B.E. DEGREE
IN
ELECTRONICS & COMMUNICATION ENGINEERING

Year : II

Part : II

Teaching Schedule							Examination Scheme						Total	Remark
							Theory			Practical				
S. N.	Course Code	Course Title	L	T	P	Total	Assesment Marks	Final		Assesment Marks	Final			
								Duaration hours	Marks		Duaration hours	Marks		
1	EE 554	Electrical Machine	3	1	1.5	5.5	20	3	80	25			125	
2	SH 553	Numerical Method	3	1	3	7	20	3	80	50			150	
3	SH 551	Applied Mathematics	3	1		4	20	3	80				100	
4	EE 552	Instrumentation I	3	1	1.5	5.5	20	3	80	25			125	
5	EE 553	Power System	3	1		4	20	3	80				100	
6	EX 551	Microprocessor	3	1	3	7	20	3	80	50			150	
7	CT 551	Discrete Structure	3			3	20	3	80				100	
		Total	**21**	**6**	**9**	**36**	**140**	**21**	**560**	**150**			**850**	

APPLIED MATHEMATICS
SH 551

Lecture : 3 **Year : II**
Tutorial : 1 **Part : II**
Practical : 0

Course Objective

This course focuses on several branches of applied mathematics. The students are exposed to complex variable theory and a study of the Fourier and Z-Transforms, topics of current importance in signal processing. The course concludes with studies of the wave and heat equations in Cartesian and polar coordinates.

1. Complex Analysis (18 hours)

1.1 Complex Analytic Functions
- 1.1.1 Functions and sets in the complex plane
- 1.1.2 Limits and Derivatives of complex functions
- 1.1.3 Analytic functions. The Cauchy –Riemann equations
- 1.1.4 Harmonic functions and it's conjugate

1.2 Conformal Mapping
- 1.2.1 Mapping
- 1.2.2 Some familiar functions as mappings
- 1.2.3 Conformal mappings and special linear functional transformations
- 1.2.4 Constructing conformal mappings between given domains

1.3 Integral in the Complex Plane
- 1.3.1 Line integrals in the complex plane
- 1.3.2 Basic Problems of the complex line integrals
- 1.3.3 Cauchy's integral theorem
- 1.3.4 Cauchy's integral formula
- 1.3.5 Supplementary problems

1.4 Complex Power Series, Complex Taylor series and Lauren series
- 1.4.1 Complex power series
- 1.4.2 Functions represented by power series
- 1.4.3 Taylor series, Taylor series of elementary functions
- 1.4.4 Practical methods for obtaining power series, Laurent series
- 1.4.5 Analyticity at infinity, zeros, singularities, residues, Cauchy's residue theorem
- 1.4.6 Evaluation of real integrals

2. The Z-Transform (9 hours)

2.1 Introduction
2.2 Properties of Z-Transform
2.3 Z- transform of elementary functions
2.4 Linearity properties

2.5 First shifting theorem, second shifting theorem, Initial value theorem,
2.6 Final value theorem, Convolution theorem
2.7 Some standard Z- transform
2.8 Inverse Z-Transform
2.9 Method for finding Inverse Z-Transform
2.10 Application of Z-Transform to difference equations

3. Partial Differential Equations (12 hours)

3.1 Linear partial differential equation of second order, their classification and solution
3.2 Solution of one dimensional wave equation, one dimensional heat equation, two dimensional heat equation and Laplace equation (Cartesian and polar form) by variable separation method

4. Fourier Transform (6 hours)

4.1 Fourier integral theorem, Fourier sine and cosine integral; complex form of Fourier integral
4.2 Fourier transform, Fourier sine transform, Fourier cosine transform and their properties
4.3 Convolution, Parseval's identity for Fourier transforms
4.4 Relation between Fourier transform and Laplace transform

References:

1. S. K. Mishra, G. B. Joshi, S. Ghimire, V. Parajuli, " A text book of Applied Mathematics", Dibya Deurali Prakashan.
2. E. Kreyszig, "Advance Engineering Mathematics", Fifth Edition, Wiley, New York.
3. A. V. Oppenheim, "Discrete-Time Signal Processing", Prentice Hall.
4. K. Ogata, "Discrete-Time Control System", Prentice Hall, Englewood Cliffs, New Jersey, 1987.

