Year: I Part: II

S.N.	Code	Title	Exam	Theory		Practical		Total
			Type	Ass	Final	Ass	Final	
1	SH451	Engineering Mathematics II	T	20	80			100
2	EX 452	Microprocessor	B	20	80	50		150
3	CT 451	Object Oriented Programming	B	20	80	50		150
4	SH453	Engineering Chemistry	B	20	80	20	30	150
5	EE 460	Electric Circuits and Machines	B	20	80	50		150
6	ME453	Workshop Technology	B	10		40		50
	Total Marks							**750**

ENGINEERING MATHEMATICS II

SH 451

Lecture : 3 **Year : I**
Tutorial : 2 **Part : II**
Practical : 0

Course Objective:
To develop the skill of solving differential equations and to provide knowledge of vector algebra and calculus. To make students familiar with calculus of several variables and infinite series.

1. Calculus of Two or More Variables **(6 hours)**
- 1.1. Introduction: limit and continuity
- 1.2. Partial derivatives
  - 1.2.1. Homogeneous function, Euler's theorem for the function of two and three variables
  - 1.2.2. Total derivatives
- 1.3. Extreme of functions of two and three variables; Lagrange's Multiplier

2. Multiple Integrals **(6 hours)**
- 2.1. Introduction
- 2.2. Double integrals in Cartesian and polar form; change of order of integration
- 2.3. Triple integrals in Cartesian, cylindrical and spherical coordinates;
- 2.4. Area and volume by double and triple integrals

3. Three Dimensional Solid Geometry **(11 hours)**
- 3.1. The straight line; Symmetric and general form
- 3.2. Coplanar lines
- 3.3. Shortest distance
- 3.4. Sphere
- 3.5. Plane Section of a sphere by planes
- 3.6. Tangent Planes and lines to the spheres
- 3.7. Right circular cone
- 3.8. Right circular cylinder

4. Solution of Differential Equations in Series and Special Functions (9 hours)
- 4.1. Solution of differential equation by power series method
- 4.2. Legendre's equation
- 4.3. Legendre polynomial function; Properties and applications.
- 4.4. Bessel's equation
- 4.5. Bessel's function of first and second kind. Properties and applications

5. Vector Algebra and Calculus **(8 hours)**
- 5.1. Introduction

5.2. Two and three dimensional vectors
5.3. Scalar products and vector products
5.4. Reciprocal System of vectors
5.5. Application of vectors: Lines and planes
5.6. Scalar and vector fields
5.7. Derivatives – Velocity and acceleration
5.8. Directional derivatives

6. Infinite Series **(5 hours)**

6.1. Introduction
6.2. Series with positives terms
6.3. convergence and divergence
6.4. Alternating series. Absolute convergence
6.5. Radius and interval of convergence

References:

1. Erwin Kreyszig, "Advanced Engineering Mathematics ", John Wiley and Sons Inc.
2. Thomas, Finney, "Calculus and Analytical Geometry", Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, "Differential Calculus", Sukunda Pustak Bhandar,Nepal
4. M. B. Singh, B. C. Bajrachrya, "A Text Book of Vectors", Sukunda Pustak Bhandar,Nepal
5. M. B. Singh, S. P. Shrestha, "Applied Engineering Mathematics", RTU, Department of Engineering Science and Humanities.
6. G.D. Pant, G. S. Shrestha, "Integral Calculus and Differential Equations", Sunila Prakashan,Nepal
7. Y. R. Sthapit, B. C. Bajrachrya, "A Text Book of Three Dimensional Geometry", Sukunda Pustak Bhandar,Nepal
8. Santosh Man Maskey, "Calculus", Ratna Pustak Bhandar, Nepal

ENGINEERING CHEMISTRY

SH 453

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

Course Objective:

To develop the basic concepts of Physical Chemistry, Inorganic Chemistry and Organic Chemistry relevant to problems in engineering.

