming to generate a pulse using Mode-1, 8051 Serial Communication, Basics of Serial Data Communication, RS-232 standard, 8051 interrupts and its programming

**Unit VI**

**Advanced processors (ARM)** : embedded system software and hardware, ISA's and ARM history

**Futuristic microprocessor technologies** : low-power microprocessor design for IoT devices, introduction to edge computing and Microprocessor requirements for edge devices

**Text Books:**

1. MICROPROCESSOR, ARCHITECTURE, PROGRAMMING, & APPLICATIONS WITH THE 8085 by RAMESH. S. GAONKAR, PENRAM INTERNATIONAL PUBLISHING (INDIA) PVT. LTD.

**References:**

1. THE 8051 MICROCONTROLLERS AND EMBEDDED SYSTEMS by MUHAMMAD ALI MAZIDI AND JANICE GILLISPIE MAZIDI, PEARSON

2. . THE 8051 MICROCONTROLLER ARCHITECTURE, PROGRAMMING AND APPLICATIONS by KENNATH J. AYALA., CENGAGE LEARNING

3. ARM SYSTEM-ON-CHIP ARCHITECTURE by STEVE FURBER, PEARSON

# ECE305:CONTROL SYSTEMS

L:3 T:0 P:0 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: Describe the mathematical model for a given physical systems.

CO2 :: Identify physical systems and classification of open and close loop control systems.

CO3 :: Examine the system performance in time and frequency domain.

CO4 :: Analyze system behaviour in state space domain

CO5 :: Assess the performance of LTI systems to different inputs

CO6 :: Design basic controllers to meet out desired performance

**Unit I**

**Introduction to Control Systems** : Introduction to linear control system, Open loop and Closed loop systems, Transfer functions, Industrial Control Examples, Transfer Function of Electrical Systems, Mechanical Systems, Electrical Analogous Systems

**Unit II**

**Modelling and Representations of Control Systems** : Block diagram representation and reduction techniques, Signal flow graphs, Mason Gain Formula, Concept of Poles and Zeros, Effect of feedback

**Unit III**

**Time Domain analysis and Stability** : Standard input signals, Time Response of first order system, Time response of second order system subjected to unit step input, Time -Domain specifications, Steady state error, Static error coefficients, Concept of stability, Absolute and Relative Stability, Routh-Hurwitz criterion

**Unit IV**

**Frequency response analysis** : Relationship between time and frequency response, Stability in frequency domain, Nyquist plot and nyquist stability criterion, Root Locus Technique, Polar Plot

**Unit V**

**Design of Compensators** : Bode Plot and stability determination, Lag-lead compensation, Lead compensation, Lag compensation, Design of Compensators using Bode plot, PID control

**Unit VI**

**State Space Analysis** : State space analysis to transfer functions, Transfer Function Decomposition, Solutions of state equations using Laplace Inverse and Caley-Hamilton Theorem, Controllability and Observability

**Text Books:**

1. CONTROL SYSTEMS PRINCIPLES AND DESIGN by M GOPAL, MCGRAW HILL EDUCATION

**References:**

1. LINEAR CONTROL SYSTEMS by B S MANKE, KHANNA PUBLISHERS

2. CONTROL SYSTEMS ENGINEERING by I J NAGRATH AND GOPAL, NEW AGE INTERNATIONAL

3. AUTOMATIC CONTROL SYSTEMS by OGATA K, PRENTICE HALL

4. MODERN CONTROL SYSTEMS by RICHARD C DORF, ROBERT H BOSHOP, PEARSON

# ECE303:DIGITAL SIGNAL PROCESSING

L:2 T:0 P:2 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: illustrate discrete time signals and systems in time domain

CO2 :: analyze signals and systems in transformed domain

CO3 :: develop digital filters using various techniques

CO4 :: examine digital filter implementation structures and concerns

CO5 :: illustrate word length issues in FIR and IIR filters

CO6 :: simulate real life applications using digital signal processing algorithms

**Unit I**

**Review on discrete-time signals and systems** : signal operations, classification of signals, introduction to systems, classification of systems – linearity, time-invariance, stability, linear convolution

**Unit II**

**Fourier analysis using DFT and FFT** : z-transform and inverse z-transform, frequency analysis, DFT and IDFT, DFT properties, linear convolution using DFT and IDFT, computation of DFT and IDFT using FFT algorithm

**Unit III**

**Design of FIR filters** : FIR filters design using rectangular window, hamming window, hanning window, blackman window, linear phase response, pole-zero plot of FIR filter

