BACHELOR
IN
CIVIL ENGINEERING

Year : I **Part : I**

Teaching Schedule								Examination Scheme							
								Theory			Practical				
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assessment Marks	Final		Total	Remark
									Duration hours	Marks		Duration hours	Marks		
1	SH 101	Engineering Mathematics I	3	3	2	-	5	40	3	60	-	-	-	100	
2	SH 103	Engineering Chemistry	3	3	1	3	7	40	3	60	25	-	-	125	
3	CT 101	Computer Programming	3	3	1	3	7	40	3	60	50	-	-	150	
4	EE 103	Basic Electrical and Electronics Engineering	3	3	1	1.5	5.5	40	3	60	25	-	-	125	
5	CE 101	Engineering Mechanics	4	4	2	-	6	40	3	60	-	-	-	100	
6	CE 102	Engineering Geology I	2	2	-	1	3	20	1.5	30	25	-	-	75	
7	CE 103	Civil Engineering Materials	2	2	-	1	3	20	1.5	30	25	-	-	75	
		Total	**20**	**20**	**7**	**9.5**	**36.5**	**240**	**-**	**360**	**150**	**-**	**-**	**750**	

Year : I **Part : II**

Teaching Schedule								Examination Scheme							
								Theory			Practical				
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assessment Marks	Final		Total	Remark
									Duration hours	Marks		Duration hours	Marks		
1	SH 151	Engineering Mathematics II	3	3	2	-	5	40	3	60	-	-	-	100	
2	SH 152	Engineering Physics	4	4	1	2	7	40	3	60	25	-	-	125	
3	ME 158	Engineering Drawing	2	2	-	4	6	20	3	30	50	-	-	100	
4	CE 151	Strength of Materials	3	3	1	1	5	40	3	60	25	-	-	125	
5	CE 152	Engineering Geology II	2	2	-	1	3	20	1.5	30	25	-	-	75	
6	CE 153	Engineering Survey I	3	3	1	4	8	40	3	60	50	-	-	150	
		Total	**17**	**17**	**5**	**12**	**34**	**200**	**-**	**300**	**175**	**-**	**-**	**675**	

ENGINEERING MATHEMATICS I

SH 101

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

Course Objectives:
To equip the students with the essential mathematical skills and techniques that are relevant to the engineering fields and enable them to solve engineering problems using mathematical methods.

1 Derivatives and its Applications (10 hours)

1.1 Review of derivative and differentiability, mean value theorems with interpretations
1.2 Indeterminate forms, types and their real life examples, L-Hospital's Rule
1.3 Power series of single valued functions
  1.3.1 Taylor's series
  1.3.2 Maclaurin's series
1.4 Asymptotes to Cartesian and Polar curves
1.5 Pedal equation to Cartesian and Polar curves
1.6 Curvature and radius of curvature for Cartesian curves

2 Antiderivatives and its Applications (11 hours)

2.1 Review of definite and indefinite integrals
2.2 Differentiation under integral sign
2.3 Improper integrals
2.4 Application of Beta and Gamma functions
2.5 Area, arc length, volume and surface of revolution in plane for Cartesian curves
2.6 Centroid and moment of inertia under area of curve

3 Ordinary Differential Equations and its Applications (10 hours)

3.1 Review of: Order, degree, solution of first order first degree differential equations by variable separation method and solution of homogeneous equations.
3.2 Linear differential equation and equations reducible to linear differential equation of first order Bernoulli’s equation, modeling electric circuit
3.3 First order and higher degree differential equations; Clairaut’s form

3.4 Linear second order differential equations with constant coefficient and variable coefficients reducible to constant coefficients, Cauchy's equations and modeling mass spring system

3.5 Application in physical sciences and engineering

4 Plane Analytic Geometry (4 hours)

4.1 Transformation of coordinates: Translation and Rotation

4.2 Equation of conic in Cartesian and polar form, identification of conics

5 Three dimensional geometry (10 hours)

5.1 The Straight line: symmetrical and general form

5.2 Coplanar lines

5.3 Shortest Distance

5.4 Sphere: General equation, plane section by planes, tangent planes

5.5 Introduction to right circular cone and right circular cylinder

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Derivatives and its Applications
2. Antiderivatives and its Applications
3. Ordinary Differential Equations and its Applications
4. Plane Analytic Geometry
5. Three dimensional geometry

Reference

1. Jeffery A., (2001), Advanced Engineering Mathematics (1st ed.), Academic Press.
2. O'Neill, P.V., (2003), Advanced Engineering Mathematics (5th ed.), Thomson Learning.
3. Kreyszig , A. (1993), Advanced engineering Mathematics (7th ed.), John Wiley & Sons.
4. Sastry S.S. (2008), Engineering Mathematics Volume I and II (4th ed.). PHI India.
5. Wylie C. and Barrett L.(1995), Advanced Engineering Mathematics (6th ed.), McGraw-Hill College.
6. Thomas, T. and Finny, R. (1984), Calculus and Analytic Geometry (6th ed.), Addison-Wesley.

ENGINEERING CHEMISTRY

SH 103

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

Course Objectives:
To develop the basic concepts of physical chemistry, inorganic chemistry, analytical chemistry, environmental chemistry, green & sustainable chemistry, nano chemistry, polymer chemistry and organic chemistry relevant to the different disciplines of engineering.

1 Electrochemistry and Buffer (8 hours)

- 1.1 Electrochemistry
  - 1.1.1 Introduction
  - 1.1.2 EMF of galvanic cell, Nernst equation
  - 1.1.3 Polarization and Overpotential
  - 1.1.4 Butler-Volmer equation and Tafel plots
- 1.2 Electrode processes and mechanisms
  - 1.2.1 Charge transfer processes at electrodes
  - 1.2.2 Mass transfer and diffusion in electrochemical systems
- 1.3 Industrial and applied electrochemistry
  - 1.3.1 Batteries: Lead acid and lithium ion
  - 1.3.2 Solar-photovoltaic cell, fuel cell
  - 1.3.3 Corrosion
- 1.4 Buffer, buffer range, buffer capacity and buffer solution and its applications

2 Catalyst and Catalysis (4 hours)

- 2.1 Definition and types
- 2.2 Design and criteria
  - 2.2.1 Structure-activity relationships
  - 2.2.2 Selection criteria of catalyst
- 2.3 Photocatalysis and electrocatalysis
- 2.4 Catalysis for energy and environmental applications
  - 2.4.1 Catalytic conversion of fossil fuels
  - 2.4.2 Renewable energy catalysts
  - 2.4.3 Catalyst for pollution control

3 Analytical Techniques and their Applications (6 hours)

3.1 Chromatography
3.2 Mass spectroscopy
3.3 X – ray diffraction (XRD)
3.4 UV – visible spectroscopy
3.5 Infrared – spectroscopy (IR)
3.6 Nuclear magnetic resonance spectroscopy (NMR)

4 Metal Complexes, Rare Earth Elements and Metal alloys (6 hours)

4.1 Complexes
  4.1.1 Introduction and Werner's theory
  4.1.2 Geometry of complex by VBT and its applications
  4.1.3 Crystal Field Theory: Principle and applications
4.2 Rare earth elements: Introduction and applications
4.3 Metallic alloys and applications

5 Sustainable Chemistry (7 hours)

5.1 Green chemistry: Introduction and principles
5.2 Water chemistry
  5.2.1 Importance of water quality standards
  5.2.2 Degree of hardness, scale formation in boiler and softening of hard water
  5.2.3 Water pollution with reference to turbidity, COD, BOD, heavy metals, radioactive substances, and plastic
  5.2.4 Industrial wastewater and its treatment
5.3 Air pollution
  5.3.1 Particulate matter, SOx, NOx, GHGs, VOCs, their impacts and remedies
5.4 Waste management
  5.4.1 Segregation and management of solid waste
  5.4.2 Management of biodegradable waste into energy
  5.4.3 E-waste and its management

6 Nanoscience and Nanotechnology (3 hours)

6.1 Introduction and types of nano materials (0-, 1-, 2-, and 3- dimensional)
6.2 Nanoparticles, Nanofibers, Nanowires, Carbon nanotubes, graphene, Mxene, quantum dots, and their uses
6.3 Preparation of nanomaterials

7 Engineering Materials (7 hours)

7.1 Polymers
- 7.1.1 Natural and synthetic, organic and inorganic, conducting and non-conducting
- 7.1.2 Types of polymerizations: Addition and condensation polymerization
- 7.1.3 Preparation and applications of – Epoxy resin, polyurethane, Kevlar, polycarbonate, polymethyl methacrylate, polyacrylonitrile, silicones; phosphorus based polymer, Sulphur based polymer
- 7.1.4 Conducting polymers: Synthesis and application
- 7.1.5 Composite: Fiber reinforced polymer
- 7.1.6 Natural polymers: cellulose, chitin, chitosan, collagen

7.2 Cement: Hydration and setting chemistry of cement

8 Explosives, Lubricants and Paints (4 hours)

8.1 Explosives
- 8.1.1 Types of explosives: Primary, low and high explosives
- 8.1.2 Preparation and applications of TNT, TNG, Nitrocellulose and Plastic explosives

8.2 Lubricants: Introduction, function and classification

8.3 Paints
- 8.3.1 Introduction, requisites, types and applications
- 8.3.2 Environmental and health impact

Laboratory

1. Determine of total, temporary and permanent hardness of water sample using complexometric titration.
2. Determine the alkalinity of water sample A and B by double indicator titration.
3. Estimate the amount of residual chlorine in water by iodometric titration.
4. Prepare the standard buffer solution (acidic or basic) and measure the approximate pH of given unknown solution by using Universal Indicator.
5. Compare the cleansing power of two sample of detergents by determining the reduction they cause in surface tension of water.
6. Construct Daniell cell and study the variation of cell potential with concentration.
7. To separate the pigments through the process of paper / thin layer chromatography.
8. Determination of total iron in ground water using spectrophotometer technique.
9. Determination of amount of copper and iron in a given mixture solution by K2Cr2O7 titration.
10. To prepare Cross – linked polymer by condensation polymerization method.
11. Standardize Potassium Permanganate Solution and use it to estimate the amount of Iron and determine the Percentage purity in the sample of Ferrous salt Solution.
12. Prepare Ni-DMG Complex and to estimate the amount of Nickel in it.

Reference

1. S.H. Maron and C. Prutton, Principles of Physical Chemistry, 4th Edition, Oxford and IBH Pub. Co., 1992.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, John Wiley and sons, Inc., 2007.
3. R.D. Madan & Satya Prakash, Inorganic Chemistry, S. Chand & Company Ltd., 1994.
4. S. Bahl, G.D. Tuli & A. Bahl, Essential of Physical Chemistry, Revised Multicolor Edition, S. Chand & Co. Ltd., New Delhi, 2009.
5. A.K. Bhagi & G.R.T. Morrison & R.N. Boyd, Organic Chemistry, 6th and 7th Edition, Prentice – Hall of India Pvt. Ltd., 2008.
6. R.T. Morrison & R.N. Boyd, Organic Chemistry, 6th and 7th Edition, Prentice – Hall of India Pvt. Ltd., 2008.
7. Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education 2008.
8. B.S. Murthy, P. Shankar, Baldev R, B. B. Rath & James Murday, Textbook of Nanoscience and Nanotechnology, Series in Metallurgy and Materials Science, Baldev Raj (Ed.), Universities Press Private Hyderabad, India, 2012.. Chatwal, Environmental Chemistry, Himalaya Publishing House, Mumbai.

COMPUTER PROGRAMMING

CT 101

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

Course Objectives:

The primary goal of this course is to provide students with a solid foundation in the principles of programming and to impart practical skills in the C programming language. This course ensures that students comprehend the fundamental concepts of variables, data types, control structures, and functions within the context of C. Advanced topics such as pointers, structures, file handling and the Standard C Library are explored to broaden students' programming capabilities. Also, through project-based assessments and evaluations, students apply their knowledge to real-world scenarios, fostering creativity and project development skills.

1 Introduction to Computer Programming (3 hours)

1.1 Definition of a computer program and programming language
1.2 Types and Generations of Programming Languages
1.3 Problem-Solving using a Computer
  1.3.1 Problem Analysis
  1.3.2 Algorithm and Flowchart
  1.3.3 Programming
  1.3.4 Compilation, Linking and Execution
  1.3.5 Debugging and Testing
  1.3.6 Documentation

2 Overview of C Programming (3 hours)

2.1 Introduction to C programming
2.2 History and Importance of C
2.3 C Headers and Library Functions
2.4 Basic Structure of a C Program
2.5 Preprocessor Directives
2.6 Tokens in C (Character set, Keywords and Identifiers)
2.7 Type Casting (Implicit and Explicit)
2.8 Data Types, Variables and Constants
2.9 Compiler and IDE for C Programming

3 Operators and Expressions (4 hours)

- 3.1 Introduction to Operators and Expressions
- 3.2 Arithmetic, Relational and Logical Operators
- 3.3 Assignment, Increment and Decrement Operators
- 3.4 Conditional, Bitwise and Special Operators
- 3.5 Comma Operator, size of Operator
- 3.6 Evaluation and Type Conversion in Expressions
- 3.7 Operator Precedence and Associativity

4 Input and Output (3 hours)

- 4.1 Introduction to data I/O in C
- 4.2 Unformatted I/O
  - 4.2.1 Character I/O
  - 4.2.2 String I/O
- 4.3 Formatted I/O
  - 4.3.1 Control String (flags, field width, precision, and specifier)
  - 4.3.2 Formatted I/O (scanf(), printf())

5 Control Structures (8 hours)

- 5.1 Introduction to Simple and Compound Statement
- 5.2 Sequential Statement
- 5.3 Branching Statement
  - 5.3.1 Simple if Statement
  - 5.3.2 if-else Statement
  - 5.3.3 Nested if-else Statement
  - 5.3.4 else-if Ladder
  - 5.3.5 switch Statement
  - 5.3.6 go to statement
- 5.4 Looping Statement
  - 5.4.1 for loop
  - 5.4.2 while loop
  - 5.4.3 do while
  - 5.4.4 Nested loop
- 5.5 Loop Interruption
  - 5.5.1 break
  - 5.5.2 continue

6 Array and Pointer (7 hours)

6.1 Introduction to an Array
6.2 One-dimensional Array
6.3 Two-dimensional Array
6.4 Multidimensional Array
6.5 Introduction to String
6.6 String Handling Functions
6.7 Definition of a Pointer
6.8 Pointer Declaration
6.9 Pointer Arithmetic
6.10 Relationship between Pointer and Arrays

7 User-defined Functions (6 hours)

7.1 Introduction to Function
7.2 Advantages of Function
7.3 Elements of User-defined Function
  7.3.1 Function Definition
  7.3.2 Function Prototype
  7.3.3 Function Parameters
7.4 Storage Class
7.5 Scope Rules
7.6 Category of Functions
  7.6.1 Functions with no arguments and no return values
  7.6.2 Functions with arguments and no return values
  7.6.3 Functions with arguments and return values
  7.6.4 Functions with no arguments and return values
7.7 Recursive functions
7.8 Function Call by Values and Reference
7.9 Passing Array and String to Function

8 Structures (5 hours)

8.1 Defining a Structure
8.2 Declaring and Accessing Structure Elements
8.3 Initializing Structure
8.4 Array of Structure
8.5 Array as member to Structure
8.6 Pointer as member to Structure
8.7 Structure as a member to Structure
8.8 Passing and Returning Structures to/from Function

9 File management (4 hours)

- 9.1 Introduction
- 9.2 Binary and Text File in C
- 9.3 File Opening Modes
- 9.4 Defining, Opening and Closing File
- 9.5 Input-output operations on files
  - 9.5.1 Character I/O (fputc(), fgetc())
  - 9.5.2 String I/O (fgets(), fputs())
  - 9.5.3 Formatted I/O (fscanf(), fprintf())
  - 9.5.4 Record I/O (fwrite(), fread())
- 9.6 Overview of Random File Access
- 9.7 Error handling

10 Recent Trends in Programming (2 hours)

- 10.1 Introduction to Object Oriented Programming (OOP)
- 10.2 Definitions of Class, Method and Object in OOP
- 10.3 Difference between Procedure Oriented and OOP
- 10.4 Overview of other High Level Programming Languages

Laboratory

1. Lab 1: Introduction and Demonstrations of projects written in C
2. Lab 2: Formatted and Unformatted Input/output in C
3. Lab 3: Branching in Control Structure
4. Lab 4: Looping in Control Structure
5. Lab 5: Array in C
6. Lab 6: String in C
7. Lab 7: Pointers in C
8. Lab 8: User Defined functions in C
9. Lab 9: Structure in C
10. Lab 10: File handling in C
11. Group project on C maximum 4 students in a group at the end of the course.

Reference

1. Robert Lafore, “C Programming Using Turbo C++”, SAMS publication
2. E. Balagurusamy, “Programming in Ansi C”, McGraw Hill Education
3. Bryons S. Gotterfried, “Programming with C”, TMH ….

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

EE 103

Lecture : 3 **Year : I**
Tutorial : 1 **Part : I**
Practical : 1.5

Course Objectives:
The course aims to provide a comprehensive understanding of electrical engineering basics, encompassing circuits, components, and related laws, emphasizing safety in installations. It also seeks to familiarize students with electrical machines, semiconductor devices, and initiate them into applications in digital electronics.