1. Electro-chemistry and Buffer **(6 hours)**

1.1 Electro-chemical cells
1.2 Electrode Potential and Standard Electrode Potential
1.3 Measurement of Electrode Potential
1.4 Nernst equation
1.5 EMF of Cell
1.6 Application of Electrochemical and Electrolytic cells
1.7 Electrochemical Series and its Application
1.8 Buffer: its type and mechanism
1.9 Henderson's equation for pH of buffer and related problems
1.10 Corrosion and its type
1.11 Factors influencing corrosion
1.12 Prevention of corrosion

2. Catalyst **(4 hours)**

2.1 Introduction
2.2 Action of Catalyst (Catalytic Promoters and Catalytic Poisons)
2.3 Characteristics of Catalyst
2.4 Types of Catalyst
2.5 Theories of Catalysis
2.6 Industrial Applications of Catalysts

3. Environmental Chemistry **(5 hours)**

3.1 Air Pollution
3.2 Air Pollutants i) gases SO_x,NO_x,CO,CO_2,O_3 and hydrocarbons ii)particulates dust, smoke and fly ash
3.3 Effects of Air Pollutants on human beings and their possible remedies
3.4 Ozone depletion and its photochemistry
3.5 Water Pollution (Ref of surface water and pound water)
3.6 Water Pollutants (Ref of surface water) their adverse effect and remedies
3.7 Soil pollution
3.8 Pollutants of soil their adverse effects and possible remedies

4. Engineering Polymers **(6 hours)**

4.1 Inorganic polymers
4.2 General properties of inorganic polymers
4.3 Polyphosphazines
4.4 Sulpher Based Polymers
4.5 Chalcogenide Glasses
4.6 Silicones
4.7 Organic Polymers
4.8 Types of Organic Polymers
4.9 Preparation and application of
i) Polyurethane ii) Polystyrene iii) Polyvinylchloride iv) Teflon
v) Nylon 6,6 and vi) Bakelite vii) Epoxy Resin viii) Fiber Reinforced Polymer
4.10 Concept of bio-degradable, non-biodegradable and conducting polymers

5. 3-d Transition elements and their applications **(5 hours)**

5.1 Introduction
5.2 Electronic Configuration
5.3 Variable oxidation states
5.4 Complex formation tendency
5.5 Color formation
5.6 Magnetic properties
5.7 Alloy formation
5.8 Applications of 3-d transition elements

6. Coordination Complexes **(5 hours)**

6.1 Introduction
6.2 Terms used in Coordination Complexes
6.3 Werner's Theory Coordination Complexes
6.4 Sidgwick's model and Sidgwick's effective atomic number rule
6.5 Nomenclature of coordination compounds (Neutral type, simple cation and complex anion and complex cation and simple anion type)
6.6 Valence Bond Theory of Complexes
6.7 Application of valence bond theory in the formation of
i) Tetrahedral Complexes
ii) Square planar Complexes and iii) Octahedral Complexes
6.8 Limitations of Valence Bond Theory
6.9 Applications of Coordination Complexes

7. Explosives **(3 hours)**

7.1 Introduction
7.2 Types of explosives: Primary, Low and High explosives
7.3 Preparation and application of TNT, TNG, Nitrocellulose and Plastic explosives

8. Lubricants and Paints **(3 hours)**

8.1 Introduction
8.2 Function of Lubricants
8.3 Classification of Lubricants (Oils, Greases and Solid)
8.4 Paints
8.5 Types of Paint
8.6 Application of Paints

9. Stereochemistry **(4 hours)**

9.1 Introduction
9.2 Geometrical Isomerism (Cis Trans Isomerism) Z and E concept of Geometrical Isomerism
9.3 Optical Isomerism with reference to two asymmetrical carbon center molecules
9.4 Terms Optical activity, Enantiomers, Diastereomers, Meso structures, Racemic mixture and Resolution

10. Reaction Mechanism in Organic reactions **(4 hours)**

10.1 Substitution reaction
10.2 Types of substitution reaction SN^1 and SN^2
10.3 Elimination reaction
10.4 Types of elimination reaction El and E2
10.5 Factors governing SN^1, SN^2, El and E2 reaction mechanism path

