BACHELOR
IN
ELECTRICAL ENGINEERING

Year : I   **Part : I**

S. N.	Course Code	Course Title	Credits	L	T	P	Total	Theory Assessment Marks	Theory Final Duration hours	Theory Final Marks	Practical Assessment Marks	Practical Final Duration hours	Practical Final Marks	Total	Remark
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**

S. N.	Course Code	Course Title	Credits	L	T	P	Total	Theory Assessment Marks	Theory Final Duration hours	Theory Final Marks	Practical Assessment Marks	Practical Final Duration hours	Practical Final Marks	Total	Remark
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

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

Tutorial : 1

Practical : 3

Year : I

Part : I

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

Reference

1. Cogdell, J. R. "" Foundations of electrical engineering," Prentice-Hall Inc., USA. pp. 11-16." (1996).
2. Hughes, Thomas P. Human-built world: How to think about technology and culture. University of Chicago Press, 2004.
3. Rizzoni, Giorgio, and James Kearns. Fundamentals of electrical engineering. New York: McGraw-Hill, 2009.
4. Alexander, Charles K. Fundamentals of electric circuits. McGraw-Hill,, 2013.
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.