1 Fundamentals of Electrical and Electronics Circuits (12 hours)

- 1.1 Current and Potential
- 1.2 Circuit Components: Source, Conductor, Resistor, Inductor, Capacitor
- 1.3 Ohms Law
- 1.4 Series and Parallel Circuits
- 1.5 Kirchhoff's Law and its application
  - 1.5.1 Nodal Analysis
  - 1.5.2 Mesh Analysis
- 1.6 Introduction to AC Circuits and Parameters
  - 1.6.1 Generation of AC Voltage
  - 1.6.2 Waveforms
  - 1.6.3 Average value
  - 1.6.4 RMS Value
- 1.7 Single Phase AC Circuit Analysis with R, RL, RC and RLC Load
- 1.8 Three phase AC Circuits
  - 1.8.1 Waveform and Advantage
  - 1.8.2 Line and Phase Quantities in Star and Delta Connection
  - 1.8.3 Voltage & current computation in Balance Circuits
  - 1.8.4 Power Measurement in Three Phase Circuits

2 Electrical Machines (14 hours)

- 2.1 Faraday's Law of Electromagnetic Induction
- 2.2 Dynamically and Statically Induced EMFs
- 2.3 Transformer
  - 2.3.1 Introduction of Single-Phase Transformer
  - 2.3.2 Working Principle of Transformer
  - 2.3.3 Components of Transformer
  - 2.3.4 Transformation Ratio
  - 2.3.5 EMF Equation of Transformer
  - 2.3.6 Types of Transformers
  - 2.3.7 Load and No-Load Operation
  - 2.3.8 Ideal and Practical Transformer
  - 2.3.9 Losses and Efficiency
  - 2.3.10 Applications
- 2.4 Three phase induction motor
  - 2.4.1 Construction
  - 2.4.2 Rotating Magnetic Field
  - 2.4.3 Working Principle
  - 2.4.4 Direction of Rotor and Slip
  - 2.4.5 Types of Rotors
  - 2.4.6 Standstill and Running Condition
  - 2.4.7 Modes of Operation
  - 2.4.8 Torque Equations
  - 2.4.9 Torque-Slip Characteristics
  - 2.4.10 Applications
- 2.5 DC Motors
  - 2.5.1 Construction
  - 2.5.2 Working Principle
  - 2.5.3 Back EMF and its Significance
  - 2.5.4 Power Torque Relationships
  - 2.5.5 Types of Motors
  - 2.5.6 Losses and Efficiency
  - 2.5.7 Applications
- 2.6 Synchronous Generator
  - 2.6.1 Construction
  - 2.6.2 Working Principle
  - 2.6.3 EMF Equation
  - 2.6.4 Applications

3 Introduction to Electronics Engineering (11 hours)

3.1 Semiconductor and Doping
3.2 Introduction to Diode
3.3 Characteristics of PN junction diode
3.4 Half-wave and full-wave rectifiers
3.5 Zener Effect
3.6 Zener diode and its characteristics
3.7 Zener diode as a Voltage regulation
3.8 Bipolar junction transistor
  3.8.1 Biasing
  3.8.2 BJT as a switch
  3.8.3 BJT as an amplifier
3.9 Introduction to Digital Electronics
3.10 Logic Gates and Boolean Algebra

4 Electrical Installations (8 hours)

4.1 Consumer Power Supply System
4.2 Overview of Electrical Wiring Components: Switches, Sockets, and Distribution Boards
4.3 Protective devices, their constructions and Sizing,
  4.3.1 Fuse
  4.3.2 MCB
  4.3.3 MCCB
4.4 Wires and Power Cable
4.5 Types of Wiring System
4.6 Determination of Size of Conductor
4.7 Earthing System and its importance
4.8 Electrical Safety Rules

Tutorial

The tutorial sessions will focus on chapter-specific exercises aimed at enhancing understanding and application in Electrical and Electronics Engineering (15 hours)

Assignment

1. Numerical and theory works

Laboratory

1. Verification of Ohms law and Kirchhoff's law
2. Measurement of AC quantities using oscilloscope and study phase relation of RL and RC load.
3. Measurement of line, phase and power in three-phase balanced load.
4. Load test on single phase transformer and T-S characteristics of induction Machine.
5. Connection of electrical installations of residential buildings.
6. To study Characteristics of PN and Zener Diodes and Perform Half wave

and Full Wave rectifiers.

Reference

1. Mehta, V. K., and Mehta Rohit. Principle of Electrical Engineering and Electronics. S. Chand Publishing, 2014.
2. Bhattacharya, S. K. Basic Electrical and Electronics Engineering I, Pearson Education India, 2010.
3. Bakshi, Uday A., and Mayuresh V. Bakshi. Electrical technology. Technical Publications, 2020.
4. Floyd, Thomas L. Digital fundamentals, 10/e. Pearson Education India, 2011.
5. Neidle, Michael. Electrical installation technology. Elsevier, 2016

ENGINEERING MECHANICS
CE 101

Lecture : 4 **Year : I**
Tutorial : 2 **Part : I**
Practical : 0

Course Objectives:
This course helps to analyze the effect of various types of Forces on the particle and rigid body at rest and motion. It also provides concept and knowledge of Engineering Application and helps to understand Structural Engineering in later courses by using basics of Mechanics in their branch of engineering.

1 Basic Concept of Mechanics and Static Equilibrium (5 hours)

1.1 Definitions, Type and Scope of Mechanics
1.2 Fundamental Concepts and Principles of Engineering Mechanics
1.3 Concept of Particle, Rigid and Deformed Bodies
1.4 Physical Meaning of Equilibrium and its Essence in Structural Application
1.5 Equation of Equilibrium in 2D and 3D Analysis of Particle and Rigid Body
1.6 Concept of Free Body Diagram with Examples

2 Forces Acting on Particle and Rigid Body (9 hours)

2.1 Different Types of Forces: Internal/External Force, Adhesive/ Cohesive Force, Point/ Line/ Surface Force and Contact/ Body Force
2.2 Resolution and Composition of Forces
2.3 Principle of Transmissibility and Equivalent Forces
2.4 Varignon's Theorem and it's Application
2.5 Moments of a Force About a Point and About an Axis
2.6 Definition, Types and Characteristics of Couple
2.7 Resolution of a Force into a Force and a Couple
2.8 Resultant of Force and Moment for a System: Coplanar, Concurrent and General Force System
2.9 Concept and Formation of Wrench (Force and Couple Lying on a Single Plane)

3 Friction (4 hours)

3.1 Definition, Types and Uses of Friction, Laws of Friction, Static and Dynamic Coefficient of Friction, Angle of Friction
3.2 Sliding and Overturning Condition of a Body
3.3 Concept and Working Principle of Jackscrew
3.4 Practical Examples of Dry Friction (Ladder and Wedge Friction)

4 Analysis of Simple Beams and Frames (10 hours)

4.1 Introduction to Structures
4.2 Various Types of Load on the Structure
4.3 Various Types of Supports; Reactions and Degree of Freedom
4.4 Internal and External Forces in the Structure
4.5 Relationship Between Load, Shear Force and Bending Moment
4.6 Statically and Geometrically Stable/ Unstable Beams and Frames
4.7 Statically Determinate and Indeterminate Beams and Frames, Degree of Static Indeterminacy
4.8 Axial Force, Shear Force and Bending Moment Diagrams for Determinate Beams and Frames

5 Analysis of Plane Trusses (5 hours)

5.1 Definition of Truss, Assumption of Ideal Truss, Types and Uses of Truss in Engineering
5.2 Statically and Geometrically Stable and Unstable Truss
5.3 Statically Determinate and Indeterminate Truss, Degree of Static Indeterminacy
5.4 Analysis of Truss by the Method of Joint and Section/ Moment

5 Centre of Gravity, Centroid, Moment of Inertia, and Mass Moment of Inertia (5 hours)

6.1 Concepts of Centre of Gravity and Centroid of Line, Area and Volume
6.2 Second Moment of Area/Moment of Inertia and Radius of Gyration
6.3 Perpendicular and Parallel Axis Theorem for Moment of Inertia
6.4 Concept of Mass Moment of Inertia

7 Kinematics of Particles (Rectilinear and Curvilinear Motion) (7 hours)

7.1 Position, Velocity and Acceleration of a Particle for Rectilinear Motion
7.2 Dependent and Relative Motion of Particles
7.3 Position, Velocity and Acceleration of a Particle for Curvilinear Motion
7.4 Projectile Motion
7.5 Tangential and Normal Components of Velocity and Acceleration
7.6 Radial and Transverse Components of Velocity and Acceleration

8 Kinetics of Particles: Force, Acceleration, Energy and Momentum (8 hours)

8.1 Newton's Second Law of Motion, Linear Momentum and Impulsive Motion
8.2 Equation of Motion and Dynamic Equilibrium
8.3 Angular Momentum and Rate of Change of Angular Momentum
8.4 Equation of Motion for Rectilinear and Curvilinear Motion (Rectangular Components, Tangential & Normal Components and Radial & Transverse Components) of Particle
8.5 Work and Energy Principle
8.6 Principle of Conservation of Energy, Concept of Conservative and Non-Conservative System

8.7 Definition and Types of Impact

9 Kinematics and Kinetics of Rigid Body in Plane Motion, Energy and Momentum Methods (7 hours)

9.1 Translation, Rotation and General Plane Motion
9.2 Absolute and Relative Velocity in Plane Motion
9.3 Instantaneous Centre of Rotation
9.4 Equation of Motion: D'Alembert's Principle
9.5 Angular Momentum of Rigid Body
9.6 Principle of Work and Energy for a Rigid Body
9.7 Kinetic Energy for a Rigid Body

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Basic Concept of Mechanics and Static Equilibrium (2 hours)
2. Forces Acting on Particle and Rigid Body (4 hours)
3. Friction (2 hours)
4. Analysis of Simple Beams and Frames (6 hours)
5. Analysis of Plane Trusses (3 hours)
6. Centre of Gravity, Centroid, Moment of Inertia and Mass Moment of Inertia (4 hours)
7. Kinematics of Particles (Rectilinear and Curvilinear Motion) (3 hours)
8. Kinetics of Particles: Force, Acceleration, Energy and Momentum (3 hours)
9. Kinematics and Kinetics of Rigid Body in Plane Motion, Energy and Momentum Methods (3 hours)

Reference

1. Beer F.P. and E.R. Johntson "Vector Mechanics for Engineers", Tata McGraw Hill Publishing Co.Ltd.
2. R.C. Hibbler, Ashok Gupta, "Engineering Mechanics –Statics and Dynamics", New Delhi, Pearson,
3. I.C. Jong and B.G. Rogers, "Engineering Mechanics- Statics and Dynamics",
4. R. Suwal, "A Text Book of Applied Mechanics" Second Edition, Mark Line Publication
5. H.R. Parajuli and S. Neupane "Applied Mechanics for Engineers" M.K. Publishers and Distributors
6. H.R. Parajuli and S. Neupane "Applied Mechanics II (Dynamics) for Engineers" M.K. Publishers and Distributors
7. M.R. Dhital, "A Course Manual on Applied Mechanics I (Statics)", TU, IOE, CIMDU,
8. M.R. Dhital, "A Course Manual on Applied Mechanics II (Dynamics)", TU, IOE, CIMDU,
9. Shame, I.H., "Engineering Mechanics- Statics and Dynamics", Prentice Hall of India, New Delhi,

10. D.K. Anand and P.F. Cunnif, “Engineering Mechanics- Statics and Dynamics”,
11. R.S. Khurmi, “A Text Book of Engineering Mechanics”,
12. Egor. P. Popov “Engineering Mechanics of Solids”, New Delhi, Prentice Hall of India.

ENGINEERING GEOLOGY I

CE 102

Lecture : 2 **Year : I**
Tutorial : 0 **Part : I**
Practical : 1

Course Objectives:
The course will provide the basic knowledge of engineering geology to the civil engineering students. Students will be able to understand the fundamental of engineering geology and various natural process and their influence on the surface as well as sub-surface features, identification of rocks and their significance, enhance the knowledge of mountain building process and importance in the field of civil engineering

1 Introduction to Engineering Geology (2 hours)

1.1 Introduction to Geology, its branches, and their interrelationships
1.2 Definition of engineering geology and its importance in civil engineering
1.3 Importance of engineering geology in the context of Nepal

2 Structure of the Earth (3 hours)

2.1 Origin, and internal structure of earth
2.2 Plate tectonics and mountain building process
2.3 Geological time scale and evolution of life

3 Mineralogy and Petrology (7 hours)

3.1 Formation of minerals, crystal morphology, physical and chemical properties of minerals
3.2 Rock forming minerals and their engineering significance
3.3 Formation of rocks and their classifications
3.4 Introduction, classification, structure, texture, uses, engineering significance and field identification criteria of igneous rock, sedimentary rock, and metamorphic rock

4 Structural Geology (8 hours)

4.1 Introduction of geological plane and its orientation (Dip, Strike, Plunge, and Trend)
4.2 Study of different geological structures: Primary sedimentary structures (bedding, lamination, cross-bedding, ripple marks etc.) and secondary structures (Lineation, foliation, folds, joints, faults, and thrusts)
4.3 Field identification criteria of the different geological structure with their importance in civil engineering

5 Physical Geology (6 hours)

5.1 Introduction, definition, different geological agents (river, groundwater, glacier, wind, and sea water)
5.2 Weathering and erosion, different geomorphological features produced by geological agents
5.3 Volcanism

6 Geology of the Himalaya (4 hours)

6.1 Evolution of the Himalayas
6.2 Tectonic sub-division of the Himalaya (Indo-Gangetic Plain, Siwalik, Lesser Himalayas, Higher Himalaya, Tibetan-Tethys Himalayan zone) and physiographic sub-division of the Himalaya
6.3 Major discontinuities systems and their engineering significance and engineering geological problems in the different tectonic sub-division of the Himalaya

Laboratory

1. Identification of common rock forming minerals (Quartz, Feldspar, Muscovite, Biotite, Chlorite, Calcite, Dolomite, Tourmaline, Pyrite, Talc, Fluorite, Apatite, Corundum, Diamond, Kyanite, Sillimanite, Garnet and clay minerals)
2. Identification of rocks: Shale, Limestone, Sandstone, Siltstone, Conglomerate, Slate, Phyllite, Schist, Gneiss, Quartzite, Marble, Granite, Rhyolite, Gabbro, Basalt, Amphibolite, Syenite)
3. Study of different geological structures in the block diagram
4. Study of maps: Topographic and geological maps, construction of geological cross-section and their interpretation

Field works (2 days)

A two-day fieldwork to provide practical on-site knowledge on preparation and interpretation of engineering geological mapping (measurement of geological plane using geological compass, identification of minerals and rocks, geomorphology, and geological structures etc). Students submit report after the fieldwork **(Attendance in Fieldwork is Compulsory)**.

Reference

1. A. Holmes (1978). Principles of Physical Geology", ELBS English Language Society
2. Bell, F. G. (2006). Engineering Geology. 2nd Edition, Elsevier.
3. Krynine, D., & Judd, W. R. (2005). Principles of Engineering Geology and Geotechnics. CBS Publishers.
4. Deoja, B., Dhital, M., Wagner, A., & K.B, T. (1991). Mountain Risk Engineering Handbooks I and II. ICIMOD.
5. Dhital, M.R. (2015), Geology of the Nepal Himalaya, Springer International Published, Switzerland

6. Price, D. (2009). Engineering Geology- Principles and Practice. (M. H. de Freitas, Ed.) Springer.Hoek, E., and Brown, E.T. (2019). The Hoek-Brown failure criterion and GSI-2018 edition, Journal of Rock Mechanics and Geotechnical Engineering, 11, 445-463.
7. Vallejo, L.G.de., Ferrer, M. (2011). Geological Engineering, Routledge, Taylor and Francis Group,

CIVIL ENGINEERING MATERIALS

CE 103

Lecture : 2 **Year : I**
Tutorial : 0 **Part : I**
Practical : 1

Course Objectives:
To provide students an introductory knowledge about the wide range of materials used in the construction of engineering projects. This course emphasizes on the property, defects, productions, preservation, alternatives and utilities of various civil engineering materials which would help in selection of the suitable materials for construction projects. This helps to build a base for the selection, adequate consideration and precautions in aspect of materials during design and construction.

1 Basics of Civil Engineering Materials (2 hours)

1.1 Materials used in engineering constructions: buildings; road and bridges; irrigation and hydropower; water, gas and petroleum supply
1.2 Classification of materials on various basis: existence in nature, functions or usage; metallurgy; composition of materials
1.3 Properties: physical; chemical; mechanical; thermal; optical; electrical; magnetic
1.4 Failure of materials: ductile and brittle failure
1.5 Factors affecting selection of materials: properties and performance; attributes and suitability; durability, safety and requirements; availability, reliability and disposability; and economy and environment
1.6 Material and environment interactions: corrosion; weathering; erosion; thermal strain; exposure to moisture, sunlight, and chemicals

2 Stones (3 hours)

2.1 Classification of rocks and aggregates: geological, physical and chemical classifications of rocks; introduction to coarse and fine aggregates
2.2 Properties of stones: physical, chemical and mechanical properties
2.3 Characteristics of good stones: appearance; structure; strength; porosity and absorption; weathering; fire resistance; hardness and toughness; specific gravity; thermal properties
2.4 Selection and use of stones: selection criteria; various uses of stones in engineering constructions
2.5 Deterioration and preservation of stones: deterioration and its retardation; preservation and preservatives used in stones
2.6 Production, storage and handling of stones: natural bed of stones; selection of quarry site; methods of quarrying; dressing of stones

3 Clay and Clay Products (3 hours)

3.1 Clay: use of clay in constructions; classification/types of clays; properties of clays

3.2 Brick earth: constituents; properties, testing (consistency test; molding property test; deformation and shrinkage test on burning, strength and quality of brick test)

3.3 Bricks: use of bricks; manufacturing of local bricks; classification and properties (including) mechanical properties) of bricks (unburnt and burnt bricks); characteristics of good bricks; standard tests for bricks (shape and size test; color test; structure test; soundness test; hardness test; water adsorption test; efflorescence test; compressive strength test)

3.4 Tiles: use of tiles; manufacturing process of tiles; types and properties of tiles (roof tiles, wall tiles, floor tiles, drain tiles); characteristics of good tiles

3.5 Terracotta, earthenware and glazing: properties; use; composition; production

3.6 Storage and handling of clay and clay products

4 Lime (2 hours)

4.1 Sources and constituent of limestones: limestones and stone lime; kankar lime; shell lime; magnesian lime; impurities in limestones

4.2 Classification/types of limes: quick lime; flat lime, hydraulic lime, poor lime; hydrated lime; milk lime; lump lime

4.3 Characteristics of lime, hydration of lime, slaking nature of lime, solidification of lime

4.4 Manufacture/production of lime: Flow diagram of lime production from limestone and kankar

4.5 Storage, handling and use of different types of lime

4.6 Types of pozzolanic materials and use with lime: volcanic ash; calcinated clay products; clay/kaolin pozzolana; mineral slag; ashes of organic origin

5 Cement (4 hours)

5.1 Fundamentals of cement: ingredients of cement; type and properties of cement; storage, handling and use of cement; characteristics of good cement

5.2 Classification of cements: natural and artificial; different types of cements, their composition, properties and applications (ordinary Portland cement (OPC), rapid hardening cement, slow setting cement, Portland pozzolana cement (PPC), white cement, colored cement)

5.3 Manufacture of ordinary cement: dry manufacturing process; wet manufacturing process

5.4 Tests of cement: field test; laboratory tests (fineness test, consistency test, initial and final setting time test, soundness test, compressive and tensile strength test)

5.5 Cement clinkers: compounds of cement clinkers and their functions in cement

5.6 Hydration of cement and admixtures: function and examples of admixture like water proofers, accelerators, retarders, plasticizers, air entraining agents.

