1. MATHEMATICS

16UMA 101T MATHEMATICS I

Prerequisite: 11th and 12th Std. Mathematics

Course Objectives:

1. Students should be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal.
2. Students should understand the meaning of the derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems.
3. Students should understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of a rate of change and should be able to use integrals to solve a variety of problems.
4. Students should understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
5. Students should be able to communicate mathematics both orally and in well-written sentences and should be able to explain solutions to problems.
6. Students should be able to model a written description of a physical situation with a function, a differential equation, or an integral.
7. Students should develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishment.
8. Students should able to know the physical significance of gradient, divergence and curl.

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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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UNIT I
Calculus for single variable: Successive differentiation, Leibnitz theorem (without proof), Taylor’s and Maclaurin's expansion of functions of single variable. Fundamental theorem of Integral calculus, Application of integrals to length, area, volume and surface area of revolution.

Curve Tracing: Asymptotes, Cartesian, polar and parametric forms.

UNIT II
Calculus for of Several variable: Partial derivatives, Euler's theorem, directional derivative and gradient, Taylor's and Maclaurin's expansion of functions of several variables, Maxima and minima of functions of several variables, Lagrange's method of undetermined multipliers, Multiple Integrals – double and triple, Jacobian, Change of order of integration, change of coordinates, evaluation of area, volumes of solids, Mass, center of gravity and moment of inertia.

UNIT III

UNIT IV
Vector Calculus: Scalar and vector fields, Line and surface Integrals, Gradient divergent curl, Green’s Theorem and Stoke’s theorem (without proof) with application and physical significance.

APPROXIMATE TOTAL 39 Hours

Texts and References
7. Calculus, Ravish Singh, Mukul Bhatt
**Course Outcomes:**

1. Be able to recognize odd, even, periodic, increasing, decreasing functions
2. Know higher order derivatives of power, trigonometric, exponential, hyperbolic, logarithmic and inverse trigonometric functions.
3. Know the chain rule and use it to find derivatives of composite functions
4. Be able to use derivatives to find intervals on which the given function is increasing or decreasing
5. Find maxima and minima, critical points and inflection points of functions of two or more variables.
6. Be able to sketch graphs of rational functions including finding asymptotes
7. Be able to find tangents and normals to graphs of functions given in explicit, implicit and parametric forms
8. Be able to evaluate line and surface integrals using Green’s, Stokes and Gauss divergence theorems.
9. Understand the concept of definite integral and know the basic properties of definite integrals
10. Know the fundamental theorem of calculus and be able to use it for evaluating definite integrals and derivatives of integrals with variable limits of integration
11. Understand the concept of area of regions with curvilinear boundaries, be able to find area between curves.
12. Be able to convert cartesian coordinates in polar coordinates and vice-versa.

Mapping :- An ability to identify, critically analyze, formulate and solve engineering problems through differential and integral calculus
2. ELEMENT OF CIVIL ENGINEERING & MECHANICS

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<th>Exam Hours</th>
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Course Objectives: Students should learn
1. Basic information of Civil Engineering structures and their scopes
2. Evaluation of resultant of concurrent and non-concurrent system of forces and to understand the concept of Equilibrium of concurrent
3. The concept of Equilibrium of non-concurrent system of forces and Problems solving procedure related to plane truss
4. The concept of Friction and the calculation of centroid and moment of inertia of compound lamina

Course Outcomes: At the end of semester students should able to
1. Explain basic information of Civil Engineering structures and their scopes
2. Compute the resultant of concurrent and non-concurrent system of forces and to solve the equilibrium problems of concurrent
3. Solve the problems related to support reactions, plane truss
4. Solve friction related problems and to calculate centroidal distances and moment of inertias of compound lamina

UNIT –I

Basics and scope of Civil Engineering:
- Introduction to Civil Engineering, Role of Civil Engineer, Scope of Civil Engineering
- Brief introduction to sub branches of Civil Engineering: Transportation Engineering, Environmental Engineering, Water resources Engineering, Geotechnical Engineering, Structural Engineering, Engineering Surveying
- Construction Materials: Basic ingredients of Concrete, smart materials/alternate materials
- Brief details of residential, commercial buildings, Green buildings, smart cities

UNIT – II

Concurrent system of forces: Definition of a force, system of forces and their classifications, principle of transmissibility, resolution of a force and its rectangular components, triangular, parallelogram and polygon law of forces. Determination of resultant of concurrent coplanar system of forces.