References:

1. Jain and Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.
2. Shashi Chawala, "A Text Book of Engineering Chemistry", Dhanpat Rai Publishing Co.
3. J. D. Lee, "A New Concise Inorganic Chemistry", Wiley India Pvt. Limited.
4. Marron and Prutton, "Principles of Physical Chemistry", S. Macmillan and Co. Ltd.
5. Bahl and Tuli, "Essential of Physical Chemistry", S. Chand and Co. Ltd.
6. Satya Prakash and Tuli, "Advanced Inorganic Chemistry Vol 1 and 2", S. Chand and Co. Ltd
7. Morrison and Boyd, "Organic chemistry"
8. Moti Kaji Sthapit, "Selected Topics in Physical Chemistry", Taleju Prakashan, Kathmandu.
9. Peavy, Rowe and Tchobanoglous, "Environmental Engineering", McGraw-Hill, New York.
10. R. K. Sharma, B. Panthi and Y. Gotame, "Textbook of Engineering Chemistry", Athrai Publication.

Practical:

1. Compare the alkalinity of different water samples by double indicator method 6 Periods

2. Determine the temporary and permanent hardness of water by EDTA Complexo-metric method 3 Periods
3. Determine residual and combined chlorine present in the chlorinated sample of water by Iodometric method 6 Periods
4. Prepare organic polymer nylon 6,6/ Bakelite in the laboratory 3 Periods
5. Determine the pH of different sample of buffer solution by universal indicator method 6 Periods
6. Prepare inorganic complex in the laboratory 3 Periods
7. Determine surface tension of the given detergent solution and compare its cleansing power with other detergent solutions 6 Periods
8. Construct an electrochemical cell in the laboratory and measure the electrode potential of it 3 Periods
9. Estimate the amount of iron present in the supplied sample of ferrous salt using standard potassium permanganate solution (redox titration) 6 Periods

WORKSHOP TECHNOLOGY

ME 453

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

Course Objective:

To impart knowledge and skill components in the field of basic workshop technology. To be familiar with different hand and machine tools required for manufacturing simple metal components and articles.

1. General Safety Considerations **(2 hours)**

1.1. Bench Tools
1.2. Machinist's Hammers
1.3. Screw Drivers
1.4. Punches
1.5. Chisels
1.6. Scrapers
1.7. Scribers
1.8. Files
1.9. Pliers and Cutters
1.10. Wrenches
1.11. Hacksaw
1.12. Bench Vise
1.13. Hand drill
1.14. Taps and Dies
1.15. Hand Shears
1.16. Rules, Tapes and Squares
1.17. Soldering Iron
1.18. Rivets

2. Hand Working Operations **(1 hours)**

2.1. Sawing
2.2. Filing
2.3. Threading
2.4. Scribing
2.5. Shearing
2.6. Soldering
2.7. Riveting

3. Measuring and Gauging **(1 hours)**

3.1. Introduction
3.2. Semi – Precision Tools – Calipers, depth Gauge, Feeler Gauge
3.3 Precision Tools – Micrometers, Vernier Calipers, Vernier Height Gauge,

Telescopic Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate

4. Drills and Drilling Processes **(1 hours)**

4.1 Introduction
4.2 Types of Drill Presses
4.3 Work Holding Devices and Accessories
4.4 Cutting Tools
4.5 Geometry of Drill Bits
4.6 Grinding of Drill Bits
4.7 Operations – Drilling, Counter - boring, Counter - sinking, Reaming, Honning, Lapping
4.8 Cutting Speeds
4.9 Drilling Safety

5. Machine Tools **(4 hours)**

5.1. General Safety Considerations
5.2. Engine Lathes
- 5.2.1 Introduction
- 5.2.2 Physical Construction
- 5.2.3 Types of Lathe
- 5.2.4 Lathe Operations – Facing, Turning, Threading