6 Mortar (2 hours)

6.1 Function and use of mortar

6.2 Properties of mortar: workability, inertness, setting and hardening, adhesion

6.3 Types of mortars: classification (on the basis of binding materials, bulk density, nature of applications; special mortars); properties and use of different types of mortar

6.4 Preparation, storage and handling of mortar: hand mixing, machine mixing; storage and handling of mortar

6.5 Selection of mortar for different construction works: selection criteria; characteristics of a good mortar

6.6 Testing of mortars: crushing strength test, tensile strength test, adhesiveness test on building unit

7 Timber (3 hours)

7.1 Tree and timber: growth and structure of tree; properties (including mechanical) and use of timber; defects in timber (during growth of trees, after felling of trees); characteristics of good timber

7.2 Classification of tree and properties of wood: hard wood, soft wood

7.3 Seasoning of timber: definition and importance of seasoning; types of seasoning (natural and artificial seasoning)

7.4 Deterioration and preservation of timber: deterioration (physical, chemical, biological); types of preservatives; methods of preservation

7.5 Commercial product of timber: veneers and ply wood; boards (laminated boards, fiber boards, block boards, and batten boards); impreg and compreg timbers

7.6 Bamboo: properties (including mechanical) of bamboo; structural use of bamboo

8 Metals and Alloys (4 hours)

8.1 Metals: classification (ferrous and nonferrous metals); properties (physical, chemical, mechanical, electrical, thermal, magnetic)

8.2 Sources, composition, properties and uses of ferrous metals: pig iron, cast iron, wrought iron, steel, alloys of steel

8.3 Sources, properties and uses of nonferrous metals: aluminum, copper, lead, tin, zinc, magnesium, nickel

8.4 Heat treatment process and its importance in metals: annealing, normalizing, quenching or hardening, tempering, surface hardening (case hardening, nitriding, cyaniding, flame/ induction/laser hardening), defects in heat treatments

8.5 Commercial forms of metals and their uses: sheets, channel sections (I, C, angle, tubular), bars

8.6 Corrosion and its prevention in steel: theory of corrosion and its prevention with enameling; applying metal coatings – galvanizing, tin plating, electroplating; applying coatings – painting and tarring.

9 Paints and Varnishes (3 hours)

9.1 Paints: function and ingredients of paints; characteristics of good paint

9.2 Type, composition, properties and uses of paints: Oil paints; Aluminum paints; Asbestos paints; Bituminous paints; Cellulose paints; Cement paints; Colloidal paints; Emulsion paints; Enamel paints; Graphite paints; Silicate paints; Anticorrosion paints; Plastic paints; Synthetic rubber paints; Distempers

9.3 Varnishes: function and ingredients of varnishes; characteristics of good varnishes

9.4 Type, composition, properties and uses of varnishes: Oil varnish; Turpentine varnish; Spirit varnish; Water varnish; Asphalt varnish; Spar varnish; Flat varnish

9.5 Process of application of different paints and varnishes: application in new surfaces; application in old surfaces

9.6 Defects in paints and varnishes: effects of background (dampness, cleanness movement reactions); effects of weather (blistering, peeling, checking, cracking, flaking, chalking, alligatoring, wrinkling, running and sagging, mildew, bloom, flashing, grining)

10 Miscellaneous Materials (4 hours)

10.1 Asphalt: origin, composition, properties, types and uses

10.2 Bitumen: origin, composition, properties, types and uses

10.3 Tar: origin, composition, properties, types and uses

10.4 Other materials: composition, properties, types and uses of – glass, plastic materials, rubber materials, insulating materials, gypsum products, adhesive and sealant materials, anti-termite treatment, water proofers, geosynthetics , carbon fiber)

10.5 Composite materials: composition, properties, types and uses of – cement steel reinforced concrete, fiber reinforced plastics, glass fiber reinforced cement concrete or plastics, metal matrix composite

10.6 Emerging materials: Calcium silicate bricks; Concrete blocks; Aerated Autoclave Concrete blocks (AAC blocks); Interlocking Compressed Stabilized Earth Blocks (Interlocking CSEB), panels and boards

Assignments

1. Various ways to join timbers and metals
2. Commercially available other new materials used in constructions

Laboratory

1. Water absorption test and bulk density, specific gravity test on brick sample
2. Compressive strength test of brick and stones
3. Consistency test of cement

4. Fineness and soundness test of cement
5. Setting time test of cement
6. Compressive strength of cement
7. Toughness test on steel and timber

Reference

1. Duggal, S. K. (2008). Building Materials. New Delhi: New Age International (P) Ltd., Publishers.
2. Mamlouk, M. S., & Zaniewski, J. P. (2018). Materials for Civil and Construction Engineers. Harlow: Pearson Education Limited.
3. Rajput, R. K. (2004). Engineering Materials. S. Chand & Company Ltd
4. Singh, P. (2010). Civil Engineering Materials. New Delhi: S K Kataria & Sons
5. Thornton, P. A., & Prentice, V. J. (1985). Fundadmental of Engineering Materials . Hall Publishing Company.

BACHELOR
IN
COMPUTER ENGINEERING

Year : I **Part : I**

Teaching Schedule								Examination Scheme							
								Theory			Practical				
									Final			Final			
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Duration hours	Marks	Assesment Marks	Duaration hours	Marks	Total	Remark
1	SH 101	Engineering Mathematics I	3	3	2	-	5	40	3	60	-	-	-	100	
2	CT 101	Computer Programming	3	3	1	3	7	40	3	60	50	-	-	150	
3	ME 101	Engineering Drawing	2	2	-	4	6	20	3	30	50	-	-	100	
4	EX 101	Fundamental of Electrical and Electronics Engineering	3	3	1	3	7	40	3	60	50	-	-	150	
5	SH 102	Engineering Physics	4	4	1	2	7	40	3	60	25	-	-	125	
6	ME 106	Engineering Workshop	1	1	-	3	4	20	-	-	30	-	-	50	
		Total		**16**	**5**	**15.00**	**36**	**200**	**-**	**270**	**205**	**-**	**-**	**675**	

Year : I **Part : II**

Teaching Schedule								Examination Scheme							
								Theory			Practical				
									Final			Final			
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assesment Marks	Duaration hours	Marks	Assesment Marks	Duaration hours	Marks	Total	Remark
1	SH 151	Engineering Mathematics II	3	3	2	-	5	40	3	60	-	-	-	100	
2	CT 151	Object Oriented Programming	3	3	1	3	7	40	3	60	50	-	-	150	
3	EX 152	Digital Logic	3	3	1	3	7	40	3	60	50	-	-	150	
4	EX 151	Electronic Device and Circuits	3	3	1	3	7	40	3	60	50	-	-	150	
5	SH 153	Engineering Chemistry	3	3	1	3	7	40	3	60	25	-	-	125	
6	EE 154	Electrical Circuits and Machines	4	4	1	1.5	6.5	40	3	60	25	-	-	125	
		Total		**19**	**7**	**13.5**	**39.5**	**240**	**-**	**360**	**200**	**-**	**-**	**800**	

ENGINEERING MATHEMATICS I

SH 101

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

Course Objectives:
To equip the students with the essential mathematical skills and techniques that are relevant to the engineering fields and enable them to solve engineering problems using mathematical methods.

1 Derivatives and its Applications (10 hours)

1.1 Review of derivative and differentiability, mean value theorems with interpretations
1.2 Indeterminate forms, types and their real life examples, L-Hospital's Rule
1.3 Power series of single valued functions
  1.3.1 Taylor's series
  1.3.2 Maclaurin's series
1.4 Asymptotes to Cartesian and Polar curves
1.5 Pedal equation to Cartesian and Polar curves
1.6 Curvature and radius of curvature for Cartesian curves

2 Antiderivatives and its Applications (11 hours)

2.1 Review of definite and indefinite integrals
2.2 Differentiation under integral sign
2.3 Improper integrals
2.4 Application of Beta and Gamma functions
2.5 Area, arc length, volume and surface of revolution in plane for Cartesian curves
2.6 Centroid and moment of inertia under area of curve

3 Ordinary Differential Equations and its Applications (10 hours)

3.1 Review of: Order, degree, solution of first order first degree differential equations by variable separation method and solution of homogeneous equations.
3.2 Linear differential equation and equations reducible to linear differential equation of first order Bernoulli’s equation, modeling electric circuit
3.3 First order and higher degree differential equations; Clairaut’s form

3.4 Linear second order differential equations with constant coefficient and variable coefficients reducible to constant coefficients, Cauchy's equations and modeling mass spring system

3.5 Application in physical sciences and engineering

4 Plane Analytic Geometry (4 hours)

4.1 Transformation of coordinates: Translation and Rotation

4.2 Equation of conic in Cartesian and polar form, identification of conics

5 Three dimensional geometry (10 hours)

5.1 The Straight line: symmetrical and general form

5.2 Coplanar lines

5.3 Shortest Distance

5.4 Sphere: General equation, plane section by planes, tangent planes

5.5 Introduction to right circular cone and right circular cylinder

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Derivatives and its Applications
2. Antiderivatives and its Applications
3. Ordinary Differential Equations and its Applications
4. Plane Analytic Geometry
5. Three dimensional geometry

Reference

1. Jeffery A., (2001), Advanced Engineering Mathematics (1st ed.), Academic Press.
2. O'Neill, P.V., (2003), Advanced Engineering Mathematics (5th ed.), Thomson Learning.
3. Kreyszig , A. (1993), Advanced engineering Mathematics (7th ed.), John Wiley & Sons.
4. Sastry S.S. (2008), Engineering Mathematics Volume I and II (4th ed.). PHI India.
5. Wylie C. and Barrett L.(1995), Advanced Engineering Mathematics (6th ed.), McGraw-Hill College.
6. Thomas, T. and Finny, R. (1984), Calculus and Analytic Geometry (6th ed.), Addison-Wesley.

COMPUTER PROGRAMMING

CT 101

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

Course Objectives:

The primary goal of this course is to provide students with a solid foundation in the principles of programming and to impart practical skills in the C programming language. This course ensures that students comprehend the fundamental concepts of variables, data types, control structures, and functions within the context of C. Advanced topics such as pointers, structures, file handling and the Standard C Library are explored to broaden students' programming capabilities. Also, through project-based assessments and evaluations, students apply their knowledge to real-world scenarios, fostering creativity and project development skills.

1 Introduction to Computer Programming (3 hours)

1.1 Definition of a computer program and programming language
1.2 Types and Generations of Programming Languages
1.3 Problem-Solving using a Computer
  1.3.1 Problem Analysis
  1.3.2 Algorithm and Flowchart
  1.3.3 Programming
  1.3.4 Compilation, Linking and Execution
  1.3.5 Debugging and Testing
  1.3.6 Documentation

2 Overview of C Programming (3 hours)

2.1 Introduction to C programming
2.2 History and Importance of C
2.3 C Headers and Library Functions
2.4 Basic Structure of a C Program
2.5 Preprocessor Directives
2.6 Tokens in C (Character set, Keywords and Identifiers)
2.7 Type Casting (Implicit and Explicit)
2.8 Data Types, Variables and Constants
2.9 Compiler and IDE for C Programming

3 Operators and Expressions (4 hours)

- 3.1 Introduction to Operators and Expressions
- 3.2 Arithmetic, Relational and Logical Operators
- 3.3 Assignment, Increment and Decrement Operators
- 3.4 Conditional, Bitwise and Special Operators
- 3.5 Comma Operator, size of Operator
- 3.6 Evaluation and Type Conversion in Expressions
- 3.7 Operator Precedence and Associativity

4 Input and Output (3 hours)

- 4.1 Introduction to data I/O in C
- 4.2 Unformatted I/O
  - 4.2.1 Character I/O
  - 4.2.2 String I/O
- 4.3 Formatted I/O
  - 4.3.1 Control String (flags, field width, precision, and specifier)
  - 4.3.2 Formatted I/O (scanf(), printf())

5 Control Structures (8 hours)

- 5.1 Introduction to Simple and Compound Statement
- 5.2 Sequential Statement
- 5.3 Branching Statement
  - 5.3.1 Simple if Statement
  - 5.3.2 if-else Statement
  - 5.3.3 Nested if-else Statement
  - 5.3.4 else-if Ladder
  - 5.3.5 switch Statement
  - 5.3.6 go to statement
- 5.4 Looping Statement
  - 5.4.1 for loop
  - 5.4.2 while loop
  - 5.4.3 do while
  - 5.4.4 Nested loop
- 5.5 Loop Interruption
  - 5.5.1 break
  - 5.5.2 continue

6 Array and Pointer (7 hours)

6.1 Introduction to an Array
6.2 One-dimensional Array
6.3 Two-dimensional Array
6.4 Multidimensional Array
6.5 Introduction to String
6.6 String Handling Functions
6.7 Definition of a Pointer
6.8 Pointer Declaration
6.9 Pointer Arithmetic
6.10 Relationship between Pointer and Arrays

7 User-defined Functions (6 hours)

7.1 Introduction to Function
7.2 Advantages of Function
7.3 Elements of User-defined Function
  7.3.1 Function Definition
  7.3.2 Function Prototype
  7.3.3 Function Parameters
7.4 Storage Class
7.5 Scope Rules
7.6 Category of Functions
  7.6.1 Functions with no arguments and no return values
  7.6.2 Functions with arguments and no return values
  7.6.3 Functions with arguments and return values
  7.6.4 Functions with no arguments and return values
7.7 Recursive functions
7.8 Function Call by Values and Reference
7.9 Passing Array and String to Function

8 Structures (5 hours)

8.1 Defining a Structure
8.2 Declaring and Accessing Structure Elements
8.3 Initializing Structure
8.4 Array of Structure
8.5 Array as member to Structure
8.6 Pointer as member to Structure
8.7 Structure as a member to Structure
8.8 Passing and Returning Structures to/from Function

9 File management (4 hours)

- 9.1 Introduction
- 9.2 Binary and Text File in C
- 9.3 File Opening Modes
- 9.4 Defining, Opening and Closing File
- 9.5 Input-output operations on files
  - 9.5.1 Character I/O (fputc(), fgetc())
  - 9.5.2 String I/O (fgets(), fputs())
  - 9.5.3 Formatted I/O (fscanf(), fprintf())
  - 9.5.4 Record I/O (fwrite(), fread())
- 9.6 Overview of Random File Access
- 9.7 Error handling

10 Recent Trends in Programming (2 hours)

- 10.1 Introduction to Object Oriented Programming (OOP)
- 10.2 Definitions of Class, Method and Object in OOP
- 10.3 Difference between Procedure Oriented and OOP
- 10.4 Overview of other High Level Programming Languages

Laboratory

1. Lab 1: Introduction and Demonstrations of projects written in C
2. Lab 2: Formatted and Unformatted Input/output in C
3. Lab 3: Branching in Control Structure
4. Lab 4: Looping in Control Structure
5. Lab 5: Array in C
6. Lab 6: String in C
7. Lab 7: Pointers in C
8. Lab 8: User Defined functions in C
9. Lab 9: Structure in C
10. Lab 10: File handling in C
11. Group project on C maximum 4 students in a group at the end of the course.

Reference

1. Robert Lafore, “C Programming Using Turbo C++”, SAMS publication
2. E. Balagurusamy, “Programming in Ansi C”, McGraw Hill Education
3. Bryons S. Gotterfried, “Programming with C”, TMH ….

ENGINEERING DRAWING

ME 101

Lecture : 2 **Year : I**
Tutorial : 0 **Part : I**
Practical : 4

Course Objectives:

To develop basic projection concepts with reference to points, lines, planes and geometrical solids. Also, to develop sketching and drafting skills to facilitate communication.