Non-concurrent system of forces: Moment of a force, Varignon’s theorem of moments, couples and their characteristics. Determination of magnitude, direction and position of resultant of non-concurrent coplanar system of forces. Example problems.
**Equilibrium of concurrent system of forces:** Conditions of equilibrium for concurrent coplanar system of forces, Lami’s theorem. Example problems  

| UNIT - III |  
|---|---|
| **Equilibrium of non-concurrent system of forces.** Types of supports, loads and beams. Conditions of equilibrium for non-concurrent coplanar system of forces, Determination of support reactions for statically determinate beams i.e simply supported beam, cantilever beam. Overhanging beams. |  
| **Trusses:** Definition: Plane truss, determinate truss and indeterminate truss. Analysis of plane determinate trusses for member forces and reactions, using method of joints and method of sections with numerical examples. |  
|  
| UNIT – IV |  
|---|---|
| **Friction:** Introduction, angle of friction, coefficient of friction, cone friction, limiting friction, types of friction, laws of static friction, Example problems related to impending motion on horizontal and inclined planes, wedge friction and ladder friction. |  
| **Centroid and Centre of Gravity:** Definition, derivation of expressions for centroidal distances of simple planar laminas like rectangle, triangle, quarter and semi circles. Determination of centroidal distances of compound laminas. |  
| **Moment of Inertia:** Definition, derivations of expressions for moment of inertia of simple planar laminas like rectangle, triangle, quarter, semi circle and circle. Theorems of perpendicular and parallel axis. concept of axis of symmetry, Definitions of polar moment of inertia, radius of gyration, Determination of moment of inertia, polar moment of inertia, radius of gyration of compound laminas about centroidal axes and about any specified reference line. |
References:

4. Elements of Civil Engineering by Jagadeesh T.R. and Jayaram, Sapna Book House, Bangalore
3. ELEMENTS OF ELECTRICAL ENGINEERING

<table>
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<tr>
<th>Course Code: UEE 106</th>
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UNIT I

**GENERAL:** Concepts of E.M.F., potential difference and current, resistance, effect of temperature on resistance, resistance temperature coefficient, and insulation resistance. S.I. units of work, power and energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems, batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd and Ni-MH batteries, current capacity and cell ratings, charging methods and maintenance procedure.

**D.C. CIRCUITS:** Classification of electrical networks, Ohm's law, Kirchhoff’s law and their applications for network solutions. Simplifications of networks using series and parallel combinations and star-delta conversions.

UNIT II

**ELECTROMAGNETISM:** Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor and toroid. Concept of M.M.F., flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series and parallel magnetic circuits, analogy of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming’s left hand rule. Faraday’s laws of electromagnetic induction, statically and dynamically induced E.M.F., self and mutual inductance, coefficient of couplings. Energy stored in magnetic field. Charging and discharging of inductor and time constant.

**ELECTROSTATICS:** Electrostatics field, electric flux density, electric field strength, absolute permittivity, relative permittivity, capacitance and capacitor, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and time constant.

**AC FUNDAMENTALS:** Sinusoidal voltages and currents, their mathematical and graphical representation, concept of instantaneous, peak (maximum), average and R.M.S. values, frequency, cycle, period, peak factor and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors.

UNIT III

**SINGLE PHASE A.C. CIRCUITS:** Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and R-L-C circuit, concept of impedance, admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, concept of active, reactive and apparent power and power factor.
**POLYPHASE A.C. CIRCUITS:** Concept of three-phase supply and phase sequence. Voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads along with phasor diagrams.

**SINGLE PHASE TRANSFORMERS:** Construction, principle of working, E.M.F. equation, voltage and current ratios. Losses, definition of regulation and efficiency, determination of these by direct loading method. Autotransformers and dimmer stats.

**UNIT IV**

**Electrical Wiring:** Connectors and switches, systems of wiring, domestic wiring installation, sub circuits in domestic wiring, simple control circuit in domestic installation, industrial electrification.

**ILLUMINATION:** Types of lamps, fixtures and reflectors, illumination schemes for domestic, industrial and commercial premises, Lumen requirements for different categories.

**SAFETY and PROTECTION:** Safety, electric shock, first aid for electric shock and other hazards, safety rules, use of multi-meters, grounding, importance of grounding, equipment grounding for safety, circuit protection devices, fuses, MCB, ELCB and relays.

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<th>TOTAL HOURS</th>
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**Text and References:**

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<tr>
<td>2</td>
<td>V. N. Mittal, <em>Basic Electrical Engineering</em>, TMH Publication, New Delhi</td>
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<td>V. K. Mehta, <em>Basic Electrical Engineering</em>, S.Chandand Company Ltd., New Delhi</td>
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</table>
4. PHYSICS (THEORY)

UNIT I

Vector concepts & applications in Physics: [6]
Introduction to vector algebra, Physical concepts in vector fields and Scalar fields with examples, Physical and mathematical concepts of gradient, divergence and curl, Green’s theorem, Gauss theorem, applications in gravitation and electrostatics. Stokes' theorem and its applications.