5.3 Shapers
- 5.3.5 Introduction
- 5.3.6 Types of Shapers
- 5.3.7 Physical Construction
- 5.3.8 General Applications

5.4 Milling Machines
- 5.4.1 Introduction
- 5.4.2 Types of Milling Machines
- 5.4.3 Physical Construction
- 5.4.4 Milling Cutters – Plain, Side, Angle, End, Form
- 5.4.5 Milling Operations – Plain, Side, Angular, Gang, End, Form, Keyway
- 5.4.6 Work Holding Devices
- 5.4.7 Cutter Holding Devices

5.5 Grinding Machines
- 5.5.1 Abrasives, Bonds, Grinding Wheels
- 5.5.2 Rough Grinders – Portable Grinders, Bench Grinders, Swing Frame Grinders, Abrasive Belt Grinders
- 5.5.3 Precision Grinders – Cylindrical Grinders, Surface Grinders

6. Material Properties **(1 hours)**

6.1. Tool materials – Low, medium and high carbon steels; Hot and cold rolled steels; Alloy steels; Carbide and Ceramic materials

6.2. Heat treating methods for steels – Annealing, Tempering, Normalizing, Hardening and Quenching
6.3. Non – ferrous metals – Brass, Bronze, Aluminum – Comparative Properties

7. Sheet Metal Works **(1 hours)**

7.1. Introduction
7.2. Sheet Metal Tools
7.3. Marking and Layout
7.4. Operations – Bending, Cutting, Rolling

8. Foundry Practice **(1 hours)**

8.1. Introduction
8.2. Pattern Making
8.3. Foundry Tools
8.4. Core Making
8.5. Melting Furnace – Cupola
8.6. Sand Casting Process

9. Forging Practice **(1 hours)**

9.1. Introduction
9.2. Forging Tools
9.3. Operations – Upsetting, Drawing, Cutting, Bending, Punching
9.4. Forging Presses and Hammers
9.5. Advantages and Limitations

10. Metal Joining **(2 hours)**

10.1 Safety Considerations
10.2 Introduction
10.3 Soldering
10.4 Brazing
10.5 Welding – Gas Welding, Arc Welding, Resistance Welding, Tungsten Inert Gas Welding (TIG), Metal Inert Gas Welding (MIG)

Practical:

1. Bench Tools and hand operations: Measuring, Marking, Layout, Cutting, Filling, Drilling, Tapping, Assembly
2. Bench Tools and hand operations: (Contd.)
3. Drilling machines
4. Measuring and Gauging Instruments
5. Engine lathe: Basic operations such as Plain turning, facing, cutting off, knurling.
6. Engine lathe: Taper turning, drilling and boring
7. Basic Shaper Operations
8. Milling Machines

9. Grinding Machines
10. Sheet Metal works
11. Foundry Practice
12. Forging Practice
13. Electric Arc Welding
14. Gas Welding

References:

1. Anderson and E. E. Tatro, "Shop Theory", JMcGraw – Hill.
2. O. D. Lascoe, C. A. Nelson and H. W. Porter, "Machine shop operations and setups", American Technical society.
3. "Machine shop Practice – Vol. I" , Industrial Press, New York.
4. "Machine shop Practice – Vol. I" , Industrial Press, New York.
5. Ryerson, " Technology of Machine Tools", Mc Graw Hill.
6. Oberg, Jones and Horton, "Machinery's Handbook", Industrial Press, New York.
7. S. K. Hajra Choudhury and A. K. Hajra Choudhury, "Elements of Workshop Technology - Vol. I (Manufacturing Processes)", Media Promoters and Publishers Pvt. Ltd. , Bombay, INDIA.
8. S. K. Hajra Choudhury, S. K. Bose and A. K. Hajra Choudhury , "Elements of Workshop Technology - Vol. II: (Machine Tools)" , Media Promoters and Publishers Pvt. Ltd. , Bombay, INDIA.
9. Prof. B. S. Raghuwanshi, "A Course in Workshop Technology - Vol. I" , Dhanpat Rai and Co. (P) Ltd, Delhi, INDIA.
10. Prof. B. S. Raghuwanshi, "A Course in Workshop Technology - Vol. II" , Dhanpat Rai and Co. (P) Ltd, Delhi, INDIA.
11. H. S. Bawa, "Workshop Technology - Vol. I", Tata Mc – Graw Hill publishing company Limited, New Delhi, INDIA,
12. H. S. Bawa, "Workshop Technology - Vol. II" , Tata Mc – Graw Hill publishing company Limited, New Delhi, INDIA,
13. R. S. Khurmi and J. K. Gupta, "A text book of Workshop Technology", S. Chand and Company Ltd, New Delhi. INDIA