1 Instrumental Drawing, Technical Lettering Practices and Techniques (1 hour)

1.1 Equipment, materials and drawing sheets (paper)
1.2 Description of drawing instruments, auxiliary equipment and drawing materials
1.3 Techniques of instrumental drawing
1.4 Pencil sharpening, securing paper, proper use of T- squares, triangles, scales dividers, compasses, erasing shields, French curves, inking pens
1.5 Line types and uses, thickness

2 Dimensioning (1 hour)

2.1 Fundamentals and techniques
2.2 Size and location dimensioning, SI conversions
2.3 Scales: Types and Representative factor
2.4 Use of scales, measurement units, reducing and enlarging drawings
2.5 Placement of dimensions: aligned and unidirectional, chain, parallel/baseline and combined type
2.6 Tolerance Dimensioning

3 Geometrical Construction (2 hours)

3.1 Plane geometrical construction: Proportional division of lines, Trisection of angles, smooth arc & line tangents
3.2 Methods for drawing regular polygons and standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices (cylindrical and conical), ogee curve
3.3 Techniques to reproduce a given drawing (by construction)

4 Basic Descriptive Geometry (4 hours)

4.1 Introduction to Orthographic projection, Principal Planes, Four Quadrants or Angles
4.2 Projection of points on first, second, third and fourth quadrants
4.3 Projection of Lines: Parallel to one of the principal planes, Inclined to one of the principal plane and parallel to other, Inclined to both principal planes, Traces of a Line
4.4 Projection Planes: Perpendicular to both principal planes, Parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5 True length of lines: horizontal, inclined and oblique lines
4.6 Rules for parallel and perpendicular lines
4.7 Point view or end view of a line
4.8 Shortest distance from a point to a line
4.9 Edge View and True shape of an oblique plane
4.10 Angle between two intersecting lines
4.11 Intersection of a line and a plane, visible portion of line
4.12 Angle between a line and a plane
4.13 Dihedral angle between two planes
4.14 Shortest distance between two skew lines
4.15 Angle between two non- intersecting (skew) lines

5 Multi view (orthographic) projections (8 hours)

5.1 Orthographic Projections
- 5.1.1 First and third angle projection
- 5.1.2 Principal views: methods for obtaining orthographic views, Projection of lines, angles and plane surfaces, analysis in three views, projection of curved lines and surfaces, object orientation and selection of views for best representation, full and hidden lines
- 5.1.3 Orthographic drawings: making an orthographic drawing, visualizing objects (pictorial view) from the given views
- 5.1.4 Interpretation of adjacent areas, true-length lines, representation of holes, conventional practices

5.2 Sectional Views: Full, half, offset, broken (partial), rotated/aligned, revolved, removed (detail) sections, phantom of hidden section, specifying cutting planes for sections, conventions practices
5.3 Auxiliary views: Basic concept and use, drawing methods and types, symmetrical and unilateral auxiliary views, auxiliary sectional views

6 Developments and Intersections (7 hours)

6.1 Introduction and Projection of Solids with points transfer
6.2 Developments: general concepts and practical considerations, Triangulation method for approximate development of surfaces of a right/oblique; prism, cylinder, pyramid, cone, prism and cylinder cut by

oblique planes, frustum/truncated pyramid and cone, transition pieces for connecting different shapes and sphere

6.3 Intersections: lines of intersection of geometric surfaces, piercing point of a line and a geometric solid, intersection lines of two planes, intersections of – prism and prism, cylinder and prism, cylinder and cylinder, pyramid and prism, cone and prism, pyramid and cylinder, cone and cylinder.

7 Pictorial Drawings (7 hours)

7.1 Classifications: Advantages and Disadvantages

7.2 Isometric View

- 7.2.1 Axonometric Projection
- 7.2.2 Isometric Projection and Isometric Drawing (View)
- 7.2.3 Isometric and Non-isometric Lines; Isometric and Non-isometric Surfaces
- 7.2.4 Angles in Isometric Drawing
- 7.2.5 Circles and Circular Arcs in Isometric and Non-isometric Surfaces (slopes)
- 7.2.6 Irregular Curves in Isometric Drawing
- 7.2.7 Isometric sectional Views

7.3 Oblique Drawing

- 7.3.1 Procedure for making an Oblique drawing
- 7.3.2 Rules for Placing Objects in Oblique drawing
- 7.3.3 Angles, Circles and Circular Arcs in Oblique drawing

7.4 Perspective Projection

- 7.4.1 Terms used in Perspective Projection
- 7.4.2 Parallel and Angular Perspective
- 7.4.3 Selection of Station Point
- 7.4.4 Perspective projection of right prism and pyramid solid

Assignments

1. Geometrical Construction
2. Descriptive Geometry
3. Multi-view Projection I
4. Multi-view Projection II
5. Surface Development and Intersection
6. Isometric Drawing
7. Oblique Drawing and Perspective Projection

Laboratory

1. Drawing Sheet Layout, Freehand Lettering, Scale, Common Graphical Symbols, Sketching of parallel lines, circles, Dimensioning
2. Geometrical Construction (Sketch and Instrumental Drawing)
3. Descriptive Geometry I (Sketch and Instrumental Drawing)
4. Descriptive Geometry II (Sketch and Instrumental Drawing)
5. Multiview Drawings I (Sketch and Instrumental Drawing)

6. Multiview Drawings II (Sketch and Instrumental Drawing)
7. Multiview, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
8. Auxiliary View, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
9. Projection of Regular Geometrical Solids with point transfer (Sketch and Instrumental Drawing)
10. Surface Development of solids I (Sketch and Instrumental Drawing)
11. Surface Development of solids II (Sketch and Instrumental Drawing)
12. Intersection of solids (Sketch and Instrumental Drawing)
13. Isometric Drawing I (Sketch and Instrumental Drawing)
14. Isometric Drawing II (Sketch and Instrumental Drawing)
15. Oblique Drawing and Perspective Projection (Sketch and Instrumental Drawing)

Reference

1. "Fundamentals of Engineering Drawing", W. J. Luzadder, Prentice Hall.
2. "Engineering Drawing and Graphic Technology", T. E. French, C. J. Vierck, and R. J. Foster, Mc Graw Hill Publshing Co.
3. "Technical Drawing", F. E. Giescke, A. Mitchell, H. C. Spencer and J. T. Dygdone, Macmillan Publshing Co.
4. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publshing House, India.
5. "A Text Book of Engineering Drawing", P. S. Gill, S. K. Kataria and Sons, India
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FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS ENGINEERING

EX 101

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

Course Objectives:
Objective of the course is to understand the language of electronics, elements, and their functionality, to introduce the DC and AC circuit analysis and basic understanding of analog systems and their applications

1 Basic Circuits Concepts (6 hours)

1.1 Current and Potential
1.2 Passive components: Resistance, Inductance, Capacitance; series, parallel combinations; Kirchhoff's voltage and current laws for dc circuits.
1.3 Signal sources: voltage and current sources; non ideal sources; representation under assumption of linearity; controlled sources: VCVS, CCVS, VCCS, CCCS; concept of gain, transconductance, transimpedance.
1.4 Maximum power transfer, Superposition theorem, Thevenin's theorem, Norton's theorem

2 Average and RMS Values (4 hours)

2.1 Generation of AC voltage
2.2 Waveform and its characteristics
2.3 RMS and Average values of periodic waveforms

3 AC Circuit Analysis (12 hours)

3.1 Single Phase AC Circuit Analysis
- 3.1.1 Series, parallel and network circuits with sinusoidal excitations
- 3.1.2 The concept of complex impedance and admittance
- 3.1.3 Sinusoidal excitation of inductive and capacitive reactance and complex impedance
- 3.1.4 Concept of time phase differences between various sinusoidal quantities
- 3.1.5 Phasor concept and phasor representation of AC quantities
- 3.1.6 Transformed Impedances and network reduction
- 3.1.7 Real , reactive and apparent power Concepts

3.2 Three Phase AC Circuit
- 3.2.1 Generation of three phase voltage
- 3.2.2 Wye and Delta connection

4 Diodes (7 hours)

4.1 Semiconductor diode characteristics
4.2 Modeling the semiconductor diode
4.3 Diode circuits: clipper; clamper circuits
4.4 Zener diode, LED, Photodiode, Varactor diode, Tunnel diodes
4.5 DC power supply: rectifier – half wave, full wave (center tapped, bridge), Zener regulated power supply

5 Transistor (10 hours)

5.1 BJT configuration and biasing, small and large signal model
5.2 T and π model
5.3 Concept of differential amplifier using BJT
5.4 BJT as switch and logic circuits
5.5 Construction and working principle of JFET, MOSFET and CMOS
5.6 MOSFET as logic circuits

6 The Operational Amplifier and Oscillator (6 hours)

6.1 Basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator, summing amplifier and their applications
6.2 Basic feedback theory; positive and negative feedback; concept of stability; oscillator
6.3 Waveform generator using op-amp for Square wave, triangular wave, Phase Shift oscillator and Wien bridge oscillator for sinusoidal waveform

Laboratory

1. Familiarization with passive components, function generator and oscilloscope
2. Measurement of amplitude, frequency, time period using oscilloscop
3. Ohm's law, series, parallel circuits and calculate average, RMS value
4. Verification of KCL, KVL and network theorems
5. Maximum power transfer/ capacitor charging and discharging
6. Diode characteristics, rectifiers, Zener diodes
7. Bipolar junction transistor characteristics and single stage amplifier
8. BJT, PMOS, NMOS and CMOS as switch
9. Inverting, non-inverting, summing and subtractor amplifier using Op-amp
10. Relaxation oscillator
11. Analog sensor and small projects

Reference

1. Robert Boylestad and Louis Nashelsky, "Electronic Device and Circuit Theory", PHI; 9th Edition, 2007

2. Thomas L. Floyd, “Electronic Devices”, 8th Edition, Pearson Education Inc., 2007
3. A.S. Sedra and K.C. Smith, “Microelectronic Circuits”, 6th Edition, Oxford University Press, 2006
4. J. R. Cogdell. “Foundation of Electrical Engineering”, prentice Hall, Englewood Cliffs, NewJersey, 1990.

ENGINEERING PHYSICS

SH 102

Lecture : 4 **Year : I**
Tutorial : 1 **Part : I/II**
Practical : 2

Course Objectives:
To provide students a concept and sound knowledge of physics with the emphasis in present day applications to apply them in relevant fields. The background of physics corresponding to Proficiency Certificate Level is assumed.

1 Oscillation (6 hours)

- 1.1 Physical pendulum
  - 1.1.1 Bar pendulum
  - 1.1.2 Interchangeability of point of suspension and point of oscillation
  - 1.1.3 Minimum time period in case of physical pendulum
  - 1.1.4 Torsion pendulum
- 1.2 Damped and Forced Oscillation
  - 1.2.1 Damped harmonic oscillator
  - 1.2.2 Difference between free and damped oscillator
  - 1.2.3 Energy in damped oscillation
  - 1.2.4 Relaxation time
  - 1.2.5 Forced oscillation and resonance
  - 1.2.6 Sharpness of resonance
  - 1.2.7 Quality factor

2 Acoustics (3 hours)

- 2.1 Introduction
  - 2.1.1 Threshold of hearing and loudness
  - 2.1.2 Reverberation and reverberation time
  - 2.1.3 Absorption coefficient
  - 2.1.4 Sabine's Law
  - 2.1.5 Conditions for good acoustics
- 2.2 Ultrasound
  - 2.2.1 Production (piezoelectric) of ultrasound and its applications
  - 2.2.2 Test of structure and materials
  - 2.2.3 Medical uses

3 Heat and Thermodynamics (8 hours)

- 3.1 Quantity of Heat
  - 3.1.1 Calorific value of Foods and Fuels
  - 3.1.2 Bomb Calorimeter
  - 3.1.3 Specific heat of solid: Dulong - Petit law, Einstein's law
- 3.2 Nature of Heat
  - 3.2.1 Degree of freedom
  - 3.2.2 Maxwell's law of equipartition of energy
  - 3.2.3 atomicity of gases
  - 3.2.4 Vander-Waal's equation of real gases
  - 3.2.5 Critical constants
- 3.3 Thermodynamics
  - 3.3.1 Laws of Thermodynamics
  - 3.3.2 Clapeyron latent heat equation
  - 3.3.3 Entropy and Third law of thermodynamics
  - 3.3.4 Negative energy
  - 3.3.5 Maxwell's thermodynamic relations
  - 3.3.6 Gibb's free energy and phase transitions
- 3.4 Heat and Mass Transfer
  - 3.4.1 Fourier's law of thermal conductivity
  - 3.4.2 Use of thermal conductivity in building sciences
  - 3.4.3 Thermal resistance
  - 3.4.4 Types of convection
  - 3.4.5 Law of diffusion
  - 3.4.6 Relation between Stefan's law and Newton's law of Cooling
  - 3.4.7 Pyrheliometer and Pyrometer

4 Optics (17 hours)

- 4.1 Geometrical optics
  - 4.1.1 Lens separation
  - 4.1.2 Chromatism in lens combination
- 4.2 Interference
  - 4.2.1 Interference in thin films (reflected and transmitted light)
  - 4.2.2 fringes produced by a wedge-shaped thin film
  - 4.2.3 Newton's rings (both reflected and transmitted case)
  - 4.2.4 Determination of wavelength of light and refractive index of liquid by using Newton's rings.
- 4.3 Diffraction
  - 4.3.1 Introduction: Fresnel and Fraunhoffer's diffraction
  - 4.3.2 Fraunhoffer's diffraction at single slit
  - 4.3.3 Intensity distribution in the diffraction pattern due to a single slit
  - 4.3.4 Multiple slits, diffraction grating
  - 4.3.5 X-ray diffraction, X-rays in material testing

4.4 Polarization
- 4.4.1 Introduction: double refraction, Nichol prism (construction and uses)
- 4.4.2 Retardation plate (quarter and half wave plates), plane, elliptical and circular polarized light (theoretical and mathematical explanation)
- 4.4.3 Optical activity, specific rotation

4.5 Laser
- 4.5.1 Introduction: Laser and ordinary light, properties of laser
- 4.5.2 Induced absorption, spontaneous and Stimulated emission, active medium, population inversion, metastable state
- 4.5.3 Pumping (types: optical, electrical, chemical and heating)
- 4.5.4 He-Ne laser, semiconductor Laser
- 4.5.5 Uses of laser

4.6 Fiber Optics
- 4.6.1 Introduction: Propagation of light wave
- 4.6.2 Types of optical fiber: step index and graded index
- 4.6.3 Fiber transmission – single and multimode, self focusing, acceptance angle and numerical aperture
- 4.6.4 Applications

5 Electrostatics (8 hours)

5.1 Electric Field
- 5.1.1 Electric field due to a electric dipole (along axial line and equatorial line)
- 5.1.2 Electric dipole in an external electric field
- 5.1.3 Electric field due to linear electric quadrupole (along axial line)
- 5.1.4 Electric field: a ring of charge, circular ring and disc of charge

5.2 Electric Potential
- 5.2.1 Potential due to electric dipole
- 5.2.2 Potential due to linear quadrupole
- 5.2.3 potential due to continuous charge distribution, potential due to ring of charge and disc of charge

5.3 Capacitors
- 5.3.1 Cylindrical Capacitor
- 5.3.2 Charging and discharging of capacitor
- 5.3.3 Capacitor with dielectrics: dielectrics and Gauss law
- 5.3.4 High intensity electrostatic fields: uses and hazards (xerography, inkjet, precipitation)

6 Electromagnetism (6 hours)

6.1 Electromagnetic induction
- 6.1.1 Faraday's laws
- 6.1.2 Induction and energy transformation
- 6.1.3 Induced electric field
- 6.1.4 Self-induction and mutual induction
- 6.1.5 LR circuit
- 6.1.6 Energy stored in a magnetic field and energy density
- 6.1.7 Induced magnetic field: modified Ampere's law and displacement current

6.2 Eddy Current
- 6.2.1 Introduction
- 6.2.2 Applications: Induction cooker, Electric Guitar, Metal Detector and Eddy Current Breaking
- 6.2.3 Cyclotron and Synchrotron

7 Electromagnetic waves (6 hours)

7.1 Maxwell's Equations
- 7.1.1 Differential and integral forms
- 7.1.2 Conversion of Maxwell's equations from integral form to differential form and differential form to integral form
- 7.1.3 Maxwell's equations in different media

7.2 Applications
- 7.2.1 Wave equations: non conducting and conducting medium and free space
- 7.2.2 Plane solution of wave equations, amplitude of electromagnetic waves, speed of electromagnetic waves, ratio of electric and magnetic fields
- 7.2.3 Continuity equation
- 7.2.4 Energy transfer and Poynting vector, Radiation pressure

8 Photon and matter waves (6 hours)

8.1 Quantum Physics
- 8.1.1 Inadequacy of classical mechanics and rise of quantum mechanics, Quantization of energy
- 8.1.2 Group velocity and phase velocity, electrons and matter waves
- 8.1.3 de-Broglie wavelength, its applications
- 8.1.4 Heisenberg uncertainty principle and its applications
- 8.1.5 Wave functions and its significance

8.2 Schrodinger wave equation
- 8.2.1 Time dependent and independent equation
- 8.2.2 Probability distribution
- 8.2.3 One dimensional infinite potential well, particle in a box
- 8.2.4 Barrier tunneling (reflection and transmission coefficient)

Laboratory

1. To determine the acceleration due to gravity and radius of gyration of the given metal bar using bar pendulum.
2. To determine the modulus of elasticity of the given material and moment of inertia of the circular disc about the wire as an axis passing through its center and perpendicular to its plane by using torsional Pendulum
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee's method
4. To determine the mechanical equivalent of heat by given method
5. To determine the wavelength of the sodium light using Newton's rings
6. To determine the wavelength of sodium light using wedge-shaped method
7. To determine the wavelength of LASER light using diffraction grating and hence determine the particle size of lycopodium power
8. To determine the focal length of two lenses when they are separated by some finite distance
9. To determine the chromatic aberration of a convex lens between red and blue colors
10. To determine the capacitance of the given capacitor by the method of charging and discharging through resistor
11. To plot the graph between frequency and current in LCR series circuit and hence determine the quality factor of the circuit
12. To study the growth and decay of current in LR circuit then determine the self-inductance of the given inductor
13. To determine the dielectric constant of the given material

Reference

1. Halliday, Resnick, Walker, "Fundamentals of Physics', John Wiley & Sons. Lnc.
2. Pokharel, Bhattarai, and Paudel "Fundamentals of Engineering Physics", Benchmark Publication.
3. Brij Lal and Subrahmanyam, ''A text book of Optics", S. Chand Publisher.
4. Basudeva, A.S. 'Modern Engineering Physics", S. Chand Publisher.
5. Caur R. K. and Gupta, S. L., "Engineering Physics', Dhanpat Publisher.
6. Brij Lal and Subrahmanyam, 'Waves and Oscillation", S. Chand publisher.
7. Brij Lal and Subrahmanyam, 'Heat and Thermodynamics", S. Chand publisher
8. Avadhanulu, Kshirsaga and Arun Murthy, A text Book of Engineering Physics, S. Chand publisher.

ENGINEERING WORKSHOP

ME 106

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

Course Objectives:
After completing this course, the students will be able to practice workshop safety rules effectively with different hand tools and machine tools for producing metal and sheet metal components. Acquire knowledge and practice on casting, forging, welding, soldering, brazing and riveting.