Electrostatics and Electrodynamics: [7]
Gauss’s law in dielectric medium, Equation of continuity, Biot Savart law – Ampere’s law – magnetization and magnetic intensity, Faraday’s law of induction – generalization of Ampere’s law, displacement current, Maxwell’s equations, wave equation for Poynting vector, electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem.

UNIT II

Waves and oscillations: [4]
Types of waves, Simple harmonic motion, Damped simple harmonic motion, types of damping, Forced oscillation, resonance, Energy Transport in Wave motion.

Acoustics & Ultrasonic: [3]
Introduction to Sound, Sabine’s reverberation theory, Acoustical defects and their remedies, Doppler Effect. Ultrasonic waves, methods of their generation and detection, properties and application of ultrasonic waves.

UNIT III

Optics: [8]

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SC 102T Physics

Theory

Examination Scheme

LTPCS

Hrs./Week

MS ES Tutorial Term Work Practical/Viva Total Marks

3 1 -- 7 4 40 60 25 -- -- 125
UNIT IV

Laser & Fiber Optics: [8]

Concepts of maser and laser, Interaction of radiation of matter-quantum mechanical view, Einstein coefficients spontaneous and stimulated emission, principles involves in laser, Meta stable state, Population inversion, three and four level laser system, and optical amplification and optical resonator, characteristics of laser, Ruby, He-Ne and semiconductor lasers, Application of lasers, Optical Fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, applications of optical fibers in communication.

Modern Physics:[4]


Total: 40 Hrs.

Texts Books

References books:
5. PHYSICS (PRACTICAL)

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<th>SC 102P Physics Practical</th>
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List of Experiments

1. Study of Interference using Michelson’s Interferometer.
2. Introduction to Oscilloscope.
4. Experiment to determine volumetric coefficient of expansion of liquids.
5. Experiment to determine thermal conductivity of different solid bodies.
6. Experiment with solar collector.
8. Experimental to determine linear thermal expansion coefficient of solid bodies.
9. Experiment on reflection of Ultrasonic waves.
10. Experiment to determine heat capacities.
11. Experiment to determine critical temperature.
12. Study of effect of electric force.
15. Study of conducting electricity by means of electrolysis.
17. Determining Plank’s constant and Inverse square law.
18. Experiments on diffraction with He-Ne Laser Kit.
21. Experiment to study forced oscillations.
22. Study of charging and discharging of capacitive plates.
23. Study of Bio-Savant’s Law
25. Experiments on spectroscopy.
27. Study of Photoconductivity.
28. Study of Interference using ultrasonic Interferometer.
29. Determining e/m by Thomson’s method.
30. Study of Polarization of light using LASER.
31. Millikan’s oil drop experiment.
32. Study of Holography.
6. ENVIRONMENTAL STUDIES

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<th>Sr. No</th>
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Course objectives

To understand the concept behind ecosystem and natural resources conservation

To understand the basics of multi-scale environmental pollution

To study the environmental pollution control strategies in detail

To study the concept of sustainability in day to day life

Course outcomes

On completion of the course, the students will be able to:

To understand the concept behind ecosystem and natural resources conservation

To understand the basics of multi-scale environmental pollution

To study the environmental pollution control strategies in detail

To study the concept of sustainability in day to day life

UNIT – I (6)

Bird’s Eye view to Environment: Environmental Studies – Its importance and Multidisciplinary nature; Ecosystem and its various types, factors affecting the functioning of an ecosystem; Biodiversity – its importance, threats and conservation; Natural Resources – Forest, Water, Mineral, Energy, Minerals, Food; Review of State of India’s Environment.

UNIT – II (6)

Multi-scale Environmental Pollution (Global, Regional and Local): Concept of Clean Environment, Introduction to various environmental standards – air, water, soil, noise, heat. Causes and Effects of Air Pollution, Water Pollution, Soil Pollution, Solid Waste (organic and Inorganic) Pollution, Hazardous Waste Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Radioactive Pollution; Pollution across Indian cities – case studies; Introduction to man-made disasters like floods, heat waves, landslides, etc.
UNIT-III (6)

**Environmental Pollution Control Strategies:** Multi-approaches (role of research, technology, policy, planning & implementation, legislation & judiciary, incentives & business) for reducing various types of pollution; Case studies of Pollution control strategies; Review of the Central and State Government’s policies and mechanisms for managing various natural resources and controlling the various types of pollutions (including Swacch Bharat Abhiyan), Global Initiatives for environmental management; Indian Culture and Traditional Wisdom for managing environment

UNIT-IV (6)

