BS-1101 ENGINEERING MATHEMATICS I

Teaching Scheme:
Lectures: 3Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester : 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

- To recall and remember basics of matrices, complex numbers, and differential calculus.
- To understand the concepts of basic mathematical methods for matrices, complex numbers and differential calculus.
- To apply methods to solve engineering problems.
- To analyze engineering problems and evaluate.
- To solve and evaluate the problems using matrices, complex numbers, and differential calculus.

Course Outcomes:

- Students will be able to remember terminologies and formulae in matrices, complex numbers, and differential calculus .
- Students will be able to understand and interpret the concepts of matrices, complex numbers, and differential calculus.
- Students will be able to compare and analyze the methods in matrices, complex numbers, and differential calculus.
- Students will be able to predict and evaluate the problems in matrices, complex numbers, and differential calculus.

Unit – I: Matrices **(07)**

Matrices, Rank of the matrix, Echelon Form, Normal form, Inverse of the matrix,System of Linear Equations, Linear Dependence and Independence, Linear Transformations, Rotation and Translation Matrices.

Unit – II: Applications of matrices **(06)**

Eigen Values, Eigen Vectors , Cayley Hamilton Theorem , Diagonalization and applications in finding powers of matrix.

Unit–III: Complex numbers and its applications **(08)**

Argand diagrams, De moivre's theorem and its applications, Hyperbolic Functions, Separation of real and imaginary parts of functions of complex numbers, Inverse Hyperbolic Functions, Logarithm of Complex Numbers.

Unit – IV: Differential calculus **(05)**

Successive Differentiation, Method of finding nth order derivative of functions, Leibnitz theorem, Taylor's series, Maclaurin's Series.

Unit – V: Partial Differentiation **(07)**

Partial Differentiation, chain rule, composite functions, Euler's theorem on homogeneous functions,Total derivatives .

Unit – VI: Jacobian and its applications **(08)**

Jacobian, Chain rule, Partial derivatives using Jacobian, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B.S. Grewal, **'Higher engineering Mathematics'***, Khanna publishers, Delhi(*40th edition),(2008).
2. B. V. Ramana, **'Higher Engineering Mathematics ',** *Tata McGraw Hill Publications* (2007)
3. Erwin Kreyszig ,**'Advanced Engineering Mathematics'** *Wiley Eastern Ltd.*(8th Student Edition)(2004).

Reference Books:

1. C.R.Wylie, L.C. Barrette, **'Advanced Engineering Mathematics',** *McGraw Hill Publications, New Delhi.(*6th edition)(2003)
2. Peter V. O'neil,**'Advanced Engineering Mathematics'** ,Thomson Brooks / Cole, *Singapore (*5th edition) (2007).

BS1102 Physics - I

Teaching Scheme:

Lectures: 2 Hrs / Week

Tutorial: 1 Hr / Week

Examination Scheme:

In - Semester: **25** Marks

End - Semester: **50** Marks

Credits: 3

Course Objectives:

To facilitate the learners -

1. To become acquainted with the terminologies of Electrodynamics, Optics and Relativity
2. For interpreting the notions of Electrodynamics, Optics and Relativity
3. For classifying and comparing these notions with respect to their domains of validity
4. In executing procedures toward solving problems in Electrodynamics, Optics and Relativity
5. In differentiating and organising basic ideas and mathematical relations of Electrodynamics, Optics and Relativity
6. For checking, judging and critiquing the applications of Electrodynamics, Optics and Relativity

Course Outcomes:

By taking this course, the learner will be able to -

1. Recall and recognise the terminologies of Electrodynamics, Optics and Relativity
2. Interpret the notions of Electrodynamics, Optics and Relativity
3. Classify and compare these notions with respect to their domains of validity
4. Execute procedures toward solving problems in Electrodynamics, Optics and Relativity
5. Differentiate and organise basic ideas and mathematical relations of Electrodynamics, Optics and Relativity
6. Check, judge and critique the applications of Electrodynamics, Optics and Relativity

Unit - I: Electromagnetic Radiation and Interference: (4)

Expression for the electric field beyond Coulomb's law; The dipole radiator; Physics of interference - Two dipole radiators; Mathematics of interference

Unit - II: Diffraction and Polarisation: (4)

The resultant amplitude due to n equal oscillators; Diffraction Grating; The electric vector of light; Birefringence; Polarizers; Optical activity