**Unit IV**

**Design of IIR filters** : impulse invariant transformation, bilinear transformation, introduction to butterworth analog filters, designing of low-pass, high-pass, band-pass and band-stop butterworth filter, introduction to chebyshev analog filters, designing of low-pass, high pass, band-pass and band-stop chebyshev filter

**Unit V**

**Filter realization and finite word length effects** : direct form-I and form-II realization, cascade and parallel form realization, introduction to finite word length effects: quantization noise, input quantization error, coefficient quantization error, overflow and limit cycles

**Unit VI**

**Applications of signal processing** : biomedical signal processing-ECG and EEG, digital image processing- image enhancement and segmentation, image restoration, digital communication- mobile phone signal processing and RADAR with their block diagrams, echo and chorus (reverberation) generation, music synthesis system

**List of Practicals / Experiments:**

**List of Practicals**

- elementary signals in Octave
- linear convolution
- visualisation of simulated signals using FFT
- system representation using FFT
- frequency representation of real world signals
- design of FIR filters using various windows
- filtering using FIR filter
- design of IIR butterworth filter
- design of IIR chebyshev filter
- filtering using IIR filter

- filter transformation
- ECG data acquisition and filtering
- image operations
- echo generation
- image enhancement and restoration

**Text Books:**

1. DIGITAL SIGNAL PROCESSING PRINCIPLES, ALGORITHMS AND APPLICATIONS by JOHN G PROAKIS, DIMTRIS G MANOLAKIS, PEARSON

**References:**

1. DIGITAL SIGNAL PROCESSING by S. SALIVAHAN, A VALLAVARAJ, GNANPIYA, MC GRAW HILL

2. DIGITAL SIGNAL PROCESSING-A COMPUTER BASED APPROACH by S. K. MITRA, MC GRAW HILL

3. DIGITAL SIGNAL PROCESSING by A.ANAND KUMAR, PHI Learning Pvt Ltd

4. DIGITAL SIGNAL PROCESSING - A MODERN INTRODUCTION by ASHOK AMBARDAR, CENGAGE LEARNING

# ECE207:ELECTROMAGNETIC FIELD THEORY

L:3 T:1 P:0 Credits:4

**Course Outcomes:** Through this course students should be able to

CO1 :: recall the basic the basic Electro and Magneto static theorems and laws

CO2 :: describe the concepts of electrodynamics & to derive and discuss the Maxwell's equations.

CO3 :: interpret Maxwell's equations to electromagnetic waves propagation and transmission line

CO4 :: explore solutions of problems relating to transmission lines and uniform plane wave propagation.

CO5 :: apply the characteristics of electromagnetic wave and its propagation in free space and different medium

CO6 :: deduce the knowledge of electromagnetic fields in practice

**Unit I**

**Introduction to Vector Analysis** : Introduction to Coordinate systems and Transformation, Differential Length,Area and Volume, Line,Surface and Volume Integrals, Del Operator,Gradient,Divergence and Curl, Stoke's Theorem, Divergence Theorem, Laplacian of a Scalar

**Unit II**

**Electrostatics** : Coulomb Law, Permittivity and Electric flux density, Electric potential, Gauss Law, Applications of Gauss's Law, Continuity Equation, Relaxation time and boundary conditions, Poisson's and Laplace's Equations

**Unit III**

**Magnetostatics** : Permeability and Magnetic flux Density, Biot Savart Law, Ampere's circuit law and its application, Magnetic flux and magnetic flux density, Derivation of the steady magnetic field laws

**Unit IV**

**Waves and Applications** : Faraday's law, Displacement current, Maxwell's equations in point form and integral form for steady fields, Phasor form of Maxwell's equation

**Unit V**

**Electromagnetic Wave Propagation** : Wave Propagation in Lossy Dielectrics, Plane Waves, Power and Poynting Vector, Reflection at boundries

**Unit VI**

**Transmission Line** : Transmission line parameters, Transmission line equation and reflection coefficients of voltage and current, SWR and Power, Input Impedance, Smith Chart, Application of electromagnetic field in modern wireless communication

**Text Books:**

1. PRINCIPLES OF ELECTROMAGNETICS by MATTHEW N.O. SADIKU,KULKARNI, OXFORD UNIVERSITY PRESS

**References:**

1. ENGINEERING ELECTROMAGNETICS by WILLIAM H.HAYT,JR AND JOHN A.BUCK, Tata McGraw Hill, India

# CSE233:OBJECT ORIENTED PROGRAMMING

L:0 T:0 P:4 Credits:2

**Course Outcomes:** Through this course students should be able to

CO1 :: identify basic programming constructs and use the newly acquired skills to solve extensive programming problems