**Social Issues and the Environment:** Concept of sustainability and Sustainable Development, Environmental Sustainability Index, Environmental Ethics, Public awareness and people’s participation (bottlenecks and solutions), Consumerism and Waste products, Introduction to Carbon Footprint & Water Footprint, Green Buildings, Green Business (profitability in managing environment)

Text-book and Reference Books:

1. Bharucha Erach, Textbook for Environmental Studies, UGC New Delhi
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad 380013, India
3. Clark, R. S., Marine Pollution, Clanderson Press Oxford
5. Hawkins R. E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
8. Survey of the Environment, The Hindu
9. Down to Earth, Centre for Science and Environment
12. Annual State of India’s Environment 2016 and 2015, Down to Earth, Centre for Science and Environment, New Delhi
13. Climate Actions – Increase Your Handprint and Decrease Your Footprint, Centre for Environment Education, Ahmedabad, 2015
16. Environmental Studies by R. Rajagopalan, Oxford University Press
19. Making Water Everybody’s Business, Centre for Science and Environment, New Delhi
7. WORKSHOP PRACTICE

8. ENGINEERING GRAPHICS (THEORY)

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Prerequisites: Nil

Learning Objectives: The students will learn

1. The role of engineering graphics in a product design process.
2. Technical communication skill in the form of communicative drawings.

Code/Table/Charts if any: NIL

UNIT I

(3 L)

Introduction to Engineering Graphics: Drawing instruments and accessories, lettering, lines and dimensioning, BIS - SP46. Use of plane scales and Representative Fraction, Free hand sketching.


Projections of Points & Lines: Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length of the line and its inclination with the reference planes.

UNIT II

(3 L)

Projections of Solids & Section of Solids: Classification of solids. Projections of solids like Cylinder, Cone, Pyramid and Prism with its inclination to one reference plane and with two reference planes.

Development of Lateral Surfaces: Concept of development of the different surfaces. Parallel Line Development and Radial Line Development.

UNIT III

(3 L)

Orthographic Projections: Principle of projection, Principal planes of projection, Projections from the pictorial view of the object on the principal planes for View from Front, View from Top and View from Side using first angle projection method and third angle projection method, Full Sectional View.

UNIT IV

(4 L)

Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.
**Texts and References**

9. ENGINEERING GRAPHICS (PRACTICAL)

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Prerequisites: Nil

Leaning Objectives: The students will learn

1. The role of engineering graphics in a product design process. Use of drawing tools and softwares
2. Technical communication skill in the form of communicative drawings.

Code/ Table/ Charts if any: NIL

List of Drawing Sheets:
1. Engineering curves
2. Projection of Planes
3. Projections of Solids
4. Intersection of solids
5. Development of surfaces of solids
6. Orthographic projections
7. Isometric projections
8. Practice with various CAD tools (2D and 3D drawing)

10. NCC/NSS/SPORTS
## SEMESTER II (ELECTRICAL/INDUSTRIAL/MECHANICAL ENGINEERING)

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### 1. MATHEMATICS- II

**16MA103T MATHEMATICS-II**

**Course description:**

The course is intended to provide understanding of concepts of mathematics and its application to engineering. This course introduces the student to the second and higher order differential equations and their solution, function of a complex variable. Students will study the integral transforms such as Laplace transform and their inverses. Students will learn the important theorems of complex variables for the engineering problems in complex plan. This course is designed to inculcate analytical ability among the students.

**Course Objectives:**

The objectives of offering this course are:

- To strengthen the analytical abilities of the students.
- To make strong foundation of the integral transforms and their inverses.
- To make students familiar with complex variable.
To create zeal of working with higher mathematics in the widespread field of engineering.

Course Outcomes:
On the successful completion of this course; student shall be able to
- Solve engineering problems using the principles of solution of differential equations.
- Understand analytic function of a complex variable and able to apply Cauchy integral theorem and residue theorem to solve contour integrations.
- Use Fourier transforms and it’s inverse in practical applications of engineering.
- Apply Laplace transform and its inverse to solve initial value and other related problems.

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**UNIT I**
**Complex Analysis:** Complex numbers, Function of a Complex variable, Analytic function, Cauchy-Riemann equations, Conformal mapping and its type, Some standard & special conformal mappings, Definition of a Complex line integral, Cauchy’s integral theorem, Cauchy’s Integral formula, Residue theorem, Calculation of residues, Evaluation of real definite integrals.

**UNIT II**
**Ordinary differential equation:** Differential equations of first order and higher degree, Linear independence and dependence of functions. Higher order differential equations with constant coefficient, Rules for finding C.F. and P.I., Method of variation of parameter, and method of undermined coefficients, Cauchy and Legendre's linear equations, Linear differential equations of second order with variable coefficients; Simultaneous linear equations with constant coefficients. Various applications of higher order differential equations in solution of engineering problems, Orthogonal trajectories.