OBJECT ORIENTED PROGRAMMING

CT 501

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

Course Objective:

To familiarize students with the C++ programming language and use the language to develop object oriented programs

1. Introduction to Object Oriented Programming **(3 hours)**

- 1.1 Issues with Procedure Oriented Programming
- 1.2 Basic of Object Oriented Programming (OOP)
- 1.3 Procedure Oriented versus Object Oriented Programming
- 1.4 Concept of Object Oriented Programming
  - 1.4.1 Object
  - 1.4.2 Class
  - 1.4.3 Abstraction
  - 1.4.4 Encapsulation
  - 1.4.5 Inheritance
  - 1.4.6 Polymorphism
- 1.5 Example of Some Object Oriented Languages
- 1.6 Advantages and Disadvantages of OOP

2. Introduction to C++ **(2 hours)**

- 2.1 The Need of C++
- 2.2 Features of C++
- 2.3 C++ Versus C
- 2.4 History of C++

3. C++ Language Constructs **(6 hours)**

- 3.1 C++ Program Structure
- 3.2 Character Set and Tokens
  - 3.2.1 Keywords
  - 3.2.2 Identifiers
  - 3.2.3 Literals
  - 3.2.4 Operators and Punctuators
- 3.3 Variable Declaration and Expression
- 3.4 Statements
- 3.5 Data Type
- 3.6 Type Conversion and Promotion Rules
- 3.7 Preprocessor Directives
- 3.8 Namespace
- 3.9 User Defined Constant const
- 3.10 Input/Output Streams and Manipulators

- 3.11 Dynamic Memory Allocation with new and delete
- 3.12 Condition and Looping
- 3.13 Functions
  - 3.13.1 Function Syntax
  - 3.13.2 Function Overloading
  - 3.13.3 Inline Functions
  - 3.13.4 Default Argument
  - 3.13.5 Pass by Reference
  - 3.13.6 Return by Reference
- 3.14 Array, Pointer and String
- 3.15 Structure, Union and Enumeration

4. Objects and Classes **(6 hours)**

- 4.1 C++ Classes
- 4.2 Access Specifiers
- 4.3 Objects and the Member Access
- 4.4 Defining Member Function
- 4.5 Constructor
  - 4.5.1 Default Constructor
  - 4.5.2 Parameterized Constructor
  - 4.5.3 Copy Constructor
- 4.6 Destructors
- 4.7 Object as Function Arguments and Return Type
- 4.8 Array of Objects
- 4.9 Pointer to Objects and Member Access
- 4.10 Dynamic Memory Allocation for Objects and Object Array
- 4.11 this Pointer
- 4.12 static Data Member and static Function
- 4.13 Constant Member Functions and Constant Objects
- 4.14 Friend Function and Friend Classes

5. Operator Overloading **(5 hours)**

- 5.1 Overloadable Operators
- 5.2 Syntax of Operator Overloading
- 5.3 Rules of Operator Overloading
- 5.4 Unary Operator Overloading
- 5.5 Binary Operator Overloading
- 5.6 Operator Overloading with Member and Non Member Functions
- 5.7 Data Conversion: Basic – User Defined and User Defined – User Defined
- 5.8 Explicit Constructors