CO2 :: discuss the mechanism of code reusability by creating own libraries of functions

CO3 :: validate the logic building and code formulation by designing code capable of passing various test cases

CO4 :: interpret the principles of the object-oriented model and apply it in the implementation in C ++ language

CO5 :: develop accurate, reliable and efficient software applications

CO6 :: apply the knowledge acquired to develop software applications

**List of Practicals / Experiments:**

**Concepts and Basics of C++ Programming :**

- Differences between procedural and object oriented programming paradigms
- Features of Input/output Streams
- Reading and writing data using cin and cout
- Creating classes
- Class objects
- Accessing class members
- Differences between Structures, Unions and Classes
- Enumeration
- Inline and Non inline member functions
- Static data members and static member functions.

**Functions:**

- Functions with Default parameters/arguments
- Inline Functions
- Manipulator Functions
- Function overloading and Scope rules
- Friend of a class (friend function and friend class)
- Reference variables
- Differences between Call by value, Call by address and call by reference
- Recursion(Function, Member Function).

**Pointers, Reference Variables, Arrays and String Concepts:**

- Differences between pointer and reference variables
- Void pointer
- Pointer arithmetic
- Pointer to pointer
- Possible problems with the use of pointers - Dangling pointer, Wild pointer, Null pointer assignment

- Classes containing pointers
- Pointer to objects
- this pointer
- Pointer to data member
- Array declaration and processing of multidimensional arrays(inside main and inside class)
- Array of objects
- The Standard C++ string class-defining and assigning string objects
- Member functions
- Modifiers of string class.

**Constructors, Destructors and File Handling:**

- Manager Functions (constructors and destructor)
- Default constructor
- Parameterized constructor
- Copy constructor
- Initializer lists
- Constructor with default arguments
- Destructors

**Data File operations:**

- Opening and closing of files
- Modes of file
- File stream functions
- Reading/Writing of files
- Sequential access and random access file processing
- Binary file operations
- Classes and file operations
- Structures and file operations

**Operator Overloading and Type Conversion:**

- Operator Overloading (unary operator, binary operator overloading)
- Type conversions - basic type to class type
- class type to basic type

**Inheritance:**

- Inheritance Basics – derived class and base class
- Types (simple, multi-level, multiple and hierarchical)
- Modes (private, protected, public inheritance)
- Overriding member functions
- Order of execution of constructors and destructors
- Resolving ambiguities in inheritance
- Virtual base class

**Dynamic Memory Management and Polymorphism :**

- Dynamic memory allocation using new and delete operators
- Memory leak and allocation failures
- Virtual destructors

- Compile and run time polymorphism
- Virtual functions
- Pure virtual functions
- Abstract classes and concrete class
- Introduction to Self-Referential class
- Early binding and late binding
- Dynamic constructors.

**Exception Handling, Templates and Standard Template Library (STL) :**

- Basics of exception handling
- Exception handling mechanism
- Throwing mechanism
- Catching mechanism
- Rethrowing an exception
- Function template and class template
- Introduction to STL- Containers, Algorithms and iterators
- Container - Vector and List

**Concepts and Basics of C++ Programming**

- Programs to define classes and structures. Program to demonstrate inline, non inline member functions and Static function

**Functions**

- Program to implement function overloading, friend function and friend class. Program to demonstrate the difference between call by value, call by address and call by reference

**Pointers, Reference Variables, Arrays and String Concepts**

- Program to demonstrate the type of pointers. Program to process multidimensional array and array of objects

**Constructors, Destructors and File Handling**

- Program to demonstrate constructor, destructor and type of constructors

**Data File operations**

- Program to demonstrate the modes of file. Program to demonstrate type of files.

**Operator Overloading and Type Conversion**

- Program to demonstrate the operator overloading and type conversion.

**Inheritance**

- Program to demonstrate the type of inheritance. Program to demonstrate the ambiguities in inheritance

**Dynamic Memory Management and Polymorphism**

- Program to use new and delete for dynamic memory management. Program to demonstrate the compile time and run time polymorphism. Program to demonstrate abstract class and dynamic constructor.