**UNIT III**

**UNIT IV**

9
Laplace transforms: Piecewise continuous functions and exponential order functions, Definition, Existence and Properties of Laplace transform, unit step function and Heavyside function, Inverse laplace transform, laplace transform of derivative, Convolution theorem, Applications for solving differential equations

APPROXIMATE TOTAL 39 Hours

Texts and References
2. CHEMISTRY (THEORY)

SC 101T CHEMISTRY (THEORY)

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UNIT I
(A) **Water and its Treatment**: Introduction, sources of water Impurities in water, hard and soft water. Degree of hardness, Types of hardness, Scale and sludge formation in boiler, Effect of hardness in oil industry, Caustic embrittlement, Priming and Foaming, Softening of water by Lime-Soda process, Zeolite process, Ion-exchange process and RO process. Biological treatment of water, Potable water, COD & BOD.

(B) **Corrosion and its Control**: Introduction, Theories of corrosion, Electrode potential, Types of corrosion, Factors of corrosion, Protection of metals from corrosion – Isolation method, Cathodic protection, Sacrificial method, Cathodic protection, ICCP.

UNIT II
Chemistry of Fuels and Lubricants:
(A) **Fuels**: Origin, Classification and properties of Solid, Liquid, Gaseous Fuels, Characteristics of good fuel, Merits & demerits of solid, liquid and gaseous fuels, Proximate and Ultimate analysis, Octane number (RON, MON) and Cetane number, Petrol and Diesel Engine, Fuel Cell and Fuel Cell technology

(B) **Lubricants** - General characteristics of lubricants, mechanism of lubrication, Classification of lubricants, chemistry of lube oil and greases, Cutting fluids, Selection of lubricants, Properties of lubricants, Biolubricant

UNIT III
[10hrs.]
Chemistry of Advanced Materials:
(A) Nanomaterials: Basics of Synthesis Properties and Application
(B) Polymers & Resins
(C) Modern-age Catalysts (Emission-control catalyst)
(D) Cement and cementing materials

UNIT IV
[9hrs]
Instrumental Methods of Chemical Analysis
Principle, Instrumentation and Applications of FT-IR, UV-Vis, Chromatographic Techniques (GC, etc), Thermal Analysis (TG-DTA-DSC); Electroanalytical techniques (pH-metry, conductometry, potentiometry), Polarimeter
Texts and References

1. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publication
3. Engineering Chemistry 2e, Prasanta Rath, Cengage Learning
3. CHEMISTRY (PRACTICAL)

**List of Experiments [2 hrs each, maximum 10 experiments]**

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. External Indicator</td>
<td>To determine the strength of given solution of ferrous ammonium sulphate by titrating against</td>
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<td>standard N/40 K2Cr2O7 using potassium ferricyanide as an external indicator</td>
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<tr>
<td>2. Iodometry</td>
<td>To determine the strength of given copper sulphate solution by titrating against N/20 sodium</td>
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<tr>
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<td>thiosulphate (hypo) solution</td>
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<tr>
<td>3. Iodimetry</td>
<td>To determine the strength of given ascorbic acid by titrating against standard N/10 iodine</td>
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<tr>
<td></td>
<td>solution</td>
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<td>4. Complexometric Titration</td>
<td>To determine the total, permanent and temporary hardness of given water by complexometric</td>
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<td>titration using standard 0.01M EDTA solution</td>
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<tr>
<td>5. PH metric titration</td>
<td>To determine the strength of given HCl solution using a standard NaOH solution by performing</td>
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<td>a pH-metric titration</td>
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<tr>
<td>6. Conductometric titration</td>
<td>To determine the strength of given HCl solution using a standard NaOH solution by performing</td>
</tr>
<tr>
<td></td>
<td>a conductometric titration</td>
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<tr>
<td>7. Potentiometric titration</td>
<td>To determine the strength of given HCl solution potentiometrically</td>
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<tr>
<td>8. Chemical Kinetics</td>
<td>To study the kinetics of decomposition of sodium thiosulphate by a mineral acid</td>
</tr>
<tr>
<td>9. Chloride in Water</td>
<td>Determination of Chloride in the given water sample by Mohr Method</td>
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<tr>
<td>10. Polymerization</td>
<td>To prepare a polymer (Nylon 6, 10) and identify the functional groups by FT-IR</td>
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<tr>
<td>11. Melting point</td>
<td>To determine melting point and purity of an organic compound by digital Melting Range apparatus</td>
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<tr>
<td>12. Polarimetry</td>
<td>To measure the optical rotation of various dilutions of sucrose by polarimetry, and calculate</td>
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<td>the specific rotation of sucrose from the data obtained</td>
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<tr>
<td>13. Spectrophotometry</td>
<td>To determine the $\lambda_{\text{max}}$ and concentration of given unknown potassium permanganate</td>
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<tr>
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<td>using UV-Visible Spectroscopy technique</td>
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<tr>
<td>14. Gas Chromatography</td>
<td>To separate different isomers of alcohol and determine the percentage of each by gas chromatography</td>
</tr>
<tr>
<td>15. Thermal Analysis</td>
<td>To observe fusion, crystallization, glass transition temperatures (Tg) and analyse amount and</td>
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<td>rate of change in the mass of a sample as a function of temperature/time using thermal analysis</td>
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<td>technique (DSC-TG)</td>
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<tr>
<td>16. Chromatography</td>
<td>To separate mixture of organic compounds by chromatrotron</td>
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<tr>
<td>17. Fractional Distillation</td>
<td>To distill mixture of organic solvents by rota-evaporator</td>
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<tr>
<td>18. Organic preparation</td>
<td>To prepare Aspirin by Conventional /Microwave/Sonochemistry method</td>
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<tr>
<td>19. Organic preparation</td>
<td>To prepare Grignard reagent (methyl magnesium iodide) and its transformation by using chiller</td>
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</tbody>
</table>