NUMERICAL METHODS
SH 553

Lecture : 3
Tutorial : 1
Practical : 3

Year : II
Part : II

Course objective:

To introduce numerical methods used for the solution of engineering problems. The course emphasizes algorithm development and programming and application to realistic engineering problems.

1. Introduction, Approximation and errors of computation (4 hours)

- 1.1 Introduction, Importance of Numerical Methods
- 1.2 Approximation and Errors in computation
- 1.3 Taylor's series
- 1.4 Newton's Finite differences (forward , Backward, central difference, divided difference)
- 1.5 Difference operators, shift operators, differential operators
- 1.6 Uses and Importance of Computer programming in Numerical Methods.

2. Solutions of Nonlinear Equations (5 hours)

- 2.1 Bisection Method
- 2.2 Newton Raphson method (two equation solution)
- 2.3 Regula-Falsi Method , Secant method
- 2.4 Fixed point iteration method
- 2.5 Rate of convergence and comparisons of these Methods

3. Solution of system of linear algebraic equations (8 hours)

- 3.1 Gauss elimination method with pivoting strategies
- 3.2 Gauss-Jordan method
- 3.3 LU Factorization
- 3.4 Iterative methods (Jacobi method, Gauss-Seidel method)
- 3.5 Eigen value and Eigen vector using Power method

4. Interpolation (8 hours)

- 4.1 Newton's Interpolation (forward, backward)
- 4.2 Central difference interpolation: Stirling's Formula, Bessel's Formula
- 4.3 agrange interpolation
- 4.4 Least square method of fitting linear and nonlinear curve for discrete data and continuous function

4.5 Spline Interpolation (Cubic Spline)

5. Numerical Differentiation and Integration **(6 hours)**

5.1 Numerical Differentiation formulae
5.2 Maxima and minima
5.3 Newton-Cote general quadrature formula
5.4 Trapezoidal, Simpson's 1/3, 3/8 rule
5.5 Romberg integration
5.6 Gaussian integration (Gaussian – Legendre Formula 2 point and 3 point)

6. Solution of ordinary differential equations **(6 hours)**

6.1 Euler's and modified Euler's method
6.2 Runge Kutta methods for 1st and 2nd order ordinary differential equations
6.3 Solution of boundary value problem by finite difference method and shooting method.

7. Numerical solution of Partial differential Equation **(8 hours)**

7.1 Classification of partial differential equation(Elliptic, parabolic, and Hyperbolic)
7.2 Solution of Laplace equation (standard five point formula with iterative method)
7.3 Solution of Poisson equation (finite difference approximation)
7.4 Solution of Elliptic equation by Relaxation Method
7.5 Solution of one dimensional Heat equation by Schmidt method

Practical:

Algorithm and program development in C programming language of following:

1. Generate difference table.
2. At least two from Bisection method, Newton Raphson method, Secant method
3. At least one from Gauss elimination method or Gauss Jordan method. Finding largest Eigen value and corresponding vector by Power method.
4. Lagrange interpolation. Curve fitting by Least square method.
5. Differentiation by Newton's finite difference method. Integration using Simpson's 3/8 rule
6. Solution of 1st order differential equation using RK-4 method
7. Partial differential equation (Laplace equation)
8. Numerical solutions using Matlab.

References:

1. Dr. B.S.Grewal, "Numerical Methods in Engineering and Science ", Khanna Publication.
2. Robert J schilling, Sandra I harries, " Applied Numerical Methods for Engineers using MATLAB and C.", Thomson Brooks/cole.
3. Richard L. Burden, J.Douglas Faires, "Numerical Analysis", Thomson / Brooks/cole
4. John. H. Mathews, Kurtis Fink, "Numerical Methods Using MATLAB", Prentice Hall publication
5. JAAN KIUSALAAS , "Numerical Methods in Engineering with MATLAB" , Cambridge Publication

INSTRUMENTATION I
EE 552

Lecture : 3 **Year : II**
Tutorial : 1 **Part : II**
Practical : 3/2

Course Objectives:

To provide comprehensive treatment of methods and instrument for a wide range of measurement problems