1 Safety Measures in the Workshop (1 hour)

1.1 Causes of accident
1.2 Types of safety: General safety, personal safety, machine and equipment safety, job safety

2 Bench Work and Fittings (4 hours)

2.1 Fitting Tools: Types, uses of holding tools, sticking tools, cutting tools (files, chisels, hacksaw), scrapping tools (scrappers), drilling tools (drill bits), measuring, marking and testing tools (steel rule, calipers, divider, surface plate, scriber, surface gauge, punches, angle plate, try square, combination sets, vernier caliper, micrometer, bevel protractor, miscellaneous tools (wrenches, screw drivers and pliers)
2.2 Benchwork and fitting operation
2.3 Filling operations, chipping operations and sawing operation

3 Thread Cutting (1 hour)

3.1 Classification of threads
3.2 Thread cutting tools for hand threading
3.3 Threading taps: Types, uses and care
3.4 Threading dies: Types, uses and care
3.5 Thread cutting by hand: Cutting internal and external thread

4 Sheet Metal (2 hours)

4.1 Introduction, sheet metal tools, sheet metal operation

4.2 Rivet types, types of rivet joints, riveting tools and their uses, riveting procedure

5 Machine Tools (2 hours)

5.1 Lathes: Working principle, types of lathes, main parts of lathe, lathe operations (facing, centre drilling, turning, knurling, boring, chamfering, thread cutting, counter sinking, counter boring).

5.2 Drilling Machine: Types of drilling machine, types of drill bits, drilling operations (drilling, counter boring, reaming, tapping)

6 Forging and Casting (1.5 hours)

6.1 Introduction, forging tools, forging operations

6.2 Introduction, pattern making foundry tools, core making, sand casting process

7 Welding (2.5 hours)

7.1 Arc welding: Introduction, arc welding equipment and accessories, influencing factor in arc welding, methods of striking an arc (tap, scratch), electrodes, types of joint, welding positions, TIG, MIG welding

7.2 Gas welding: Oxyacetylene gas welding, oxyacetylene gas welding accessories, filler rods, fluxes, types of flames and uses

8 Brazing and Soldering (1 hour)

8.1 Introduction, brazing equipment and materials, brazing process, surface clearing, join design, support parts, brazing operations (heating, filler metal applications, flux application, clearing after brazing)

8.2 Introduction, flux, soft solder and soldering process

Laboratory

1. Fitting Practice: Demonstration, usage of different types of hand tools and measuring instruments.
2. Perform Filing, sawing, drilling and tapping operations on given Mild steel strip
3. Machining practice: Perform Lathe operations
4. Welding Practice: Perform Arc welding and Oxy-Acetylene gas welding operations
5. Sheet metal practice: Perform sheet metal operations
6. Soldering and brazing
7. Electrical installations

Reference

1. Khurmi, R. S., & Gupta, J. K. (2008). A Textbook of Workshop Technology. S. Chand Publishing.

2. Raghuwanshi, B. S. (1990). A Course in Workshop Technology, Volume II (machine tools). New Delhi: Dhanpat Rai & Company Ltd, 23(5), 309-316.
3. S. K. Hajra Choudhary, A. K. Hajra Choudhary (2005). Elements of Workshop Technology Vol. I and II: Manufacturing Processes. Media promoter & publishers Pvt. Ltd.
4. . Khurmi, R. S., & Gupta, J. K. (2008). A Textbook of Workshop Technology. S. Chand Publishing.
5. Rajput, R. K. (2007). A textbook of manufacturing technology: Manufacturing processes. Firewall Media.
6. Rao, K. V. (2002). Manufacturing Science and Technology-Manufacturing Processess and Machine Tools. New Age International.
7. Gerling Heinrich. (2006).All About Machine Tools, New Age International Publisher.

BACHELOR
IN
ELECTRONICS, COMMUNICATION AND INFORMATION ENGINEERING

Year : I **Part : I**

Teaching Schedule								Examination Scheme							
								Theory			Practical			Total	Remark
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assesment Marks	Final			
									Duration hours	Marks		Duaration hours	Marks		
1	SH 101	Engineering Mathematics I	3	3	2	-	5	40	3	60	-	-	-	100	
2	SH 102	Engineering Physics	4	4	1	2	7	40	3	60	25	-	-	125	
3	CT 101	Computer Programming	3	3	1	3	7	40	3	60	50	-	-	150	
4	ME 101	Engineering Drawing	2	2	-	4	6	20	3	30	50	-	-	100	
5	EX 101	Fundamental of Electrical and Electronics Engineering	3	3	1	3	7	40	3	60	50	-	-	150	
6	ME 106	Engineering Workshop	1	1	-	3	4	20	-	-	30	-	-	50	
Total			**16**	**16**	**5**	**15**	**36**	**180**	**-**	**270**	**175**	**-**	**-**	**675**	

Year : I **Part : II**

Teaching Schedule								Examination Scheme							
								Theory			Practical			Total	Remark
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assesment Marks	Final			
									Duration hours	Marks		Duaration hours	Marks		
1	SH 151	Engineering Mathematics II	3	3	2	-	5	40	3	60	-	-	-	100	
2	CT 151	Object Oriented Programming	3	3	1	3	7	40	3	60	50	-	-	150	
3	EX 151	Electronic Device and Circuits	3	3	1	3	7	40	3	60	50	-	-	150	
4	EX 152	Digital Logic	3	3	1	3	7	40	3	60	50	-	-	150	
5	EE 154	Electrical Circuits and Machines	4	4	1	1.5	6.5	40	3	60	25	-	-	125	
6	SH 153	Engineering Chemistry	3	3	1	3	7	40	3	60	25	-	-	125	
Total			**19**	**19**	**7**	**13.5**	**39.5**	**240**	**-**	**360**	**200**	**-**	**-**	**800**	

ENGINEERING MATHEMATICS I

SH 101

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

Course Objectives:
To equip the students with the essential mathematical skills and techniques that are relevant to the engineering fields and enable them to solve engineering problems using mathematical methods.

1 Derivatives and its Applications (10 hours)

1.1 Review of derivative and differentiability, mean value theorems with interpretations
1.2 Indeterminate forms, types and their real life examples, L-Hospital's Rule
1.3 Power series of single valued functions
  1.3.1 Taylor's series
  1.3.2 Maclaurin's series
1.4 Asymptotes to Cartesian and Polar curves
1.5 Pedal equation to Cartesian and Polar curves
1.6 Curvature and radius of curvature for Cartesian curves

2 Antiderivatives and its Applications (11 hours)

2.1 Review of definite and indefinite integrals
2.2 Differentiation under integral sign
2.3 Improper integrals
2.4 Application of Beta and Gamma functions
2.5 Area, arc length, volume and surface of revolution in plane for Cartesian curves
2.6 Centroid and moment of inertia under area of curve

3 Ordinary Differential Equations and its Applications (10 hours)

3.1 Review of: Order, degree, solution of first order first degree differential equations by variable separation method and solution of homogeneous equations.
3.2 Linear differential equation and equations reducible to linear differential equation of first order Bernoulli’s equation, modeling electric circuit
3.3 First order and higher degree differential equations; Clairaut’s form

3.4 Linear second order differential equations with constant coefficient and variable coefficients reducible to constant coefficients, Cauchy's equations and modeling mass spring system

3.5 Application in physical sciences and engineering

4 Plane Analytic Geometry (4 hours)

4.1 Transformation of coordinates: Translation and Rotation

4.2 Equation of conic in Cartesian and polar form, identification of conics

5 Three dimensional geometry (10 hours)

5.1 The Straight line: symmetrical and general form

5.2 Coplanar lines

5.3 Shortest Distance

5.4 Sphere: General equation, plane section by planes, tangent planes

5.5 Introduction to right circular cone and right circular cylinder

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Derivatives and its Applications
2. Antiderivatives and its Applications
3. Ordinary Differential Equations and its Applications
4. Plane Analytic Geometry
5. Three dimensional geometry

Reference

1. Jeffery A., (2001), Advanced Engineering Mathematics (1st ed.), Academic Press.
2. O'Neill, P.V., (2003), Advanced Engineering Mathematics (5th ed.), Thomson Learning.
3. Kreyszig , A. (1993), Advanced engineering Mathematics (7th ed.), John Wiley & Sons.
4. Sastry S.S. (2008), Engineering Mathematics Volume I and II (4th ed.). PHI India.
5. Wylie C. and Barrett L.(1995), Advanced Engineering Mathematics (6th ed.), McGraw-Hill College.
6. Thomas, T. and Finny, R. (1984), Calculus and Analytic Geometry (6th ed.), Addison-Wesley.

ENGINEERING PHYSICS

SH 102

Lecture : 4 **Year : I**
Tutorial : 1 **Part : I/II**
Practical : 2

Course Objectives:
To provide students a concept and sound knowledge of physics with the emphasis in present day applications to apply them in relevant fields. The background of physics corresponding to Proficiency Certificate Level is assumed.

1 Oscillation (6 hours)

- 1.1 Physical pendulum
  - 1.1.1 Bar pendulum
  - 1.1.2 Interchangeability of point of suspension and point of oscillation
  - 1.1.3 Minimum time period in case of physical pendulum
  - 1.1.4 Torsion pendulum
- 1.2 Damped and Forced Oscillation
  - 1.2.1 Damped harmonic oscillator
  - 1.2.2 Difference between free and damped oscillator
  - 1.2.3 Energy in damped oscillation
  - 1.2.4 Relaxation time
  - 1.2.5 Forced oscillation and resonance
  - 1.2.6 Sharpness of resonance
  - 1.2.7 Quality factor

2 Acoustics (3 hours)

- 2.1 Introduction
  - 2.1.1 Threshold of hearing and loudness
  - 2.1.2 Reverberation and reverberation time
  - 2.1.3 Absorption coefficient
  - 2.1.4 Sabine's Law
  - 2.1.5 Conditions for good acoustics
- 2.2 Ultrasound
  - 2.2.1 Production (piezoelectric) of ultrasound and its applications
  - 2.2.2 Test of structure and materials
  - 2.2.3 Medical uses

3 Heat and Thermodynamics (8 hours)

- 3.1 Quantity of Heat
  - 3.1.1 Calorific value of Foods and Fuels
  - 3.1.2 Bomb Calorimeter
  - 3.1.3 Specific heat of solid: Dulong - Petit law, Einstein's law
- 3.2 Nature of Heat
  - 3.2.1 Degree of freedom
  - 3.2.2 Maxwell's law of equipartition of energy
  - 3.2.3 atomicity of gases
  - 3.2.4 Vander-Waal's equation of real gases
  - 3.2.5 Critical constants
- 3.3 Thermodynamics
  - 3.3.1 Laws of Thermodynamics
  - 3.3.2 Clapeyron latent heat equation
  - 3.3.3 Entropy and Third law of thermodynamics
  - 3.3.4 Negative energy
  - 3.3.5 Maxwell's thermodynamic relations
  - 3.3.6 Gibb's free energy and phase transitions
- 3.4 Heat and Mass Transfer
  - 3.4.1 Fourier's law of thermal conductivity
  - 3.4.2 Use of thermal conductivity in building sciences
  - 3.4.3 Thermal resistance
  - 3.4.4 Types of convection
  - 3.4.5 Law of diffusion
  - 3.4.6 Relation between Stefan's law and Newton's law of Cooling
  - 3.4.7 Pyrheliometer and Pyrometer

4 Optics (17 hours)

- 4.1 Geometrical optics
  - 4.1.1 Lens separation
  - 4.1.2 Chromatism in lens combination
- 4.2 Interference
  - 4.2.1 Interference in thin films (reflected and transmitted light)
  - 4.2.2 fringes produced by a wedge-shaped thin film
  - 4.2.3 Newton's rings (both reflected and transmitted case)
  - 4.2.4 Determination of wavelength of light and refractive index of liquid by using Newton's rings.
- 4.3 Diffraction
  - 4.3.1 Introduction: Fresnel and Fraunhoffer's diffraction
  - 4.3.2 Fraunhoffer's diffraction at single slit
  - 4.3.3 Intensity distribution in the diffraction pattern due to a single slit
  - 4.3.4 Multiple slits, diffraction grating
  - 4.3.5 X-ray diffraction, X-rays in material testing

4.4 Polarization
- 4.4.1 Introduction: double refraction, Nichol prism (construction and uses)
- 4.4.2 Retardation plate (quarter and half wave plates), plane, elliptical and circular polarized light (theoretical and mathematical explanation)
- 4.4.3 Optical activity, specific rotation

4.5 Laser
- 4.5.1 Introduction: Laser and ordinary light, properties of laser
- 4.5.2 Induced absorption, spontaneous and Stimulated emission, active medium, population inversion, metastable state
- 4.5.3 Pumping (types: optical, electrical, chemical and heating)
- 4.5.4 He-Ne laser, semiconductor Laser
- 4.5.5 Uses of laser

4.6 Fiber Optics
- 4.6.1 Introduction: Propagation of light wave
- 4.6.2 Types of optical fiber: step index and graded index
- 4.6.3 Fiber transmission – single and multimode, self focusing, acceptance angle and numerical aperture
- 4.6.4 Applications

5 Electrostatics (8 hours)

5.1 Electric Field
- 5.1.1 Electric field due to a electric dipole (along axial line and equatorial line)
- 5.1.2 Electric dipole in an external electric field
- 5.1.3 Electric field due to linear electric quadrupole (along axial line)
- 5.1.4 Electric field: a ring of charge, circular ring and disc of charge

5.2 Electric Potential
- 5.2.1 Potential due to electric dipole
- 5.2.2 Potential due to linear quadrupole
- 5.2.3 potential due to continuous charge distribution, potential due to ring of charge and disc of charge

5.3 Capacitors
- 5.3.1 Cylindrical Capacitor
- 5.3.2 Charging and discharging of capacitor
- 5.3.3 Capacitor with dielectrics: dielectrics and Gauss law
- 5.3.4 High intensity electrostatic fields: uses and hazards (xerography, inkjet, precipitation)

6 Electromagnetism (6 hours)

6.1 Electromagnetic induction
- 6.1.1 Faraday's laws
- 6.1.2 Induction and energy transformation
- 6.1.3 Induced electric field
- 6.1.4 Self-induction and mutual induction
- 6.1.5 LR circuit
- 6.1.6 Energy stored in a magnetic field and energy density
- 6.1.7 Induced magnetic field: modified Ampere's law and displacement current

6.2 Eddy Current
- 6.2.1 Introduction
- 6.2.2 Applications: Induction cooker, Electric Guitar, Metal Detector and Eddy Current Breaking
- 6.2.3 Cyclotron and Synchrotron

7 Electromagnetic waves (6 hours)

7.1 Maxwell's Equations
- 7.1.1 Differential and integral forms
- 7.1.2 Conversion of Maxwell's equations from integral form to differential form and differential form to integral form
- 7.1.3 Maxwell's equations in different media

7.2 Applications
- 7.2.1 Wave equations: non conducting and conducting medium and free space
- 7.2.2 Plane solution of wave equations, amplitude of electromagnetic waves, speed of electromagnetic waves, ratio of electric and magnetic fields
- 7.2.3 Continuity equation
- 7.2.4 Energy transfer and Poynting vector, Radiation pressure

8 Photon and matter waves (6 hours)

8.1 Quantum Physics
- 8.1.1 Inadequacy of classical mechanics and rise of quantum mechanics, Quantization of energy
- 8.1.2 Group velocity and phase velocity, electrons and matter waves
- 8.1.3 de-Broglie wavelength, its applications
- 8.1.4 Heisenberg uncertainty principle and its applications
- 8.1.5 Wave functions and its significance

8.2 Schrodinger wave equation
- 8.2.1 Time dependent and independent equation
- 8.2.2 Probability distribution
- 8.2.3 One dimensional infinite potential well, particle in a box
- 8.2.4 Barrier tunneling (reflection and transmission coefficient)

Laboratory

1. To determine the acceleration due to gravity and radius of gyration of the given metal bar using bar pendulum.
2. To determine the modulus of elasticity of the given material and moment of inertia of the circular disc about the wire as an axis passing through its center and perpendicular to its plane by using torsional Pendulum
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee's method
4. To determine the mechanical equivalent of heat by given method
5. To determine the wavelength of the sodium light using Newton's rings
6. To determine the wavelength of sodium light using wedge-shaped method
7. To determine the wavelength of LASER light using diffraction grating and hence determine the particle size of lycopodium power
8. To determine the focal length of two lenses when they are separated by some finite distance
9. To determine the chromatic aberration of a convex lens between red and blue colors
10. To determine the capacitance of the given capacitor by the method of charging and discharging through resistor
11. To plot the graph between frequency and current in LCR series circuit and hence determine the quality factor of the circuit
12. To study the growth and decay of current in LR circuit then determine the self-inductance of the given inductor
13. To determine the dielectric constant of the given material

Reference

1. Halliday, Resnick, Walker, "Fundamentals of Physics', John Wiley & Sons. Lnc.
2. Pokharel, Bhattarai, and Paudel "Fundamentals of Engineering Physics", Benchmark Publication.
3. Brij Lal and Subrahmanyam, ''A text book of Optics", S. Chand Publisher.
4. Basudeva, A.S. 'Modern Engineering Physics", S. Chand Publisher.
5. Caur R. K. and Gupta, S. L., "Engineering Physics', Dhanpat Publisher.
6. Brij Lal and Subrahmanyam, 'Waves and Oscillation", S. Chand publisher.
7. Brij Lal and Subrahmanyam, 'Heat and Thermodynamics", S. Chand publisher
8. Avadhanulu, Kshirsaga and Arun Murthy, A text Book of Engineering Physics, S. Chand publisher.

COMPUTER PROGRAMMING

CT 101

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

Course Objectives:

The primary goal of this course is to provide students with a solid foundation in the principles of programming and to impart practical skills in the C programming language. This course ensures that students comprehend the fundamental concepts of variables, data types, control structures, and functions within the context of C. Advanced topics such as pointers, structures, file handling and the Standard C Library are explored to broaden students' programming capabilities. Also, through project-based assessments and evaluations, students apply their knowledge to real-world scenarios, fostering creativity and project development skills.