Texts and References
4. ELEMENT OF MECHANICAL ENGINEERING

<table>
<thead>
<tr>
<th>Course Code: 16ME106T</th>
<th>Course Name: Elements of Mechanical Engineering</th>
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<tbody>
<tr>
<td><strong>Teaching Scheme</strong></td>
<td><strong>Examination Scheme</strong></td>
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Prerequisites: NIL

Learning Objectives:

Code/ Table/ Charts if any: NIL

UNIT I

**Introduction to Thermodynamics**: Definition and its applications. Systems and control volumes, thermodynamic properties, state and equilibrium processes and cycles, temperature and Zeroth law of thermodynamics. Forms of Energy, energy transfer by work and heat, law of conservation of energy (First law of thermodynamics)

**Properties of Pure substances**: Definition, examples and phases; Phase change processes, Property diagrams and tables, ideal gas equation of state

UNIT II

**Closed system analysis**: Concept of moving boundary work, energy balance. Specific heats, internal energy and Enthalpy-expressions for ideal gas, liquids and gases

**Control volume analysis**: Conservation of mass, flow work, energy analysis of steady flow systems and applications

**Introduction to II law of Thermodynamics**: Limitations of First Law, Thermal Energy reservoirs, heat engines, Refrigerators and Heat pumps, Kelvin Plank and Clausius statement and their equivalence.

UNIT III

**Internal Combustion Engines**: Introduction, classification and brief description of I.C. engines mechanism, 4-Stroke and 2-Stroke petrol, gas and diesel engines, Otto, Diesel and dual cycles and their air standard efficiencies and mean effective pressures.

**Pump and compressors**: Classification of pumps and compressors, working principle, Theory of single stage reciprocating air compressor, effect of clearance, volumetric efficiency, concept of multistage compression.

UNIT IV

**Power transmission systems**: Belts, gears, rope, couplings, clutches, brakes, and bearings

**Boilers**: Classification, study of various types of boilers.

Lecture: 52 Hrs.
Tutorial: 00 Hrs.
Approximate Total: 52 Hrs.
Texts and References

1. Yunus A. Cengel& Bole, Thermodynamics- An Engineering Approach by Tata Mcgraw Hill, New Delhi
2. P. K. Nag, Engineering Thermodynamics, Tata Mcgraw Hill, New Delhi
3. R.K.Rajput , Engineering Thermodynamics, EVSS Thermo Laxmi Publications
4. Rayner Joel, Engineering Thermodynamics, ELBS Longman.
5. BASIC ELECTRONICS

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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</thead>
<tbody>
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<td>L</td>
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<td>3</td>
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</tbody>
</table>

UNIT I

UNIT II
BIPOLAR JUNCTION TRANSISTOR CHARACTERISTICS: Junction Transistor, Transistor Current Components, Working of a BJT, Operating Regions, Transistor as a Switch, Transistor as an Amplifier, CB, CE and CC Configurations, Input and Output Characteristics, Transistor Biasing.

UNIT III

UNIT IV
DIGITAL ELECTRONICS: Number systems (Decimal, Binary, Octal and Hexadecimal), One’s and two’s complements, Binary codes (weighted and non-weighted codes), Boolean algebraic theorems and simplification of Boolean expressions, Logic gates, Implementation of Boolean expressions using logic gates, Standard and canonical forms of Boolean expression, POS and SOP forms, Simplification of Boolean expressions using K-map, Basics of Flip-flops and its applications.