1. **Instrumentations Systems** **(2 hours)**
   1.1 Functions of components of instrumentation system introduction, signal processing , Signal transmission ,output indication
   1.2 Need for electrical, electronics, pneumatic and hydraulic working media systems and conversion devices
   1.3 Analog and digital systems

2. **Theory of measurement** **(10 hours)**
   2.1 Static performance parameters - accuracy, precision, sensitivity, resolution and linearity
   2.2 Dynamic performance parameters - response time, frequency response and bandwidth
   2.3 Error in measurement
   2.4 Statistical analysis of error in measurement
   2.5 Measurement of voltage & current (moving coil & moving iron instruments)
   2.6 Measurement of low, high & medium resistances
   2.7 AC bridge & measurement of inductance and capacitance

3. **Transducer** **(8 hours)**
   3.1 Introduction
   3.2 Classification
   3.3 Application
      3.3.1 Measurement of mechanical variables, displacement, strain. velocity. acceleration and vibration
      3.3.2 Measurement of process variables - temperature pressure, level, fluid flow, chemical constituents in gases or liquids, pH and humidity.
      3.3.3 Measurement of bio-physical variables blood pressure and myoelectric potentials

4. **Electrical Signal Processing and transmission** **(6 hours)**
   4.1 Basic Op-amp characteristics
   4.2 Instrumentation amplifier

- 4.3 Signal amplification, attenuation, integration, differentiation, network isolation, wave shaping
- 4.4 Effect of noise, analog filtering, digital filtering
- 4.5 Optical communication, fibre optics, electro-optic conversion devices

5. Analog - Digital and Digital - Analog Conversion (6 hours)

- 5.1 Analog signal and digital signal
- 5.2 Digital to analog convertors - weighted resistor type, R-2R ladder type, DAC Errors
- 5.3 Analog to digital convertors - successive approximation type, ramp type, dual ramp type, flash type, ADC errors

6. Digital Instrumentation (5 hours)

- 6.1 Sample data system, sample and hold circuit
- 6.2 Components of data acquisition system
- 6.3 Interfacing to the computer

7. Electrical equipment (8 hours)

- 7.1 Wattmeter
  - 7.1.1 Types
  - 7.1.2 Working principles
- 7.2 Energy meter
  - 7.2.1 Types
  - 7.2.2 Working principles
- 7.3 Frequency meter
  - 7.3.1 Types
  - 7.3.2 Working principles
- 7.4 Power factor meter
- 7.5 Instrument transformers

Practical:

1. Accuracy test in analog meters
2. Operational Amplifiers in Circuits
   - Use of Op amp as a summer, inverter, integrator and differentiator
3. Use resistive, inductive and capacitive transducers to measure displacement
   - Use strain gauge transducers to measure force
4. Study of Various transducers for measurement of Angular displacement, Angular Velocity, Pressure and Flow
   - Use optical, Hall effect and inductive transducer to measure angular displacement
   - Use tacho - generator to measure angular velocity
   - Use RTD transducers to measure pressure and flow
5. Digital to Analog Conversion
   - Perform static testing of D/A converter
6. Analog to Digital Conversion
   - Perform static testing of A/D converter

References:

1. D.M Considine "Process Instruments and Controls Handbook" McGraw Hill.
2. S. Wolf and R.F.M. Smith "Students Reference Manual for Electronics Instrumentation Laboratories", Prentice Hall.
3. E.O Deobelin "Measurement System, Application and Design" McGraw Hill.
4. A.K Sawhney "A Course in Electronic Measurement and Instrumentation " DhanpatRai and Sons.
5. C.S. Rangan, G.R Sharma and V.S.V. Mani, "Instrumentation Devices and Systems" Tata McGraw Hill publishing Company Limited New Delhi.
6. J.B. Gupta. "A Course in Electrical & Electronics Measurement & Instrumentation, Kataria& Sons.

POWER SYSTEM
EE 553

Lecture : 3
Tutorial : 1
Practical : 0

Year : II
Part : II

Course Objectives:

To deliver the principle and fundamental analysis techniques for generation, transmission and distribution components of a power system with basic protection system.