6. Inheritance **(5 hours)**

- 6.1 Base and Derived Class
- 6.2 protected Access Specifier
- 6.3 Derived Class Declaration
- 6.4 Member Function Overriding

6.5 Forms of Inheritance: single, multiple, multilevel, hierarchical, hybrid, multipath
6.6 Multipath Inheritance and Virtual Base Class
6.7 Constructor Invocation in Single and Multiple Inheritances
6.8 Destructor in Single and Multiple Inheritances

7. Polymorphism and Dynamic Binding **(4 hours)**

7.1 Need of Virtual Function
7.2 Pointer to Derived Class
7.3 Definition of Virtual Functions
7.4 Array of Pointers to Base Class
7.5 Pure Virtual functions and Abstract Class
7.6 Virtual Destructor
7.7 reinterpret_cast Operator
7.8 Run-Time Type Information
7.8.1 dynamic_cast Operator
7.8.2 typeid Operator

8. Stream Computation for Console and File Input /Output **(5 hours)**

8.1 Stream Class Hierarchy for Console Input /Output
8.2 Testing Stream Errors
8.3 Unformatted Input /Output
8.4 Formatted Input /Output with ios Member functions and Flags
8.5 Formatting with Manipulators
8.6 Stream Operator Overloading
8.7 File Input/output with Streams
8.8 File Stream Class Hierarchy
8.9 Opening and Closing files
8.10 Read/Write from File
8.11 File Access Pointers and their Manipulators
8.12 Sequential and Random Access to File
8.13 Testing Errors during File Operations

9. Templates **(5 hours)**

9.1 Function Template
9.2 Overloading Function Template
9.2.1 Overloading with Functions
9.2.2 Overloading with other Template
9.3 Class Template
9.3.1 Function Definition of Class Template
9.3.2 Non-Template Type Arguments
9.3.3 Default Arguments with Class Template
9.4 Derived Class Template
9.5 Introduction to Standard Template Library
9.5.1 Containers
9.5.2 Algorithms
9.5.3 Iterators

10. Exception Handling **(4 hours)**

10.1 Error Handling
10.2 Exception Handling Constructs (try, catch, throw)
10.3 Advantage over Conventional Error Handling
10.4 Multiple Exception Handling
10.5 Rethrowing Exception
10.6 Catching All Exceptions
10.7 Exception with Arguments
10.8 Exceptions Specification for Function
10.9 Handling Uncaught and Unexpected Exceptions

Practical:

There will be about 12 lab exercises covering the course. At the end of the course students must complete a programming project on object oriented programming with C++.

References :

1. Robert Lafore, "Object Oriented Programming in C++", Sams Publication
2. DayaSagarBaral and DiwakarBaral, "The Secrets of Object Oriented Programming in C++", BhundipuranPrakasan
3. Harvey M. Deitel and Paul J. Deitel, "C++ How to Program", Pearson Education Inc.
4. D. S. Malik, "C++ Programming", Thomson Course Technology
5. Herbert Schildt, "C++: The Complete Reference", Tata McGraw Hill

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 about 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

ELECTRIC CIRCUITS AND MACHINES

EE .....

Lecture 4 Year: 1 Tutorial: 1 Part : 11 Practical : 3/2

Course Objectives:

To continue work in Basic Electrical Engineering including transient analysis and electric machines.

1. Network Analysis of AC circuit & dependent sources hours)
   - 1.1 Mesh Analysis
   - 1.2 Nodal Analysis
   - 1.3 Series & parallel resonance in RLC circuits
     - 1.3.1 Impedance and phase angle of series Resonant Circuit
     - 1.3.2 Voltage and current in series resonant circuit
     - 1.3.3 Band width of the RLC circuit.
     - 1.3.4 High-Q and Low-Q circuits

2. Initial Conditions (2 hours)
   - 2.1 Characteristics of various network elements
   - 2.2 Initial value of derivatives
   - 2.3 Procedure for evaluating initial conditions
   - 2.4 Initial condition in the case of R-L-C network