INTRODUCTION TO COMMUNICATION SYSTEMS: Elements of Communication Systems, Concept of Modulation and Demodulation, Basics of Analog and Digital Communication

TOTAL HOURS 39

Texts and References:
Boylestad and Nashlesky, "Electronic Devices and Circuit Theory", PHI
R. A. Gaikwad, “Operational Amplifier and Linear Integrated Circuits”, PHI
Morris Mano, “Digital Design”, PHI
V. K. Mehta, “Principles of Electronics”, S. Chand Publishers
6. PROFESSIONAL ETHICS AND HUMAN VALUES

Mid Semester Exam: 25 marks
End Semester Exam: 50 marks
Internal Assessment: 25 marks (Attendance, Assignment)
Lectures - 1 hr./week (Credits – 1)

Unit 1: Human Values

Unit 2: Engineering Ethics

Unit 3: Engineering as experimentation
Engineers as responsible experimenters - Research ethics - Codes of ethics - Industrial Standard - Balanced outlook on law - the challenger case study.

Unit 4: Safety and risk
Unit 5: Global Issues
Multinational corporations - Business ethics - Environmental ethics - computer ethics - Role in Technological Development - Weapons development - consulting engineers - engineers as expert witnesses and advisors - Engineering council of India - Ethics and codes of business conduct in MNC
7. COMPUTER PROGRAMMING (PRACTICAL)

- WRITE ALGORITHM/DRAW FLOWCHART/ WRITE C++ PROGRAMS FOR THE FOLLOWING. (SIMPLE PROGRAMS)

1. Add two numbers.
2. Subtract two numbers.
3. Multiply two numbers.
4. Divide two numbers.
5. Add, multiply, subtract and divide two numbers.
6. Convert hours into minutes.
7. Convert minutes into hours.
8. Convert dollars into Rs. Where 1 $ = 70 Rs.
9. Convert Rs. into dollars where 1 $ = 70 Rs.
10. Convert dollars into pound where 1 $ = 70 Rs. And 1 pound = 80 Rs.
11. Convert grams into kg.
12. Convert kgs into grams.
13. Convert bytes into KB, MB and GB.
14. Convert Celsius into Fahrenheit. \( F = \frac{9}{5} \times C + 32 \)
15. Convert Fahrenheit into Celsius. \( C = \frac{5}{9} \times (F - 32) \)
16. Calculate interest where \( I = PRN/100 \).
17. Calculate area & perimeter of a square. \( A = L^2, P = 4L \)
18. Calculate area & perimeter of a rectangle. \( A = L*B, P = 2(L+B) \)
19. Calculate area of a circle. \( A = \frac{22}{7} \times R^2 \)
20. Calculate area of a triangle. \( A = \frac{H*L}{2} \)
21. Calculate net salary
   Where net salary = gross salary + allowance – deduction.
   Allowances are 10% while deductions are 3% of gross salary.
22. Calculate net sales where net sales = gross sales – 10% discount of gross sales.
23. Calculate average of three subjects along with their total.
24. Swap two values.
2. WRITE ALGORITHM/DRAW FLOWCHART/ WRITE C++ PROGRAMS FOR THE FOLLOWING. (USING IF CONDITION)

1. Find out largest and smallest of two values.
2. Find out largest and smallest of three values.
3. Find out net salary where net salary = gross salary + allowances – deductions.
   If gross salary > 10000, allowances are 10%, deductions are 3%
   If gross salary > 5000, allowances are 7%, deduction are 2%
4. Find out whether a given no. is divisible by 7 or not.
5. Find out net sales where net sales = gross sales – discount.
   If gross sales > 20000, discount is 15%
   If gross sales > 10000, discount is 10% otherwise 5%.
6. Calculate total, average of marks of three subjects. Give following grades to the student.
   If average >= 70, distinction,
   >= 60, first,
   >= 50, second,
   >= 35, third class,
   Otherwise fail.

If student secures < 35 marks in any subject then declare student fail.