1. General Background (4 hours)

1.1 Power System Evolution
1.2 Generation, Transmission and Distribution Components
1.3 Major electrical components in power station; alternators, transformers, bus bars, voltage regulators, switch and isolators, metering and control panels
1.4 Voltage levels, AC vs DC Transmission
1.5 Single phase and three phase power delivery
1.6 Single line diagram representation of a power system

2. Mechanical consideration of Transmission (8 hours)

2.1 Overhead Lines
  2.1.1 Line supports, spacing between conductors
  2.1.2 Calculation of sag, equal and unequal supports, effect of ice and wind loadings
  2.1.3 Application of G.P.S system
2.2 Underground cables
  2.2.1 Classification, construction of cables, insulation resistance
  2.2.2 Dielectric stress in single core/multi core cables
  2.2.3 Cable faults and location of faults

3. Line parameter calculations (10 hours)

3.1 Inductance, resistance and capacitance of a line
3.2 Inductance of line due to internal & external flux linkages
3.3 Skin & proximity effect
3.4 Inductance of single phase two wire line, stranded & bundled conductor consideration, concept of G.M.R and G. M.D, inductance of 3 phase line; equilateral and unsymmetrical spacing
3.5 Transposition, inductance of double circuit 3 phase lines
3.6 Concept of G.M.R and G. M.D for capacitance calculations
3.7 Capacitance calculations of single phase two wire line, stranded & bundled conductor consideration, capacitance of 3 phase line; equilateral and unsymmetrical spacing, double circuit
3.8 Earth effect in capacitance of a line

4. Transmission line performance analysis (8 hours)

4.1 Classification of a lines based on short, medium and long lines
4.2 Representation of 'Tee' and 'Pi' of medium lines; calculation of ABCD parameters
4.3 Per unit system; advantage and applications
4.4 Voltage regulation & efficiency calculation of transmission lines
4.5 Transmission line as source and sink of reactive power
4.6 Real and reactive power flow through lines
4.7 Surge impedance loading
4.8 Reactive compensation of transmission lines

5. Interconnected power system (5 hours)

5.1 Real power/ frequency balance
5.2 Reactive power/ voltage balance
5.3 Computer application in Interconnected power system
5.4 Basic concept of Power system Load flow

6. Distribution System (5 hours)

6.1 Distribution system terminology
6.2 Distribution transformer & Load centers
6.3 Rural vs urban distribution
6.4 Radial, loop & network distribution
6.5 Voltage drop computation in a radial Dc & Ac distribution

7. Introduction to power system protection (5 hours)

7.1 Power system faults & protection principle
7.2 Fuse as a protection device
7.3 Relays; working and types
7.4 Circuit breaker; working and types
7.5 Basic protection schemes for generators, motors, transformers and transmission lines
7.6 Basic concept of power line carrier communication (PLCC)

References:

1 W.D. Stevension "Power System Analysis " Tata McGraw Hill Publications
2 S.N. Singh "Electric power Generation, Transmission & Distribution" Prentece Hall

ELECTRICAL MACHINES
EE 554

Lecture : 3
Tutorial : 1
Practical : 3/2

Year : II
Part : II

Course Objective:

To impart knowledge on constructional details, operating principle and performance of Transformers, DC Machines, 1-phase and 3-phase Induction Machines, 3-phase Synchronous Machines and Fractional Kilowatt Motors.

1. Magnetic Circuits and Induction **(4 hours)**

1.1 Magnetic Circuits
1.2 Ohm's Law for Magnetic Circuits
1.3 Series and Parallel magnetic circuits
1.4 Core with air gap
1.5 B-H relationship (Magnetization Characteristics)
1.6 Hysteresis with DC and AC excitation
1.7 Hysteresis Loss and Eddy Current Loss
1.8 Faraday's Law of Electromagnetic Induction, Statically and Dynamically Induced EMF
1.9 Force on Current Carrying Conductor

2. Transformer **(8 hours)**

2.1 Constructional Details, recent trends
2.2 Working principle and EMF equation
2.3 Ideal Transformer
2.4 No load and load Operation
2.5 Operation of Transformer with load
2.6 Equivalent Circuits and Phasor Diagram
2.7 Tests: Polarity Test, Open Circuit test, Short Circuit test and Equivalent Circuit Parameters
2.8 Voltage Regulation
2.9 Losses in a transformer
2.10 Efficiency, condition for maximum efficiency and all day efficiency
2.11 Instrument Transformers: Potential Transformer (PT) and Current Transformer (CT)
2.12 Auto transformer: construction, working principle and Cu saving
2.13 Three phase Transformers