Unit - III: Capacitance and Dielectrics: (4)

Electrostatic energy - of a capacitor, of an ionic crystal, in nuclei; The dielectric constant; The polarization vector

Unit - IV: Special Relativity: (4)

The Lorentz transformation; Slowing of clocks; Contraction of length; Mass-Energy equivalence; Relativistic energy

Unit - V: Quantum Behaviour - Waves, Particles and Photons: (4)

Experiments with bullets, waves and electrons; The uncertainty principle; Probability wave amplitudes; Crystal diffraction; The size of an atom

Unit - VI: Quantum Behaviour - The Magnetism of Matter: (4)

Diamagnetism and Paramagnetism; The precession of atomic magnets; Angular momentum in Quantum Mechanics; The magnetic energy of atoms; Quantized magnetic states; The Stern - Gerlach experiment

Text Book:

R. P. Feynman, R. B. Leighton and M. Sands, **'The Feynman Lectures on Physics - Volume 1 and 2'**, *Pearson Education* (2006)

Reference Books:

1. J. Walker, D. Halliday, R. Resnick, **'Principles of Physics'**, *Wiley Student Edition* (10th Edition)
2. H. Young and Roger Freedman, **'University Physics'**, Pearson Addison Wesley (12th Edition)

BS-1103 Chemistry I

Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hr/Week

Examination Scheme:

In-Semester: **25** Marks

End-Semester: **50** Marks

Credits: 3

Course Objectives:

1. To learn about properties, characteristics and applications of different molecules based upon chemical bonding and structure.
2. To understand different synthesis routes for preparation of variety of compounds.
3. To study qualitative and quantitative analytical techniques for engineering materials.
4. To apply specific mechanisms and models involved in synthesis /analysis of materials.
5. To inculcate creativity, reasoning and problem solving skills using principles of chemistry.

Course Outcomes:

1. To understand nature of chemical bonding in materials and predict their properties.
2. To comprehend various analytical techniques/ methods towards qualitative and quantitative analysis.
3. To outline synthesis procedures and separation techniques of some engineering substances.
4. To apply specific models and processes for better understanding of material properties and applications.
5. The students would be able to apply basic chemical concepts and principles in understanding simple real life problems.

Unit – I: Chemical Bonding **(05)**

Types of bonds - primary & secondary types with examples, hybridization based on valence bond theory, VSEPR theory, molecular orbital theory with respect to bonding in homo and hetero nuclear diatomic molecules.

Unit – II: Water Analysis and purification **(06)**

Chemical Analysis of water hardness, alkalinity and effect of hard water in boilers, Internal treatment of boiler feed water, water softening techniques (Permutit and Ion exchange method) and membrane based processes.

Unit – III: Electro chemistry **(06)**

(a) Fundamentals of an electrochemical cell, EMF of cell, reference and indicator electrodes, conductance in solution and conductometric titration.

(b) Battery Technology

Primary & secondary cell, battery characteristics, Ni-Cd cell, Lithium-ion battery, rechargeable batteries, Fuel cell technology

Unit – IV: Instrumental methods of Analysis-I **(04)**

Basic principles,instrumentation and applications of pHmetry, Potentiometry, Chromatography

Unit – V: Coordination Chemistry **(04)**

Introduction,Classification of ligands, naming coordination compounds, Werner and Sidgwick theory, VBT, CFT for Td and Oh complexes. Applications and comparison of VBT & CFT.

Unit – VI: Photochemistry **(05)**

Photochemical reactions, Laws of Photochemistry and quantum yield, energy transfer in photochemical reaction, applications.

Text Books:

1. Arun Bahl & G.D. Tuli,**Essentials of Physical Chemistry,***S.Chand Publications* (2014)
2. S.S. Dara **'Engineering Chemistry'** *S. Chand Publications (2010)*
3. Puri, Sharma, Kalia **'Principles of Physical Chemistry'**: *Milestone Publications* (2009)
4. B.S. Chauhan **'Engineering Chemistry'** :*Univ Sc Press.*(third edition)2009
5. Shashi Chawla **'A Text Book Of Engineering Chemistry'**: *Dhanpat Rai & Co.*(2015)
6. Jain and Jain *'***A Text Book Of Engineering Chemistry'** *Dhanpat Rai & Co.*
7. Gurdeep Chatwal **'Instrumental methods of Chemical Analysis'** *Himalaya publ.house*