3. WRITE ALGORITHM/DRAW FLOWCHART/ WRITE C++ PROGRAMS FOR THE FOLLOWING. (USING LOOP)

1. Print 1st 10 natural nos.
2. Print 1st 10 odd nos.
3. Print 1st 10 even nos.
4. Print 1st n natural nos.
5. Print 1st n odd nos.
6. Print 1st n even nos.
7. Print sum of n natural nos.
8. Print sum of 1st n odd nos.
9. Print sum of 1st n even nos.
10. Print factorial of a given no. e.g. 5! = 5*4*3*2*1 = 120.
11. Print your name 5 times.
12. Print your name n times.
13. Print sum of all nos. divisible by 13 in the range of 1 and 100.
14. Calculate sum and mean of any 10 values.
15. Calculate sum and mean of any n values.
16. Find out largest and smallest out of 100 nos.
17. Count +vet.-vet and zeroes in 200 values.
18. Find out how many boys and girls are there in a class of 50 students.
Input sex code.
19. Print all integers from 1 to 100, which are divisible by 5
20. Print sum of all integers from 1 to 100, which are divisible by 3.
21. Separate digits of a given no. e.g. 351—1, 5, 3.
22. Count how many digits are there in a given no. e.g. 351-3.
23. Summation of digits of a given no. e.g. 351 = 1+5+3 = 9
24. Reverse digits of a given no. e.g. 351—153.
25. Check whether a given no. is palindrome no or not. e.g. 12321.
26.
27. Find out whether a given no. is Armstrong no. or not. If sum of cube of digits = no. itself then it is the Armstrong no. e.g. 153.
28. Find out factors of a given no. E.g. 6-1, 2, 3, 6
29. Find out whether a given no. is perfect no. or not.
If sum of factors up to half of a given no. =no. itself then no. is perfect no. e.g. 6=1+2+3=6
30. Check whether a given no. is prime no. or not e.g. 7,11,13,17.
31. Find out all prime nos. between 1and 500.
32. Find out summation of prime nos. between 1 & 500.
33. Find out how many prime nos. are there between 1 and 500.
34. Check whether a given no. is auto orphic no. or not.
Auto orphic nos. are the nos. whose last digit(s) of square of any no=no itself. E.g. 5-25, 6-36, 25-625
35. Print Fibonacci series. 1, 1, 2, 3, 5, 8, up to n nos.

1 + 343 + 729 + 27 = 1100

36. Print the following series. (Loop within loop)
(A) 1 1  (B) 1 1  (C) 1 1 1  (D) 5 1
1 2  2 1  1 1 2  5 2
37. Print the following series (Parallel loop)

(A) 1 5
(B) 1 5
2 4
3 3
4 2
5 1

3 3

4. WRITE ALGORITHM/DRAW FLOWCHART/ WRITE C++ PROGRAMS FOR THE FOLLOWING (USING ARRAY)

1. Accept 5 values and print them later on.
2. Accept 10 values and print 4th, 7th and 9th value.
3. Accept 5 values and sort the array in ascending/descending order.
4. Print minimum no. of notes required. Notes given are 1, 2, 5, 10, 20, 50, 100.
e.g if value is 1256, then answer is 12 hundred-rupee notes, 1 fifty-rupee note, 1 five-rupee note, 1 one-rupee note.
5. Convert figures into word. e.g. 99-ninety nine.
Assume number to be between 0 and 100 only.
6. Print month name of a given month no. e.g. 3 - March.
7. Print month no. of a given month name e.g. April-4.
8. COMMUNICATION SKILLS (THEORY)

Semester: 2  
Syllabus with effect from: August 2016

<table>
<thead>
<tr>
<th>Subject Code:</th>
<th>English Communication/Communication for Business/Communication Skills</th>
<th>Total Credit: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Code:</td>
<td>UHS103T</td>
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Objectives:

- The course aims to impart understanding of the fundamental elements of communication, its process, interpersonal communication and communication in groups of different organizational settings.
- The course caters to know and understand different practices of verbal and non-verbal communication along with practices on listening, reading and writing skills.

Theory:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>I</td>
<td>• Basic Language Skills and Grammar</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>• Theories of Communication</td>
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<td>• Phonetics and Accent</td>
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<tr>
<td>II</td>
<td>• Communicative English</td>
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<td>• Précis Writing</td>
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<td>• Technical Report Writing</td>
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<td>• Creative Writing – Stories, Poems, First Person Narration, Diary, Skit</td>
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<tr>
<td>III</td>
<td>• Academic Vocabulary</td>
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<td>• English for Business</td>
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<td>• Comprehending notices, advertisements, official documents, booklets, newspapers, instructional manuals and other documents</td>
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<td>• Appreciation of Movies/Documentaries</td>
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<tr>
<td>IV</td>
<td>• Group Discussion</td>
<td>25</td>
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<td>• Resume Writing</td>
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<td>• Interview Skills</td>
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<td>• Listening Practice (Songs)</td>
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</tbody>
</table>
9. COMMUNICATION SKILLS (PRACTICAL)

Practical:

- Reading
- Writing Reviews (Books/Articles)
- Drafting Proposals
- Note Taking and Note Making
- Manual Writing
- Content Writing (Designing Websites, Creating Online Layout/Blogs)
- Introducing Product/Service/Company
- Reading Comprehension
- Academic Use of Social Networking Sites
- Listening Comprehension – MCQ
- Dictation
- Self Introduction
- Mock Interviews

Books for References:


10. NCC/NSS/SPORT