3. DC Generator **(6 hours)**

3.1 Constructional Details and Armature Winding
3.2 Working principle and Commutator Action
3.3 EMF equation

- 3.4 Method of excitation: separately and self excited, Types of DC Generator
- 3.5 Characteristics of series, shunt and compound generator
- 3.6 Losses in DC generators
- 3.7 Efficiency and Voltage Regulation

4. DC Motor **(6 hours)**

- 4.1 Working principle and Torque equation
- 4.2 Back EMF
- 4.3 Method of excitation, Types of DC motor
- 4.4 Performance Characteristics of D.C. motors
- 4.5 Starting of D.C. Motors: 3 point and 4 point starters
- 4.6 Speed control of D.C. motors: Field Control, Armature Control
- 4.7 Losses and Efficiency

5. Three Phase Induction Machines **(7 hours)**

- 5.1 Three Phase Induction Motor
  - 5.1.1 Constructional Details and Types
  - 5.1.2 Operating Principle, Rotating Magnetic Field, Synchronous Speed, Slip, Induced EMF, Rotor Current and its frequency, Torque Equation
  - 5.1.3 Torque-Slip characteristics
- 5.2 Three Phase Induction Generator
  - 5.2.1 Working Principle, voltage build up in an Induction Generator
  - 5.2.2 Power Stages

6. Three Phase Synchronous Machines **(6 hours)**

- 6.1 Three Phase Synchronous Generator
  - 6.1.1 Constructional Details, Armature Windings, Types of Rotor, Exciter
  - 6.1.2 Working Principle
  - 6.1.3 EMF equation, distribution factor, pitch factor
  - 6.1.4 Armature Reaction and its effects
  - 6.1.5 Alternator with load and its phasor diagram
- 6.2 Three Phase Synchronous Motor
  - 6.2.1 Principle of operation
  - 6.2.2 Starting methods
  - 6.2.3 No load and Load operation, Phasor Diagram
  - 6.2.4 Effect of Excitation and power factor control

7. Fractional Kilowatt Motors **(6 hours)**

- 7.1 Single phase Induction Motors: Construction and Characteristics
- 7.2 Double Field Revolving Theory
- 7.3 Split phase Induction Motor
  - 7.3.1 Capacitors start and run motor

7.3.2 Reluctance start motor

7.4 Alternating Current Series motor and Universal motor

7.5 Special Purpose Machines: Stepper motor, Schrage motor and Servo motor

Practical:

1. Magnetic Circuits
   - To draw B-H curve for two different sample of Iron Core
   - Compare their relative permeability
2. Two Winding Transformers
   - To perform turn ratio test
   - To perform open circuit (OC) and short circuit (SC) test to determine equivalent circuit parameter of a transformer and hence to determine the regulation and efficiency at full load
3. DC Generator
   - To draw open circuit characteristic (OCC) of a DC shunt generator
   - To draw load characteristic of shunt generator
4. DC Motor
   - Speed control of DC Shunt motor by (a) armature control method (b) field control method
   - To observe the effect of increasing load on DC shunt motor's speed, armature current, and field current.
5. 3-phase Machines
   - To draw torque-speed characteristics and to observe the effect of rotor resistance on torque-speed characteristics of a 3-phase Induction Motor
   - To study load characteristics of synchronous generator with (a) resistive load (b) inductive load and (c) capacitive load
6. Fractional Kilowatt Motors
   - To study the effect of a capacitor on the starting and running of a single-phase induction motor
   - Reversing the direction of rotation of a single phase capacitor induct

References:

1. I.J. Nagrath & D.P.Kothari," Electrical Machines", Tata McGraw Hill
2. S. K. Bhattacharya, "Electrical Machines", Tata McGraw Hill.
3. B. L. Theraja and A. K. Theraja, "Electrical Technology (Vol-II)", S. Chand.
4. Husain Ashfaq ," Electrical Machines", Dhanpat Rai & Sons
5. A.E. Fitzgerald, C.Kingsley Jr and Stephen D. Umans,"Electric Machinery", Tata McGraw Hill.
6. B.R. Gupta & Vandana Singhal, "Fundamentals of Electrical Machines, New Age International.