1 Introduction to Computer Programming (3 hours)

1.1 Definition of a computer program and programming language
1.2 Types and Generations of Programming Languages
1.3 Problem-Solving using a Computer
  1.3.1 Problem Analysis
  1.3.2 Algorithm and Flowchart
  1.3.3 Programming
  1.3.4 Compilation, Linking and Execution
  1.3.5 Debugging and Testing
  1.3.6 Documentation

2 Overview of C Programming (3 hours)

2.1 Introduction to C programming
2.2 History and Importance of C
2.3 C Headers and Library Functions
2.4 Basic Structure of a C Program
2.5 Preprocessor Directives
2.6 Tokens in C (Character set, Keywords and Identifiers)
2.7 Type Casting (Implicit and Explicit)
2.8 Data Types, Variables and Constants
2.9 Compiler and IDE for C Programming

3 Operators and Expressions (4 hours)

- 3.1 Introduction to Operators and Expressions
- 3.2 Arithmetic, Relational and Logical Operators
- 3.3 Assignment, Increment and Decrement Operators
- 3.4 Conditional, Bitwise and Special Operators
- 3.5 Comma Operator, size of Operator
- 3.6 Evaluation and Type Conversion in Expressions
- 3.7 Operator Precedence and Associativity

4 Input and Output (3 hours)

- 4.1 Introduction to data I/O in C
- 4.2 Unformatted I/O
  - 4.2.1 Character I/O
  - 4.2.2 String I/O
- 4.3 Formatted I/O
  - 4.3.1 Control String (flags, field width, precision, and specifier)
  - 4.3.2 Formatted I/O (scanf(), printf())

5 Control Structures (8 hours)

- 5.1 Introduction to Simple and Compound Statement
- 5.2 Sequential Statement
- 5.3 Branching Statement
  - 5.3.1 Simple if Statement
  - 5.3.2 if-else Statement
  - 5.3.3 Nested if-else Statement
  - 5.3.4 else-if Ladder
  - 5.3.5 switch Statement
  - 5.3.6 go to statement
- 5.4 Looping Statement
  - 5.4.1 for loop
  - 5.4.2 while loop
  - 5.4.3 do while
  - 5.4.4 Nested loop
- 5.5 Loop Interruption
  - 5.5.1 break
  - 5.5.2 continue

6 Array and Pointer (7 hours)

6.1 Introduction to an Array
6.2 One-dimensional Array
6.3 Two-dimensional Array
6.4 Multidimensional Array
6.5 Introduction to String
6.6 String Handling Functions
6.7 Definition of a Pointer
6.8 Pointer Declaration
6.9 Pointer Arithmetic
6.10 Relationship between Pointer and Arrays

7 User-defined Functions (6 hours)

7.1 Introduction to Function
7.2 Advantages of Function
7.3 Elements of User-defined Function
  7.3.1 Function Definition
  7.3.2 Function Prototype
  7.3.3 Function Parameters
7.4 Storage Class
7.5 Scope Rules
7.6 Category of Functions
  7.6.1 Functions with no arguments and no return values
  7.6.2 Functions with arguments and no return values
  7.6.3 Functions with arguments and return values
  7.6.4 Functions with no arguments and return values
7.7 Recursive functions
7.8 Function Call by Values and Reference
7.9 Passing Array and String to Function

8 Structures (5 hours)

8.1 Defining a Structure
8.2 Declaring and Accessing Structure Elements
8.3 Initializing Structure
8.4 Array of Structure
8.5 Array as member to Structure
8.6 Pointer as member to Structure
8.7 Structure as a member to Structure
8.8 Passing and Returning Structures to/from Function

9 File management (4 hours)

- 9.1 Introduction
- 9.2 Binary and Text File in C
- 9.3 File Opening Modes
- 9.4 Defining, Opening and Closing File
- 9.5 Input-output operations on files
  - 9.5.1 Character I/O (fputc(), fgetc())
  - 9.5.2 String I/O (fgets(), fputs())
  - 9.5.3 Formatted I/O (fscanf(), fprintf())
  - 9.5.4 Record I/O (fwrite(), fread())
- 9.6 Overview of Random File Access
- 9.7 Error handling

10 Recent Trends in Programming (2 hours)

- 10.1 Introduction to Object Oriented Programming (OOP)
- 10.2 Definitions of Class, Method and Object in OOP
- 10.3 Difference between Procedure Oriented and OOP
- 10.4 Overview of other High Level Programming Languages

Laboratory

1. Lab 1: Introduction and Demonstrations of projects written in C
2. Lab 2: Formatted and Unformatted Input/output in C
3. Lab 3: Branching in Control Structure
4. Lab 4: Looping in Control Structure
5. Lab 5: Array in C
6. Lab 6: String in C
7. Lab 7: Pointers in C
8. Lab 8: User Defined functions in C
9. Lab 9: Structure in C
10. Lab 10: File handling in C
11. Group project on C maximum 4 students in a group at the end of the course.

Reference

1. Robert Lafore, “C Programming Using Turbo C++”, SAMS publication
2. E. Balagurusamy, “Programming in Ansi C”, McGraw Hill Education
3. Bryons S. Gotterfried, “Programming with C”, TMH ….

ENGINEERING DRAWING

ME 101

Lecture : 2 **Year : I**
Tutorial : 0 **Part : I**
Practical : 4

Course Objectives:

To develop basic projection concepts with reference to points, lines, planes and geometrical solids. Also, to develop sketching and drafting skills to facilitate communication.

1 Instrumental Drawing, Technical Lettering Practices and Techniques (1 hour)

1.1 Equipment, materials and drawing sheets (paper)
1.2 Description of drawing instruments, auxiliary equipment and drawing materials
1.3 Techniques of instrumental drawing
1.4 Pencil sharpening, securing paper, proper use of T- squares, triangles, scales dividers, compasses, erasing shields, French curves, inking pens
1.5 Line types and uses, thickness

2 Dimensioning (1 hour)

2.1 Fundamentals and techniques
2.2 Size and location dimensioning, SI conversions
2.3 Scales: Types and Representative factor
2.4 Use of scales, measurement units, reducing and enlarging drawings
2.5 Placement of dimensions: aligned and unidirectional, chain, parallel/baseline and combined type
2.6 Tolerance Dimensioning

3 Geometrical Construction (2 hours)

3.1 Plane geometrical construction: Proportional division of lines, Trisection of angles, smooth arc & line tangents
3.2 Methods for drawing regular polygons and standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices (cylindrical and conical), ogee curve
3.3 Techniques to reproduce a given drawing (by construction)

4 Basic Descriptive Geometry (4 hours)

4.1 Introduction to Orthographic projection, Principal Planes, Four Quadrants or Angles
4.2 Projection of points on first, second, third and fourth quadrants
4.3 Projection of Lines: Parallel to one of the principal planes, Inclined to one of the principal plane and parallel to other, Inclined to both principal planes, Traces of a Line
4.4 Projection Planes: Perpendicular to both principal planes, Parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5 True length of lines: horizontal, inclined and oblique lines
4.6 Rules for parallel and perpendicular lines
4.7 Point view or end view of a line
4.8 Shortest distance from a point to a line
4.9 Edge View and True shape of an oblique plane
4.10 Angle between two intersecting lines
4.11 Intersection of a line and a plane, visible portion of line
4.12 Angle between a line and a plane
4.13 Dihedral angle between two planes
4.14 Shortest distance between two skew lines
4.15 Angle between two non- intersecting (skew) lines

5 Multi view (orthographic) projections (8 hours)

5.1 Orthographic Projections
- 5.1.1 First and third angle projection
- 5.1.2 Principal views: methods for obtaining orthographic views, Projection of lines, angles and plane surfaces, analysis in three views, projection of curved lines and surfaces, object orientation and selection of views for best representation, full and hidden lines
- 5.1.3 Orthographic drawings: making an orthographic drawing, visualizing objects (pictorial view) from the given views
- 5.1.4 Interpretation of adjacent areas, true-length lines, representation of holes, conventional practices

5.2 Sectional Views: Full, half, offset, broken (partial), rotated/aligned, revolved, removed (detail) sections, phantom of hidden section, specifying cutting planes for sections, conventions practices
5.3 Auxiliary views: Basic concept and use, drawing methods and types, symmetrical and unilateral auxiliary views, auxiliary sectional views

6 Developments and Intersections (7 hours)

6.1 Introduction and Projection of Solids with points transfer
6.2 Developments: general concepts and practical considerations, Triangulation method for approximate development of surfaces of a right/oblique; prism, cylinder, pyramid, cone, prism and cylinder cut by

oblique planes, frustum/truncated pyramid and cone, transition pieces for connecting different shapes and sphere

6.3 Intersections: lines of intersection of geometric surfaces, piercing point of a line and a geometric solid, intersection lines of two planes, intersections of – prism and prism, cylinder and prism, cylinder and cylinder, pyramid and prism, cone and prism, pyramid and cylinder, cone and cylinder.

7 Pictorial Drawings (7 hours)

7.1 Classifications: Advantages and Disadvantages

7.2 Isometric View

- 7.2.1 Axonometric Projection
- 7.2.2 Isometric Projection and Isometric Drawing (View)
- 7.2.3 Isometric and Non-isometric Lines; Isometric and Non-isometric Surfaces
- 7.2.4 Angles in Isometric Drawing
- 7.2.5 Circles and Circular Arcs in Isometric and Non-isometric Surfaces (slopes)
- 7.2.6 Irregular Curves in Isometric Drawing
- 7.2.7 Isometric sectional Views

7.3 Oblique Drawing

- 7.3.1 Procedure for making an Oblique drawing
- 7.3.2 Rules for Placing Objects in Oblique drawing
- 7.3.3 Angles, Circles and Circular Arcs in Oblique drawing

7.4 Perspective Projection

- 7.4.1 Terms used in Perspective Projection
- 7.4.2 Parallel and Angular Perspective
- 7.4.3 Selection of Station Point
- 7.4.4 Perspective projection of right prism and pyramid solid

Assignments

1. Geometrical Construction
2. Descriptive Geometry
3. Multi-view Projection I
4. Multi-view Projection II
5. Surface Development and Intersection
6. Isometric Drawing
7. Oblique Drawing and Perspective Projection

Laboratory

1. Drawing Sheet Layout, Freehand Lettering, Scale, Common Graphical Symbols, Sketching of parallel lines, circles, Dimensioning
2. Geometrical Construction (Sketch and Instrumental Drawing)
3. Descriptive Geometry I (Sketch and Instrumental Drawing)
4. Descriptive Geometry II (Sketch and Instrumental Drawing)
5. Multiview Drawings I (Sketch and Instrumental Drawing)

6. Multiview Drawings II (Sketch and Instrumental Drawing)
7. Multiview, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
8. Auxiliary View, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
9. Projection of Regular Geometrical Solids with point transfer (Sketch and Instrumental Drawing)
10. Surface Development of solids I (Sketch and Instrumental Drawing)
11. Surface Development of solids II (Sketch and Instrumental Drawing)
12. Intersection of solids (Sketch and Instrumental Drawing)
13. Isometric Drawing I (Sketch and Instrumental Drawing)
14. Isometric Drawing II (Sketch and Instrumental Drawing)
15. Oblique Drawing and Perspective Projection (Sketch and Instrumental Drawing)

Reference

1. "Fundamentals of Engineering Drawing", W. J. Luzadder, Prentice Hall.
2. "Engineering Drawing and Graphic Technology", T. E. French, C. J. Vierck, and R. J. Foster, Mc Graw Hill Publshing Co.
3. "Technical Drawing", F. E. Giescke, A. Mitchell, H. C. Spencer and J. T. Dygdone, Macmillan Publshing Co.
4. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publshing House, India.
5. "A Text Book of Engineering Drawing", P. S. Gill, S. K. Kataria and Sons, India
6. "A Text Book of Engineering Drawing", R. K. Dhawan, S. Chand and Company Limited, India
7. "Engineering Drawing I" and "Engineering Drawing II", M. C. Luintel, Heritage Publishers and Distributors Pvt. Ltd., Bhotahity, Kathmdu, Nepal

FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS ENGINEERING

EX 101

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

Course Objectives:
Objective of the course is to understand the language of electronics, elements, and their functionality, to introduce the DC and AC circuit analysis and basic understanding of analog systems and their applications

1 Basic Circuits Concepts (6 hours)

1.1 Current and Potential
1.2 Passive components: Resistance, Inductance, Capacitance; series, parallel combinations; Kirchhoff's voltage and current laws for dc circuits.
1.3 Signal sources: voltage and current sources; non ideal sources; representation under assumption of linearity; controlled sources: VCVS, CCVS, VCCS, CCCS; concept of gain, transconductance, transimpedance.
1.4 Maximum power transfer, Superposition theorem, Thevenin's theorem, Norton's theorem

2 Average and RMS Values (4 hours)

2.1 Generation of AC voltage
2.2 Waveform and its characteristics
2.3 RMS and Average values of periodic waveforms

3 AC Circuit Analysis (12 hours)

3.1 Single Phase AC Circuit Analysis
- 3.1.1 Series, parallel and network circuits with sinusoidal excitations
- 3.1.2 The concept of complex impedance and admittance
- 3.1.3 Sinusoidal excitation of inductive and capacitive reactance and complex impedance
- 3.1.4 Concept of time phase differences between various sinusoidal quantities
- 3.1.5 Phasor concept and phasor representation of AC quantities
- 3.1.6 Transformed Impedances and network reduction
- 3.1.7 Real , reactive and apparent power Concepts

3.2 Three Phase AC Circuit
- 3.2.1 Generation of three phase voltage
- 3.2.2 Wye and Delta connection

4 Diodes (7 hours)

4.1 Semiconductor diode characteristics
4.2 Modeling the semiconductor diode
4.3 Diode circuits: clipper; clamper circuits
4.4 Zener diode, LED, Photodiode, Varactor diode, Tunnel diodes
4.5 DC power supply: rectifier – half wave, full wave (center tapped, bridge), Zener regulated power supply

5 Transistor (10 hours)

5.1 BJT configuration and biasing, small and large signal model
5.2 T and π model
5.3 Concept of differential amplifier using BJT
5.4 BJT as switch and logic circuits
5.5 Construction and working principle of JFET, MOSFET and CMOS
5.6 MOSFET as logic circuits

6 The Operational Amplifier and Oscillator (6 hours)

6.1 Basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator, summing amplifier and their applications
6.2 Basic feedback theory; positive and negative feedback; concept of stability; oscillator
6.3 Waveform generator using op-amp for Square wave, triangular wave, Phase Shift oscillator and Wien bridge oscillator for sinusoidal waveform

Laboratory

1. Familiarization with passive components, function generator and oscilloscope
2. Measurement of amplitude, frequency, time period using oscilloscop
3. Ohm's law, series, parallel circuits and calculate average, RMS value
4. Verification of KCL, KVL and network theorems
5. Maximum power transfer/ capacitor charging and discharging
6. Diode characteristics, rectifiers, Zener diodes
7. Bipolar junction transistor characteristics and single stage amplifier
8. BJT, PMOS, NMOS and CMOS as switch
9. Inverting, non-inverting, summing and subtractor amplifier using Op-amp
10. Relaxation oscillator
11. Analog sensor and small projects

Reference

1. Robert Boylestad and Louis Nashelsky, "Electronic Device and Circuit Theory", PHI; 9th Edition, 2007

2. Thomas L. Floyd, “Electronic Devices”, 8th Edition, Pearson Education Inc., 2007
3. A.S. Sedra and K.C. Smith, “Microelectronic Circuits”, 6th Edition, Oxford University Press, 2006
4. J. R. Cogdell. “Foundation of Electrical Engineering”, prentice Hall, Englewood Cliffs, NewJersey, 1990.

ENGINEERING WORKSHOP

ME 106

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

Course Objectives:
After completing this course, the students will be able to practice workshop safety rules effectively with different hand tools and machine tools for producing metal and sheet metal components. Acquire knowledge and practice on casting, forging, welding, soldering, brazing and riveting.

1 Safety Measures in the Workshop (1 hour)

1.1 Causes of accident
1.2 Types of safety: General safety, personal safety, machine and equipment safety, job safety

2 Bench Work and Fittings (4 hours)

2.1 Fitting Tools: Types, uses of holding tools, sticking tools, cutting tools (files, chisels, hacksaw), scrapping tools (scrappers), drilling tools (drill bits), measuring, marking and testing tools (steel rule, calipers, divider, surface plate, scriber, surface gauge, punches, angle plate, try square, combination sets, vernier caliper, micrometer, bevel protractor, miscellaneous tools (wrenches, screw drivers and pliers)
2.2 Benchwork and fitting operation
2.3 Filling operations, chipping operations and sawing operation

3 Thread Cutting (1 hour)

3.1 Classification of threads
3.2 Thread cutting tools for hand threading
3.3 Threading taps: Types, uses and care
3.4 Threading dies: Types, uses and care
3.5 Thread cutting by hand: Cutting internal and external thread

4 Sheet Metal (2 hours)

4.1 Introduction, sheet metal tools, sheet metal operation

4.2 Rivet types, types of rivet joints, riveting tools and their uses, riveting procedure

5 Machine Tools (2 hours)

5.1 Lathes: Working principle, types of lathes, main parts of lathe, lathe operations (facing, centre drilling, turning, knurling, boring, chamfering, thread cutting, counter sinking, counter boring).