3. Transient analysis in RLC circuit by direct solution (10 hours)
   - 3.1 Introduction
   - 3.2 First order differential equation
   - 3.3 Higher order homogeneous and non-homogeneous differential equations
   - 3.4 Particular integral by method of undetermined coefficients
   - 3.5 Response of R-L circuit with DC, Sinusoidal and Exponential excitations
   - 3.6 Response of R-C circuit with DC, Sinusoidal and Exponential excitations
   - 3.7 Response of series R-L-C circuit with DC, Sinusoidal and Exponential excitations

4. Transient analysis in RLC circuit by Laplace Transform (8 hours)
   - 4.1 Introduction
   - 4.2 The Laplace Transformation
   - 4.3 Important properties of Laplace transformation
   - 4.4 Use of Partial Fraction expansion in analysis using Laplace Transformations
   - 4.5 Heaviside's partial fraction expansion theorem
   - 4.6 Response of R-L circuit with DC, Sinusoidal and Exponential excitations
   - 4.7 Response of R-C circuit with DC, Sinusoidal and Exponential excitations
   - 4.8 Response of series R-L-C circuit with DC, Sinusoidal and Exponential excitations
   - 4.9 Transfer functions Poles and Zeros of Networks

5. Two-port Parameter of Networks (6 Hours)

5.1 Definition of two-port networks
5.2 Short circuit admittance parameters
5.3 eircuits impedance parameters
5.4 Transmission Short circuit admittance parameters
5.5 Hybrid parameters
5.6 Relationship and transformations between sets of parameters
5.7 Application to filters
5.8 Applications to transmission lines
5.9 Interconnection of two-port network (Cascade, series, parallel)

6. Magnetic Circuits and Induction (4hours)

6.1 Magnetic Circuits
6.2 Ohm's Law for Magnetic Circuits
6.3 Series and Parallel magnetic circuits
6.4 Core with air gap
6.5 B-H relationship (Magnetization Characteristics)
6.6 Hysteresis with DC and AC excitation
6.7 Hysteresis Loss and Eddy Current Loss
6.8 Faraday's Law of Electromagnetic Induction, Statically and Dynamically Induced EMF
6.9 Force on Current Carrying Conductor

7. Transformer (8 hours)

7.1 Constructional Details, recent trends
7.2 Working principle and EMF equation
7.3 Ideal Transformer
7.4 4No load and load Operation
7.5 Operation of Transformer with load
7.6 Equivalent Circuits and Phasor Diagram
7.7 Tests: Polarity Test, Open Circuit test, Short Circuit test and Equivalent Circuit Parameters
7.8 Voltage Regulation
7.9 Losses in a transformer
7.10 Auto transformer: construction, working principle and Cu saving

8. DC Machines (8 hours)

8.1 Constructional Details and Armature Winding
8.2 Working principle of DC generator and EMF equation
8.3 Working principle of DC motor and Torque equation

8.4 Back EMF

8.5 Method of excitation, Types of DC motor

8.6 Performance Characteristics of D.C. motors

8.7 Starting of D.C. Motors: 3 point and 4 point starters

8.8 Speed control of D.C. motors: Field Control, Armature Control

8.9 Losses and Efficiency

9. AC Motors (8 hours)

9.1 Three phase induction motor- construction, operating principle and toraue speed characteristics

9.2 Single phase Induction Motors: Construction and Characteristics

9.3 Double Field Revolving Theory

9.4 Split phase Induction Motor

9.3.1 Capacitors start and run motor

9.3.2 Reluctance start motor

9.5 Alternating Current Series motor and Universal motor

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

Practical:

1. Resonance in RLC series circuit - measurement of resonant frequency

2. Transient Response in first Order System passive circuits - measure step and impulse response of RL and RC circuit using oscilloscope - relate time response to analytical transfer functions calculations

3. Transient Response in Second Order System passive circuits - measure step and impulse response of RLC series and parallel circuits using oscilloscope - relate time response to transfer functions and pole-zero configuration

4. 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

5. 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.

6. Single Phase AC 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

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