7. P. S. Bhimbra, "Electrical Machines", Khanna Publishers
8. Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
9. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
10. Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" Oxford University Press.

MICROPROCESSORS
EX 551

Lecture : 3 | **Year : II**
Tutorial : 1 | **Part : II**
Practical : 3

Course Objective:

To familiarize students with architecture, programming, hardware and application of microprocessor

1. Introduction **(4 hours)**

1.1 Introduction and History of Microprocessors
1.2 Basic Block Diagram of a Computer
1.3 Organization of Microprocessor Based System
1.4 Bus Organization
1.5 Stored program Concept and Von Neumann Machine
1.6 Processing Cycle of a Stored Program Computer
1.7 Microinstructions and Hardwired/Microprogrammed Control Unit
1.8 Introduction to Register Transfer Language

2. Programming with 8085 Microprocessor **(10 hours)**

2.1 Internal Architecture and Features of 8085 microprocessor
2.2 Instruction Format and Data Format
2.3 Addressing Modes of 8085
2.4 Intel 8085 Instruction Set
2.5 Various Programs in 8085
   2.5.1 Simple Programs with Arithmetic and Logical Operations
   2.5.2 Conditions and Loops
   2.5.3 Array and Table Processing
   2.5.4 Decimal BCD Conversion
   2.5.5 Multiplication and Division

3. Programming with 8086 Microprocessor **(12 hours)**

3.1 Internal Architecture and Features of 8086 Microprocessor
   3.1.1 BIU and Components
   3.1.2 EU and Components
   3.1.3 EU and BIU Operations
   3.1.4 Segment and Offset Address
3.2 Addressing Modes of 8086

3.3 Assembly Language Programming
3.4 High Level versus Low Level Programming
3.5 Assembly Language Syntax
  3.5.1 Comments
  3.5.2 Reserved words
  3.5.3 Identifiers
  3.5.4 Statements
  3.5.5 Directives
  3.5.6 Operators
  3.5.7 Instructions
3.6 EXE and COM programs
3.7 Assembling, Linking and Executing
3.8 One Pass and Two Pass Assemblers
3.9 Keyboard and Video Services
3.10 Various Programs in 8086
  3.10.1 Simple Programs for Arithmetic, Logical, String Input/Output
  3.10.2 Conditions and Loops
  3.10.3 Array and String Processing
  3.10.4 Read and Display ASCII and Decimal Numbers
  3.10.5 Displaying Numbers in Binary and Hexadecimal Formats

4. Microprocessor System **(10 hours)**

4.1 Pin Configuration of 8085 and 8086 Microprocessors
4.2 Bus Structure
  4.2.1 Synchronous Bus
  4.2.2 Asynchronous Bus
  4.2.3 Read and Write Bus Timing of 8085 and 8086 Microprocessors
4.3 Memory Device Classification and Hierarchy
4.4 Interfacing I/O and Memory
  4.4.1 Address Decoding
  4.4.2 Unique and Non Unique Address Decoding
  4.4.3 I/O Mapped I/O and Memory Mapped I/O
  4.4.4 Serial and Parallel Interfaces
  4.4.5 I/O Address Decoding with NAND and Block Decoders (8085, 8086)
  4.4.6 Memory Address Decoding with NAND, Block and PROM Decoders (8085, 8086)
4.5 Parallel Interface
  4.5.1 Modes: Simple, Wait, Single Handshaking and Double Handshaking

- 4.5.2 Introduction to Programmable Peripheral Interface (PPI)
- 4.6 Serial Interface
  - 4.6.1 Synchronous and Asynchronous Transmission
  - 4.6.2 Serial Interface Standards: RS232, RS423, RS422, USB
  - 4.6.3 Introduction to USART
- 4.7 Introduction to Direct Memory Access (DMA) and DMA Controllers