5.2 Drilling Machine: Types of drilling machine, types of drill bits, drilling operations (drilling, counter boring, reaming, tapping)

6 Forging and Casting (1.5 hours)

6.1 Introduction, forging tools, forging operations

6.2 Introduction, pattern making foundry tools, core making, sand casting process

7 Welding (2.5 hours)

7.1 Arc welding: Introduction, arc welding equipment and accessories, influencing factor in arc welding, methods of striking an arc (tap, scratch), electrodes, types of joint, welding positions, TIG, MIG welding

7.2 Gas welding: Oxyacetylene gas welding, oxyacetylene gas welding accessories, filler rods, fluxes, types of flames and uses

8 Brazing and Soldering (1 hour)

8.1 Introduction, brazing equipment and materials, brazing process, surface clearing, join design, support parts, brazing operations (heating, filler metal applications, flux application, clearing after brazing)

8.2 Introduction, flux, soft solder and soldering process

Laboratory

1. Fitting Practice: Demonstration, usage of different types of hand tools and measuring instruments.
2. Perform Filing, sawing, drilling and tapping operations on given Mild steel strip
3. Machining practice: Perform Lathe operations
4. Welding Practice: Perform Arc welding and Oxy-Acetylene gas welding operations
5. Sheet metal practice: Perform sheet metal operations
6. Soldering and brazing
7. Electrical installations

Reference

1. Khurmi, R. S., & Gupta, J. K. (2008). A Textbook of Workshop Technology. S. Chand Publishing.

2. Raghuwanshi, B. S. (1990). A Course in Workshop Technology, Volume II (machine tools). New Delhi: Dhanpat Rai & Company Ltd, 23(5), 309-316.
3. S. K. Hajra Choudhary, A. K. Hajra Choudhary (2005). Elements of Workshop Technology Vol. I and II: Manufacturing Processes. Media promoter & publishers Pvt. Ltd.
4. . Khurmi, R. S., & Gupta, J. K. (2008). A Textbook of Workshop Technology. S. Chand Publishing.
5. Rajput, R. K. (2007). A textbook of manufacturing technology: Manufacturing processes. Firewall Media.
6. Rao, K. V. (2002). Manufacturing Science and Technology-Manufacturing Processess and Machine Tools. New Age International.
7. Gerling Heinrich. (2006).All About Machine Tools, New Age International Publisher.

BACHELOR
IN
ELECTRICAL ENGINEERING

Year : I **Part : I**

Teaching Schedule								Examination Scheme							
								Theory			Practical			Total	Remark
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assessment Marks	Final			
									Duration hours	Marks		Duration hours	Marks		
1	SH 101	Engineering Mathematics I	3	3	2	-	5	40	3	60	-	-	-	100	
2	SH 102	Engineering Physics	4	4	1	2	7	40	3	60	25	-	-	125	
3	CT 101	Computer Programming	3	3	1	3	7	40	3	60	50	-	-	150	
4	ME 101	Engineering Drawing	2	2	-	4	6	20	3	30	50	-	-	100	
5	CE 104	Applied Mechanics	3	3	2	-	5	40	3	60	-	-	-	100	
6	EE 101	Electric Circuit I	3	3	1	3	7	40	3	60	50	-	-	150	
		Total	**18**	**18**	**7**	**12**	**37**	**220**	**-**	**330**	**175**	**-**	**-**	**725**	

Year : I **Part : II**

Teaching Schedule								Examination Scheme							
								Theory			Practical			Total	Remark
S. N.	Course Code	Course Title	Credits	L	T	P	Total	Assessment Marks	Final		Assessment Marks	Final			
									Duration hours	Marks		Duration hours	Marks		
1	SH 151	Engineering Mathematics II	3	3	2	-	5	40	3	60	-	-	-	100	
2	SH 153	Engineering Chemistry	3	3	1	3	7	40	3	60	25	-	-	125	
3	EX 154	Electronics Circuits	3	3	1	3	7	40	3	60	50	-	-	150	
4	CT 153	Advanced Computer Programming	3	3	1	3	7	40	3	60	50	-	-	150	
5	EE 151	Electric Circuit II	3	3	1	1.5	5.5	40	3	60	25	-	-	125	
6	EE 152	Electrical Installation Workshop	1	-	-	3	3	-	-	-	30	-	20	50	
		Total	**16**	**15**	**6**	**13.5**	**34.5**	**200**	**-**	**300**	**180**	**-**	**20.00**	**700**	

ENGINEERING MATHEMATICS I

SH 101

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

Course Objectives:
To equip the students with the essential mathematical skills and techniques that are relevant to the engineering fields and enable them to solve engineering problems using mathematical methods.

1 Derivatives and its Applications (10 hours)

1.1 Review of derivative and differentiability, mean value theorems with interpretations
1.2 Indeterminate forms, types and their real life examples, L-Hospital's Rule
1.3 Power series of single valued functions
  1.3.1 Taylor's series
  1.3.2 Maclaurin's series
1.4 Asymptotes to Cartesian and Polar curves
1.5 Pedal equation to Cartesian and Polar curves
1.6 Curvature and radius of curvature for Cartesian curves

2 Antiderivatives and its Applications (11 hours)

2.1 Review of definite and indefinite integrals
2.2 Differentiation under integral sign
2.3 Improper integrals
2.4 Application of Beta and Gamma functions
2.5 Area, arc length, volume and surface of revolution in plane for Cartesian curves
2.6 Centroid and moment of inertia under area of curve

3 Ordinary Differential Equations and its Applications (10 hours)

3.1 Review of: Order, degree, solution of first order first degree differential equations by variable separation method and solution of homogeneous equations.
3.2 Linear differential equation and equations reducible to linear differential equation of first order Bernoulli’s equation, modeling electric circuit
3.3 First order and higher degree differential equations; Clairaut’s form

3.4 Linear second order differential equations with constant coefficient and variable coefficients reducible to constant coefficients, Cauchy's equations and modeling mass spring system

3.5 Application in physical sciences and engineering

4 Plane Analytic Geometry (4 hours)

4.1 Transformation of coordinates: Translation and Rotation

4.2 Equation of conic in Cartesian and polar form, identification of conics

5 Three dimensional geometry (10 hours)

5.1 The Straight line: symmetrical and general form

5.2 Coplanar lines

5.3 Shortest Distance

5.4 Sphere: General equation, plane section by planes, tangent planes

5.5 Introduction to right circular cone and right circular cylinder

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Derivatives and its Applications
2. Antiderivatives and its Applications
3. Ordinary Differential Equations and its Applications
4. Plane Analytic Geometry
5. Three dimensional geometry

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4. Sastry S.S. (2008), Engineering Mathematics Volume I and II (4th ed.). PHI India.
5. Wylie C. and Barrett L.(1995), Advanced Engineering Mathematics (6th ed.), McGraw-Hill College.
6. Thomas, T. and Finny, R. (1984), Calculus and Analytic Geometry (6th ed.), Addison-Wesley.

ENGINEERING PHYSICS

SH 102

Lecture : 4 **Year : I**
Tutorial : 1 **Part : I/II**
Practical : 2

Course Objectives:
To provide students a concept and sound knowledge of physics with the emphasis in present day applications to apply them in relevant fields. The background of physics corresponding to Proficiency Certificate Level is assumed.

1 Oscillation (6 hours)

- 1.1 Physical pendulum
  - 1.1.1 Bar pendulum
  - 1.1.2 Interchangeability of point of suspension and point of oscillation
  - 1.1.3 Minimum time period in case of physical pendulum
  - 1.1.4 Torsion pendulum
- 1.2 Damped and Forced Oscillation
  - 1.2.1 Damped harmonic oscillator
  - 1.2.2 Difference between free and damped oscillator
  - 1.2.3 Energy in damped oscillation
  - 1.2.4 Relaxation time
  - 1.2.5 Forced oscillation and resonance
  - 1.2.6 Sharpness of resonance
  - 1.2.7 Quality factor

2 Acoustics (3 hours)

- 2.1 Introduction
  - 2.1.1 Threshold of hearing and loudness
  - 2.1.2 Reverberation and reverberation time
  - 2.1.3 Absorption coefficient
  - 2.1.4 Sabine's Law
  - 2.1.5 Conditions for good acoustics
- 2.2 Ultrasound
  - 2.2.1 Production (piezoelectric) of ultrasound and its applications
  - 2.2.2 Test of structure and materials
  - 2.2.3 Medical uses

3 Heat and Thermodynamics (8 hours)

- 3.1 Quantity of Heat
  - 3.1.1 Calorific value of Foods and Fuels
  - 3.1.2 Bomb Calorimeter
  - 3.1.3 Specific heat of solid: Dulong - Petit law, Einstein's law
- 3.2 Nature of Heat
  - 3.2.1 Degree of freedom
  - 3.2.2 Maxwell's law of equipartition of energy
  - 3.2.3 atomicity of gases
  - 3.2.4 Vander-Waal's equation of real gases
  - 3.2.5 Critical constants
- 3.3 Thermodynamics
  - 3.3.1 Laws of Thermodynamics
  - 3.3.2 Clapeyron latent heat equation
  - 3.3.3 Entropy and Third law of thermodynamics
  - 3.3.4 Negative energy
  - 3.3.5 Maxwell's thermodynamic relations
  - 3.3.6 Gibb's free energy and phase transitions
- 3.4 Heat and Mass Transfer
  - 3.4.1 Fourier's law of thermal conductivity
  - 3.4.2 Use of thermal conductivity in building sciences
  - 3.4.3 Thermal resistance
  - 3.4.4 Types of convection
  - 3.4.5 Law of diffusion
  - 3.4.6 Relation between Stefan's law and Newton's law of Cooling
  - 3.4.7 Pyrheliometer and Pyrometer

4 Optics (17 hours)

- 4.1 Geometrical optics
  - 4.1.1 Lens separation
  - 4.1.2 Chromatism in lens combination
- 4.2 Interference
  - 4.2.1 Interference in thin films (reflected and transmitted light)
  - 4.2.2 fringes produced by a wedge-shaped thin film
  - 4.2.3 Newton's rings (both reflected and transmitted case)
  - 4.2.4 Determination of wavelength of light and refractive index of liquid by using Newton's rings.
- 4.3 Diffraction
  - 4.3.1 Introduction: Fresnel and Fraunhoffer's diffraction
  - 4.3.2 Fraunhoffer's diffraction at single slit
  - 4.3.3 Intensity distribution in the diffraction pattern due to a single slit
  - 4.3.4 Multiple slits, diffraction grating
  - 4.3.5 X-ray diffraction, X-rays in material testing

4.4 Polarization
- 4.4.1 Introduction: double refraction, Nichol prism (construction and uses)
- 4.4.2 Retardation plate (quarter and half wave plates), plane, elliptical and circular polarized light (theoretical and mathematical explanation)
- 4.4.3 Optical activity, specific rotation

4.5 Laser
- 4.5.1 Introduction: Laser and ordinary light, properties of laser
- 4.5.2 Induced absorption, spontaneous and Stimulated emission, active medium, population inversion, metastable state
- 4.5.3 Pumping (types: optical, electrical, chemical and heating)
- 4.5.4 He-Ne laser, semiconductor Laser
- 4.5.5 Uses of laser

4.6 Fiber Optics
- 4.6.1 Introduction: Propagation of light wave
- 4.6.2 Types of optical fiber: step index and graded index
- 4.6.3 Fiber transmission – single and multimode, self focusing, acceptance angle and numerical aperture
- 4.6.4 Applications

5 Electrostatics (8 hours)

5.1 Electric Field
- 5.1.1 Electric field due to a electric dipole (along axial line and equatorial line)
- 5.1.2 Electric dipole in an external electric field
- 5.1.3 Electric field due to linear electric quadrupole (along axial line)
- 5.1.4 Electric field: a ring of charge, circular ring and disc of charge

5.2 Electric Potential
- 5.2.1 Potential due to electric dipole
- 5.2.2 Potential due to linear quadrupole
- 5.2.3 potential due to continuous charge distribution, potential due to ring of charge and disc of charge

5.3 Capacitors
- 5.3.1 Cylindrical Capacitor
- 5.3.2 Charging and discharging of capacitor
- 5.3.3 Capacitor with dielectrics: dielectrics and Gauss law
- 5.3.4 High intensity electrostatic fields: uses and hazards (xerography, inkjet, precipitation)

6 Electromagnetism (6 hours)

6.1 Electromagnetic induction
- 6.1.1 Faraday's laws
- 6.1.2 Induction and energy transformation
- 6.1.3 Induced electric field
- 6.1.4 Self-induction and mutual induction
- 6.1.5 LR circuit
- 6.1.6 Energy stored in a magnetic field and energy density
- 6.1.7 Induced magnetic field: modified Ampere's law and displacement current

6.2 Eddy Current
- 6.2.1 Introduction
- 6.2.2 Applications: Induction cooker, Electric Guitar, Metal Detector and Eddy Current Breaking
- 6.2.3 Cyclotron and Synchrotron

7 Electromagnetic waves (6 hours)

7.1 Maxwell's Equations
- 7.1.1 Differential and integral forms
- 7.1.2 Conversion of Maxwell's equations from integral form to differential form and differential form to integral form
- 7.1.3 Maxwell's equations in different media

7.2 Applications
- 7.2.1 Wave equations: non conducting and conducting medium and free space
- 7.2.2 Plane solution of wave equations, amplitude of electromagnetic waves, speed of electromagnetic waves, ratio of electric and magnetic fields
- 7.2.3 Continuity equation
- 7.2.4 Energy transfer and Poynting vector, Radiation pressure

8 Photon and matter waves (6 hours)

8.1 Quantum Physics
- 8.1.1 Inadequacy of classical mechanics and rise of quantum mechanics, Quantization of energy
- 8.1.2 Group velocity and phase velocity, electrons and matter waves
- 8.1.3 de-Broglie wavelength, its applications
- 8.1.4 Heisenberg uncertainty principle and its applications
- 8.1.5 Wave functions and its significance

8.2 Schrodinger wave equation
- 8.2.1 Time dependent and independent equation
- 8.2.2 Probability distribution
- 8.2.3 One dimensional infinite potential well, particle in a box
- 8.2.4 Barrier tunneling (reflection and transmission coefficient)

Laboratory

1. To determine the acceleration due to gravity and radius of gyration of the given metal bar using bar pendulum.
2. To determine the modulus of elasticity of the given material and moment of inertia of the circular disc about the wire as an axis passing through its center and perpendicular to its plane by using torsional Pendulum
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee's method
4. To determine the mechanical equivalent of heat by given method
5. To determine the wavelength of the sodium light using Newton's rings
6. To determine the wavelength of sodium light using wedge-shaped method
7. To determine the wavelength of LASER light using diffraction grating and hence determine the particle size of lycopodium power
8. To determine the focal length of two lenses when they are separated by some finite distance
9. To determine the chromatic aberration of a convex lens between red and blue colors
10. To determine the capacitance of the given capacitor by the method of charging and discharging through resistor
11. To plot the graph between frequency and current in LCR series circuit and hence determine the quality factor of the circuit
12. To study the growth and decay of current in LR circuit then determine the self-inductance of the given inductor
13. To determine the dielectric constant of the given material

Reference

1. Halliday, Resnick, Walker, "Fundamentals of Physics', John Wiley & Sons. Lnc.
2. Pokharel, Bhattarai, and Paudel "Fundamentals of Engineering Physics", Benchmark Publication.
3. Brij Lal and Subrahmanyam, ''A text book of Optics", S. Chand Publisher.
4. Basudeva, A.S. 'Modern Engineering Physics", S. Chand Publisher.
5. Caur R. K. and Gupta, S. L., "Engineering Physics', Dhanpat Publisher.
6. Brij Lal and Subrahmanyam, 'Waves and Oscillation", S. Chand publisher.
7. Brij Lal and Subrahmanyam, 'Heat and Thermodynamics", S. Chand publisher
8. Avadhanulu, Kshirsaga and Arun Murthy, A text Book of Engineering Physics, S. Chand publisher.

COMPUTER PROGRAMMING

CT 101

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

Course Objectives:

The primary goal of this course is to provide students with a solid foundation in the principles of programming and to impart practical skills in the C programming language. This course ensures that students comprehend the fundamental concepts of variables, data types, control structures, and functions within the context of C. Advanced topics such as pointers, structures, file handling and the Standard C Library are explored to broaden students' programming capabilities. Also, through project-based assessments and evaluations, students apply their knowledge to real-world scenarios, fostering creativity and project development skills.