**Exception Handling, Templates and Standard Template Library (STL)**

- Program to demonstrate exception handling. Program to demonstrate function template and class template. Program to demonstrate STL- Containers, Algorithms and Iterators

**Text Books:**

1. OBJECT ORIENTED PROGRAMMING IN C++ by ROBERT LAFORE, PEARSON

**References:**

1. PROGRAMMING WITH C++ by D RAVICHANDRAN, MCGRAW HILL EDUCATION

2. OBJECT ORIENTED PROGRAMMING IN C++ by E BALAGURUSAMY, MCGRAW HILL EDUCATION

# ECE325:CONTROL SYSTEM LABORATORY

L:0 T:0 P:2 Credits:1

**Course Outcomes:** Through this course students should be able to

CO1 :: identify the hardware components required in control systems

CO2 :: visualize the effect of different type of compensators in control systems

CO3 :: compare different controller design methods like PID control and ON-OFF control

CO4 :: analyze the time domain characteristics of closed loop control systems

CO5 :: analyze the frequency domain characteristics of closed loop control systems

CO6 :: simulate different control strategies for a given control system

**List of Practicals / Experiments:**

**Error Detector Characteristics**

- Positional error detector characteritics of the following : (a) Two servo potentiometers (b) synchro transmitter - receiver

**Servomotor**

- To obtain the Transfer Function and Control Characteristics of DC/AC Servo Motor

**Step Response**

- To Study the Step Response and Feed Back Properties for Ist and 2nd order system.

**Position Control Performances**

- To obtain the Position Control performance of DC Servo Motor.

**Time and Frequency Domain Analysis**

- To analyze the system in time and frequency domain

**P/PI/ PID controller**

- Design and study of the P/PI/ PID controller for different systems

**Performance Analysis**

- Performance Analysis of Thermal System and Design using PID/Relay Control

**Temperature and Light Intensity Control**

- To perform temperature and light intensity control using open loop control and closed loop control (on/off and PID)

**DC Motor Speed Control**

- To study & implement DC motor speed Control using open loop control and close loop control (on/off and PID)

**Performance characteristics of compensators**

- To obtain the characteristics of lead, lag and lead-lag compensators

**References:**

1. LINEAR CONTROL SYSTEM by B.S.MANKE, KHANNA PUBLISHERS

2. CONTROL SYSTEMS PRINCIPLE AND DESIGN by M.GOPAL, MCGRAW HILL EDUCATION

3. ANALYSIS AND DESIGN OF CONTROL SYSTEMS USING MATLAB by RAO V DIKKIBATI, NEW AGE INTERNATIONAL PUBLISHERS

# ECE322:MICROCONTROLLER AND APPLICATIONS LABORATORY

L:0 T:0 P:3 Credits:2

**Course Outcomes:** Through this course students should be able to

CO1 :: learn and execute the basic instruction set of 8051 micro-controller

CO2 :: analyze the assembly language programs and compute the results

CO3 :: develop skills on 8051 microcontroller I/O interface

CO4 :: design a system that incorporates sensors and interfaces seamlessly with a 8051 microcontroller

CO5 :: understand and evaluate programs by utilizing ARM architecture

CO6 :: Apply the integration of an ARM processor with peripherals

**List of Practicals / Experiments:**

**8051 Basic Programs**

- Find the sum of the values 79H, F5H, E2H. Put thesum in register R0 (low byte) and R5 (high byte).
- Write a program to toggle all the bits of P1 aftersome delay
- Write a program to generate square wave of 50%duty cycle on bit 0 of port 1

**LCD and 8051**

- Interfacing of LCD with8051 Micro-controller

**8051 Basic Programs using Keil**

- Write a program for addition of two 8-bit numbers
- Write a program for subtraction of two 8-bit numbers
- Write a program for division of two 8-bit numbers
- execution of Boolean and logical instructions(bit manipulations)
- assembly language program (8051) to implement hexadecimal up/down counter.

**Temperature Sensor Interfacing Using AT89C51 Micro-controller**

- Write a program to print room temperature in 16*2 LCD.

**Basic programming of ARM processor**

- design and interfacing of LED with ARM processor.

**DC motor interfacing with ARM processor**

- Interfacing of DC motor with ARM processor.

**L293D interfacing with 8051**

- Interfacing of DC motor with 8051 and rotate it clockwise and anti-clockwise

**8051 and Seven Segment**

- Interfacing of Seven segment display with 8051 microcontroller

**References:**

1. THE 8051 MICROCONTROLLERS AND EMBEDDED SYSTEMS by MUHAMMAD ALI MAZIDI AND JANICE GILLISPIE MAZIDI, PEARSON