5. Interrupt Operations **(5 hours)**

- 5.1 Polling versus Interrupt
- 5.2 Interrupt Processing Sequence
- 5.3 Interrupt Service Routine
- 5.4 Interrupt Processing in 8085
  - 5.4.1 Interrupt Pins and Priorities
  - 5.4.2 Using Programmable Interrupt Controllers (PIC)
  - 5.4.3 Interrupt Instructions
- 5.5 Interrupt Processing in 8086
  - 5.5.1 Interrupt Pins
  - 5.5.2 Interrupt Vector Table and its Organization
  - 5.5.3 Software and Hardware Interrupts
  - 5.5.4 Interrupt Priorities

6. Advanced Topics **(4 hours)**

- 6.1 Multiprocessing Systems
  - 6.1.1 Real and Pseudo-Parallelism
  - 6.1.2 Flynn's Classification
  - 6.1.3 Instruction Level, Thread Level and Process Level Parallelism
  - 6.1.4 Interprocess Communication, Resource Allocation and Deadlock
  - 6.1.5 Features of Typical Operating System
- 6.2 Different Microprocessor Architectures
  - 6.2.1 Register Based and Accumulator Based Architecture
  - 6.2.2 RISC and CISC Architectures
  - 6.2.3 Digital Signal Processors

Practical:

There will be aout 12 lab exercises to program 8085 and 8086 microprocessors.

References:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Application with 8085", Prentice Hall
2. Peter Abel, "IBM PC Assembly Language and Programming", Pearson Education Inc.
3. D. V. Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata McGraw Hill
4. John Uffenbeck, "Microcomputers and Microprocessors, The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting", Prentice Hall
5. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications", Prentice Hall
6. William Stalling, "Computer Organization and Architecture", Prentice Hall

DISCRETE STRUCTURE
CT 551

Lecture : 3	**Year : II**
Tutorial : 0	**Part : II**
Practical : 0	

Course Objectives:

To gain knowledge in discrete mathematics and finite state automata in an algorithmic approach and to gain fundamental and conceptual clarity in the area of Logic, Reasoning, Algorithms, Recurrence Relation, Graph Theory, and Theory of Automata

1. Logic, Induction and Reasoning **(12 hours)**

1.1 Proposition and Truth function
1.2 Propositional Logic
1.3 Expressing statements in Logic Propositional Logic
1.4 The predicate Logic
1.5 Validity
1.6 Informal Deduction in Predicate Logic
1.7 Rules of Inference and Proofs
1.8 Informal Proofs and Formal Proofs
1.9 Elementary Induction and Complete Induction
1.10 Methods of Tableaux
1.11 Consistency and Completeness of the System

2. Finite State Automata **(10 hours)**

2.1 Sequential Circuits and Finite state Machine
2.2 Finite State Automata
2.3 Language and Grammars
2.4 Non-deterministic Finite State Automata
2.5 Language and Automata
2.6 Regular Expression and its characteristics

3. Recurrence Relation **(8 hours)**

3.1 Recursive Definition of Sequences
3.2 Solution of Linear recurrence relations
3.3 Solution to Nonlinear Recurrence Relations
3.4 Application to Algorithm Analysis

4. Graph Theory **(15 hours)**

4.1 Undirected and Directed Graphs
4.2 Walk Paths, Circuits, Components
4.3 Connectedness Algorithm
4.4 Shortest Path Algorithm
4.5 Bipartite Graphs, Planar Graphs, Regular Graphs

4.6 Planarity Testing Algorithms
4.7 Eulerian Graph
4.8 Hamiltonian Graph
4.9 Tree as a Directed Graph
4.10 Binary Tree, Spanning Tree
4.11 Cutsets and Cutvertices
4.12 Network Flows, Maxflow and Mincut Theorem
4.13 Data Structures Representing Trees and Graphs in Computer
4.14 Network Application of Trees and Graphs
4.15 Concept of Graph Coloring

References:

1. Kenth Rosen, "Discrete Mathematical Structures with Applications to Computer Science", WCB/ McGraw Hill
2. G. Birkhoff, T.C. Bartee, "Modern Applied Algebra", CBS Publishers.
3. R. Johnsonbaugh, "Discrete Mathematics", Prentice Hall Inc.
4. G.Chartand, B.R.Oller Mann, "Applied and Algorithmic Graph Theory", McGraw Hill
5. Joe L. Mott, AbrahanKandel, and Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", Prentice-Hall of India