1 Introduction to Computer Programming (3 hours)

1.1 Definition of a computer program and programming language
1.2 Types and Generations of Programming Languages
1.3 Problem-Solving using a Computer
  1.3.1 Problem Analysis
  1.3.2 Algorithm and Flowchart
  1.3.3 Programming
  1.3.4 Compilation, Linking and Execution
  1.3.5 Debugging and Testing
  1.3.6 Documentation

2 Overview of C Programming (3 hours)

2.1 Introduction to C programming
2.2 History and Importance of C
2.3 C Headers and Library Functions
2.4 Basic Structure of a C Program
2.5 Preprocessor Directives
2.6 Tokens in C (Character set, Keywords and Identifiers)
2.7 Type Casting (Implicit and Explicit)
2.8 Data Types, Variables and Constants
2.9 Compiler and IDE for C Programming

3 Operators and Expressions (4 hours)

- 3.1 Introduction to Operators and Expressions
- 3.2 Arithmetic, Relational and Logical Operators
- 3.3 Assignment, Increment and Decrement Operators
- 3.4 Conditional, Bitwise and Special Operators
- 3.5 Comma Operator, size of Operator
- 3.6 Evaluation and Type Conversion in Expressions
- 3.7 Operator Precedence and Associativity

4 Input and Output (3 hours)

- 4.1 Introduction to data I/O in C
- 4.2 Unformatted I/O
  - 4.2.1 Character I/O
  - 4.2.2 String I/O
- 4.3 Formatted I/O
  - 4.3.1 Control String (flags, field width, precision, and specifier)
  - 4.3.2 Formatted I/O (scanf(), printf())

5 Control Structures (8 hours)

- 5.1 Introduction to Simple and Compound Statement
- 5.2 Sequential Statement
- 5.3 Branching Statement
  - 5.3.1 Simple if Statement
  - 5.3.2 if-else Statement
  - 5.3.3 Nested if-else Statement
  - 5.3.4 else-if Ladder
  - 5.3.5 switch Statement
  - 5.3.6 go to statement
- 5.4 Looping Statement
  - 5.4.1 for loop
  - 5.4.2 while loop
  - 5.4.3 do while
  - 5.4.4 Nested loop
- 5.5 Loop Interruption
  - 5.5.1 break
  - 5.5.2 continue

6 Array and Pointer (7 hours)

6.1 Introduction to an Array
6.2 One-dimensional Array
6.3 Two-dimensional Array
6.4 Multidimensional Array
6.5 Introduction to String
6.6 String Handling Functions
6.7 Definition of a Pointer
6.8 Pointer Declaration
6.9 Pointer Arithmetic
6.10 Relationship between Pointer and Arrays

7 User-defined Functions (6 hours)

7.1 Introduction to Function
7.2 Advantages of Function
7.3 Elements of User-defined Function
  7.3.1 Function Definition
  7.3.2 Function Prototype
  7.3.3 Function Parameters
7.4 Storage Class
7.5 Scope Rules
7.6 Category of Functions
  7.6.1 Functions with no arguments and no return values
  7.6.2 Functions with arguments and no return values
  7.6.3 Functions with arguments and return values
  7.6.4 Functions with no arguments and return values
7.7 Recursive functions
7.8 Function Call by Values and Reference
7.9 Passing Array and String to Function

8 Structures (5 hours)

8.1 Defining a Structure
8.2 Declaring and Accessing Structure Elements
8.3 Initializing Structure
8.4 Array of Structure
8.5 Array as member to Structure
8.6 Pointer as member to Structure
8.7 Structure as a member to Structure
8.8 Passing and Returning Structures to/from Function

9 File management (4 hours)

- 9.1 Introduction
- 9.2 Binary and Text File in C
- 9.3 File Opening Modes
- 9.4 Defining, Opening and Closing File
- 9.5 Input-output operations on files
  - 9.5.1 Character I/O (fputc(), fgetc())
  - 9.5.2 String I/O (fgets(), fputs())
  - 9.5.3 Formatted I/O (fscanf(), fprintf())
  - 9.5.4 Record I/O (fwrite(), fread())
- 9.6 Overview of Random File Access
- 9.7 Error handling

10 Recent Trends in Programming (2 hours)

- 10.1 Introduction to Object Oriented Programming (OOP)
- 10.2 Definitions of Class, Method and Object in OOP
- 10.3 Difference between Procedure Oriented and OOP
- 10.4 Overview of other High Level Programming Languages

Laboratory

1. Lab 1: Introduction and Demonstrations of projects written in C
2. Lab 2: Formatted and Unformatted Input/output in C
3. Lab 3: Branching in Control Structure
4. Lab 4: Looping in Control Structure
5. Lab 5: Array in C
6. Lab 6: String in C
7. Lab 7: Pointers in C
8. Lab 8: User Defined functions in C
9. Lab 9: Structure in C
10. Lab 10: File handling in C
11. Group project on C maximum 4 students in a group at the end of the course.

Reference

1. Robert Lafore, “C Programming Using Turbo C++”, SAMS publication
2. E. Balagurusamy, “Programming in Ansi C”, McGraw Hill Education
3. Bryons S. Gotterfried, “Programming with C”, TMH ….

ENGINEERING DRAWING

ME 101

Lecture : 2 **Year : I**
Tutorial : 0 **Part : I**
Practical : 4

Course Objectives:

To develop basic projection concepts with reference to points, lines, planes and geometrical solids. Also, to develop sketching and drafting skills to facilitate communication.

1 Instrumental Drawing, Technical Lettering Practices and Techniques (1 hour)

1.1 Equipment, materials and drawing sheets (paper)
1.2 Description of drawing instruments, auxiliary equipment and drawing materials
1.3 Techniques of instrumental drawing
1.4 Pencil sharpening, securing paper, proper use of T- squares, triangles, scales dividers, compasses, erasing shields, French curves, inking pens
1.5 Line types and uses, thickness

2 Dimensioning (1 hour)

2.1 Fundamentals and techniques
2.2 Size and location dimensioning, SI conversions
2.3 Scales: Types and Representative factor
2.4 Use of scales, measurement units, reducing and enlarging drawings
2.5 Placement of dimensions: aligned and unidirectional, chain, parallel/baseline and combined type
2.6 Tolerance Dimensioning

3 Geometrical Construction (2 hours)

3.1 Plane geometrical construction: Proportional division of lines, Trisection of angles, smooth arc & line tangents
3.2 Methods for drawing regular polygons and standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices (cylindrical and conical), ogee curve
3.3 Techniques to reproduce a given drawing (by construction)

4 Basic Descriptive Geometry (4 hours)

4.1 Introduction to Orthographic projection, Principal Planes, Four Quadrants or Angles
4.2 Projection of points on first, second, third and fourth quadrants
4.3 Projection of Lines: Parallel to one of the principal planes, Inclined to one of the principal plane and parallel to other, Inclined to both principal planes, Traces of a Line
4.4 Projection Planes: Perpendicular to both principal planes, Parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5 True length of lines: horizontal, inclined and oblique lines
4.6 Rules for parallel and perpendicular lines
4.7 Point view or end view of a line
4.8 Shortest distance from a point to a line
4.9 Edge View and True shape of an oblique plane
4.10 Angle between two intersecting lines
4.11 Intersection of a line and a plane, visible portion of line
4.12 Angle between a line and a plane
4.13 Dihedral angle between two planes
4.14 Shortest distance between two skew lines
4.15 Angle between two non- intersecting (skew) lines

5 Multi view (orthographic) projections (8 hours)

5.1 Orthographic Projections
- 5.1.1 First and third angle projection
- 5.1.2 Principal views: methods for obtaining orthographic views, Projection of lines, angles and plane surfaces, analysis in three views, projection of curved lines and surfaces, object orientation and selection of views for best representation, full and hidden lines
- 5.1.3 Orthographic drawings: making an orthographic drawing, visualizing objects (pictorial view) from the given views
- 5.1.4 Interpretation of adjacent areas, true-length lines, representation of holes, conventional practices

5.2 Sectional Views: Full, half, offset, broken (partial), rotated/aligned, revolved, removed (detail) sections, phantom of hidden section, specifying cutting planes for sections, conventions practices
5.3 Auxiliary views: Basic concept and use, drawing methods and types, symmetrical and unilateral auxiliary views, auxiliary sectional views

6 Developments and Intersections (7 hours)

6.1 Introduction and Projection of Solids with points transfer
6.2 Developments: general concepts and practical considerations, Triangulation method for approximate development of surfaces of a right/oblique; prism, cylinder, pyramid, cone, prism and cylinder cut by

oblique planes, frustum/truncated pyramid and cone, transition pieces for connecting different shapes and sphere

6.3 Intersections: lines of intersection of geometric surfaces, piercing point of a line and a geometric solid, intersection lines of two planes, intersections of – prism and prism, cylinder and prism, cylinder and cylinder, pyramid and prism, cone and prism, pyramid and cylinder, cone and cylinder.

7 Pictorial Drawings (7 hours)

7.1 Classifications: Advantages and Disadvantages

7.2 Isometric View

- 7.2.1 Axonometric Projection
- 7.2.2 Isometric Projection and Isometric Drawing (View)
- 7.2.3 Isometric and Non-isometric Lines; Isometric and Non-isometric Surfaces
- 7.2.4 Angles in Isometric Drawing
- 7.2.5 Circles and Circular Arcs in Isometric and Non-isometric Surfaces (slopes)
- 7.2.6 Irregular Curves in Isometric Drawing
- 7.2.7 Isometric sectional Views

7.3 Oblique Drawing

- 7.3.1 Procedure for making an Oblique drawing
- 7.3.2 Rules for Placing Objects in Oblique drawing
- 7.3.3 Angles, Circles and Circular Arcs in Oblique drawing

7.4 Perspective Projection

- 7.4.1 Terms used in Perspective Projection
- 7.4.2 Parallel and Angular Perspective
- 7.4.3 Selection of Station Point
- 7.4.4 Perspective projection of right prism and pyramid solid

Assignments

1. Geometrical Construction
2. Descriptive Geometry
3. Multi-view Projection I
4. Multi-view Projection II
5. Surface Development and Intersection
6. Isometric Drawing
7. Oblique Drawing and Perspective Projection

Laboratory

1. Drawing Sheet Layout, Freehand Lettering, Scale, Common Graphical Symbols, Sketching of parallel lines, circles, Dimensioning
2. Geometrical Construction (Sketch and Instrumental Drawing)
3. Descriptive Geometry I (Sketch and Instrumental Drawing)
4. Descriptive Geometry II (Sketch and Instrumental Drawing)
5. Multiview Drawings I (Sketch and Instrumental Drawing)

6. Multiview Drawings II (Sketch and Instrumental Drawing)
7. Multiview, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
8. Auxiliary View, Sectional Drawings and Dimensioning (Sketch and Instrumental Drawing)
9. Projection of Regular Geometrical Solids with point transfer (Sketch and Instrumental Drawing)
10. Surface Development of solids I (Sketch and Instrumental Drawing)
11. Surface Development of solids II (Sketch and Instrumental Drawing)
12. Intersection of solids (Sketch and Instrumental Drawing)
13. Isometric Drawing I (Sketch and Instrumental Drawing)
14. Isometric Drawing II (Sketch and Instrumental Drawing)
15. Oblique Drawing and Perspective Projection (Sketch and Instrumental Drawing)

Reference

1. "Fundamentals of Engineering Drawing", W. J. Luzadder, Prentice Hall.
2. "Engineering Drawing and Graphic Technology", T. E. French, C. J. Vierck, and R. J. Foster, Mc Graw Hill Publshing Co.
3. "Technical Drawing", F. E. Giescke, A. Mitchell, H. C. Spencer and J. T. Dygdone, Macmillan Publshing Co.
4. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publshing House, India.
5. "A Text Book of Engineering Drawing", P. S. Gill, S. K. Kataria and Sons, India
6. "A Text Book of Engineering Drawing", R. K. Dhawan, S. Chand and Company Limited, India
7. "Engineering Drawing I" and "Engineering Drawing II", M. C. Luintel, Heritage Publishers and Distributors Pvt. Ltd., Bhotahity, Kathmdu, Nepal

APPLIED MECHANICS

CE 104

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

Course Objectives:
This course helps to analyze the effect of various types of Forces on the particle and rigid body at rest. It also provides concept and knowledge of Engineering Application and helps to understand Structural Engineering in later courses by using basics of Mechanics in their branch of engineering.

1 Basic Concept of Mechanics and Static Equilibrium (6 hours)

1.1 Definitions, Type and Scope of Mechanics
1.2 Fundamental Concepts and Principles of Engineering Mechanics
1.3 Concept of Particle, Rigid and Deformed Bodies
1.4 Physical Meaning of Equilibrium and its Essence in Structural Application
1.5 Equation of Equilibrium in 2D and 3D Analysis of Particle and Rigid Body
1.6 Concept of Free Body Diagram with Examples

2 Forces Acting on Particle and Rigid Body (10 hours)

2.1 Different Types of Forces: Internal/External Force, Adhesive/ Cohesive Force, Point/ Line/ Surface Force and Contact/ Body Force
2.2 Resolution and Composition of Forces
2.3 Principle of Transmissibility and Equivalent Forces
2.4 Varignon's Theorem and it's Application
2.5 Moments of a Force About a Point and About an Axis
2.6 Definition, Types and Characteristics of Couple
2.7 Resolution of a Force into a Force and a Couple

3 Friction (5 hours)

3.1 Definition, Types and Uses of Friction, Laws of Friction, Static and Dynamic Coefficient of Friction, Angle of Friction
3.2 Sliding and Overturning Condition of a Body
3.3 Practical Examples of Dry Friction (Ladder and Wedge Friction)

4 Analysis of Simple Beams and Frames (12 hours)

4.1 Introduction to Structures
4.2 Various Types of Load on the Structure
4.3 Various Types of Supports; Reactions and Degree of Freedom
4.4 Internal and External Forces in the Structure
4.5 Relationship Between Load, Shear Force and Bending Moment
4.6 Statically and Geometrically Stable/ Unstable Beams and Frames
4.7 Statically Determinate and Indeterminate Beams and Frames, Degree of Static Indeterminacy
4.8 Axial Force, Shear Force and Bending Moment Diagrams for Determinate Beams and Frames

5 Analysis of Plane Trusses (6 hours)

5.1 Definition of Truss, Assumption of Ideal Truss, Types and Uses of Truss in Engineering
5.2 Statically and Geometrically Stable and Unstable Truss
5.3 Statically Determinate and Indeterminate Truss, Degree of Static Indeterminacy
5.4 Analysis of Truss by the Method of Joint and Section/ Moment

6 Centre of Gravity, Centroid, Moment of Inertia, and Mass Moment of Inertia (6 hours)

6.1 Concepts of Centre of Gravity and Centroid of Line, Area and Volume
6.2 Second Moment of Area/Moment of Inertia and Radius of Gyration
6.3 Perpendicular and Parallel Axis Theorem for Moment of Inertia

Tutorials

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

1. Basic Concept of Mechanics and Static Equilibrium (2 hours)
2. Forces Acting on Particle and Rigid Body (6 hours)
3. Friction (3 hours)
4. Analysis of Simple Beams and Frames (8 hours)
5. Analysis of Plane Trusses (5 hours)
6. Centre of Gravity, Centroid, Moment of Inertia and Mass Moment of Inertia (6 hours)

Reference

1. Beer F.P. and E.R. Johntson “Vector Mechanics for Engineers”, Tata McGraw Hill Publishing Co.Ltd.
2. R.C. Hibbler, Ashok Gupta, “Engineering Mechanics –Statics and Dynamics”, New Delhi, Pearson,
3. I.C. Jong and B.G. Rogers, “Engineering Mechanics- Statics and Dynamics”,

4. R. Suwal, “A Text Book of Applied Mechanics” Second Edition, Mark Line Publication
5. H.R. Parajuli and S. Neupane “Applied Mechanics for Engineers” M.K. Publishers and Distributors
6. M.R. Dhital, “A Course Manual on Applied Mechanics I (Statics)”, TU, IOE, CIMDU,
7. Shame, I.H., “Engineering Mechanics- Statics and Dynamics”, Prentice Hall of India, New Delhi,
8. R.S. Khurmi, “A Text Book of Engineering Mechanics”,

ELECTRIC CIRCUIT I

EE 101

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

Course Objectives:
To understand the fundamental concept and analysis of AC and DC electrical circuits.

1 Introduction to Electric Circuits (6 hours)

1.1 Overview of electrical supply
1.2 Electric current and potential
1.3 Circuit components
  1.3.1 Electrical sources: dependent and independent, voltage and current source
  1.3.2 Electrical load: Linear and nonlinear
1.4 Ohm's law, limitation and application
1.5 Resistance and resistivity
1.6 Factors affecting resistance
1.7 Effect of temperature on resistance
1.8 Conductance and conductivity
1.9 Power and energy
1.10. Series and parallel combination of resistor
1.11. Current and voltage divider rules

2 DC Network Analysis (16 hours)

2.1 Network terminology
2.2 Kirchhoff's laws
2.3 Nodal analysis method
2.4 Mesh analysis method
2.5 Star/Delta and Delta/Star transformation
2.6 Superposition theorem
2.7 Thevenin's theorem
2.8 Norton's theorem
2.9 Maximum power transfer theorem
2.10 Compensation theorem and reciprocity theorem

3 Capacitance and Inductance (4 hours)

3.1 General concept of capacitance and geometrical point of view
3.2 Factors affecting capacitance
3.3 Energy stored in capacitor
3.4 Capacitors in series, parallel combination
3.5 General concept of inductance and geometrical point of view
3.6 Inductance in series, parallel combination with mutual inductance.
3.7 Energy stored in an inductor

4 AC System (5 hours)

4.1 Introduction of AC quantities
4.2 Faraday's law of electromagnetic induction
4.3 Generation of alternating voltage
4.4 Waveform and its characteristics
4.5 Average value
4.6 Root mean square (rms) value
4.7 Phase and phase difference
4.8 Phasor representation

5. Single Phase AC Circuit (8 hours)

5.1 AC circuit analysis with resistive, inductive and capacitive load
5.2 AC circuit analysis comprising series configurations of RL, RC, and RLC loads.
5.3. AC parallel circuit analysis
5.4. Resonance in RLC series and parallel circuit, bandwidth and quality factor
5.5. Measurement of power in single phase AC system

6. Three Phase Circuit Analysis (6 hours)

6.1 Advantage of three phase AC system
6.2 Generation of three phase AC Voltage
6.3 Phase sequence and its importance
6.4 Interconnection of three phase coils
6.5 Phase and line quantities in star and delta connection
6.6 Analysis with balanced and unbalanced load
6.7 Power measurement in three phase AC circuit and Blondel theorem
6.8 Power factor and its correction

Tutorial

Tutorials will encompass numerical exercises from all chapters

Assignment

1. Numerical and theory works

Laboratory

1. Familiarization of electrical Elements, sources and measuring devices related to electrical circuits and safety rules to be followed in Labs
2. Verification of Ohms Law and effect of temperature on resistance.
3. Verification of Kirchhoff's Law and Series and Parallel Combination of Resistor
4. Verification of Thevenin Theorem and Maximum Power Transfer Theorem
5. Verification of Superposition and Reciprocity Theorem
6. Measurement of Inductance of a coil and perform series-parallel combination of Capacitor and Inductor.
7. Verifications of Faradays Law of Induction.
8. Measurement of AC Quantities using Oscilloscope and study phase relation of RL and RC load.
9. Measurement of Power and Power Factor in a Single-Phase AC Series RL Circuit and Study of Improvement of Power Factor using Capacitor
10. Study the Phenomenon of Resonance in RLC Series and parallel Circuit
11. Measurement of line, phase and neutral relations in three phases Balanced and unbalanced Load.
12. Phase Sequence Detection and Power Analysis using a Power Analyzer
13. To Study Power Measurement in a Three Phase AC Circuits by Two - Wattmeter Method.
14. Conduct a hands-on practical assessment
15. Conduct an oral examination

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3. Rizzoni, Giorgio, and James Kearns. Fundamentals of electrical engineering. New York: McGraw-Hill, 2009.
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5. Mayergoyz, Isaak D., and Wes Lawson. Basic electric circuit theory: a one-semester text. Gulf Professional Publishing, 1997.
6. Theraja, B. L. A textbook of electrical technology. S. Chand Publishing, 2014.