Reference Books:

1. Steven S. Zumdahl, **'Chemistry concepts and applications',** *Cengage learning publication* (2009)
2. Ram D. Gupta,**'Hydrogen fuel'***C.R.C.Publications*(2009)
3. Puri, Sharma, Pathania **'Principles of Physical Chemistry'** *: Vishal Publ. Co.*(2015)
4. Robert D. Braun***' Instrumental methods of analysis'*** *Pharmamed press* (2010)

BS-1104 PHYSICS–CHEMISTRY LAB – I

Teaching Scheme:	Examination Scheme:
Lectures: 2Hrs/Week	In-Semester: 25 Marks
Tutorial: 1Hr/Week	End-Semester: 50 Marks
Practical: 2 Hrs/Week	Credits: 1

PHYSICS-LAB-I

- **Course Objective :**

To introduce students to the modern equipment, Precision techniques and experimental methods for observing, understanding and verifying laws of electromagnetism and optics.

- **Course Outcome :**

By taking the physics-lab component of this course, a student of any engineering branch –

a) Will be trained to make precise observations

b) Will have developed experimental skills pertaining to the use and handling of modern set-ups – in the context of electromagnetism and optics.

List of Experiments – Physics Laboratory:

1. Michelson Interferometer

2. Determination of Dielectric Constant and Capacitance

3. Polarization of Light: Law of Malus, Uses of Wave Plates

4. Faraday's Law and Induced EMF and Dia-Para-Ferro Magnetism (Demo)

CHEMISTRY -LAB-I

- **Course Objective –**

The Chemistry laboratory course will enable students to get a hands-on experience of determining various analysis parameters learnt in the theory course using different methods/techniques prevalent in analytical chemistry.

- **Course Outcome –**

The Chemistry laboratory course aims at developing abilities in combining chemical principles alongside handling instruments/techniques and synthesis methodologies to facilitate good understanding of the subject.

List of Experiments – Chemistry Laboratory

1. Determination of total hardness of sample water by complexometric titration (EDTA method).

2. Determination of total alkalinity present in sample water.

3. Determination of conc. of strong acid and weak acid in a mixture using conductometry.

4. To find the normality of weak acid by titrating against strong alkali by potentiometry.

5. Chromatographic separation Technique.

ES 1101 Basic Electrical and Electronics Engineering - I

Teaching Scheme:
Lectures: 3 Hrs/Week

Examination Scheme:
In-Semester: **25** Marks
End-Semester: **50** Marks

Credits: 3

Course Objectives:

1. To make students familiar with the fundamental concepts of electric and magnetic circuits.
2. To educate the students about the realization of basic theoretical concepts & laws in real physical world.
3. To educate the students about the construction and applications of diode
4. To educate the students about the construction and applications of diode

Course Outcomes:

After completion of course, students will be able to

1. Calculate energy consumption for electro-mechanical and electro-thermal systems
2. Analyse and solve magnetic circuits.
3. Apply the knowledge of relevant laws and principles for solving electric circuits.
4. Analyse sinusoidal and non sinusoidal alternating current
5. Characterize semiconductor diodes and transistors

Unit – I: Introduction to electrical systems (06)

Review of basic electrical terms, Effect of temperature on resistance, Resistance temperature coefficient, insulation resistance, Work, Power and energy calculations for thermal, mechanical and electrical systems.

Unit – II: DC Networks (08)

Kirchoff's laws, Mesh and Nodal Analysis, Thevenin , Norton and Superposition Theorems, maximum power transfer theorem, Network Simplifications using star-delta / delta-star transformations.

Unit – III: Electromagnetism and Magnetic Circuits (06)

Magnetic field due to electric current, Force on a current carrying conductor, Electromagnetic induction, direction and magnitude of induced EMF, magnetomotive force and magnetic field strength, relative and absolute permeability, reluctance, series and parallel magnetic circuits,

magnetic materials and B-H curve, self and mutual inductance, coupling coefficient,energy stored in magnetic circuits .

Unit – IV: Electrostatics and AC fundamentals (08)

A: Electrostatic field, electric flux density, electric field strength, permittivity. Capacitor and capacitance, dielectric strength and breakdown voltage, capacitors in series and parallel,composite capacitors, energy stored in capacitors, charging and discharging of capacitors and time constant.

B: Generation of alternating emf, waveform terms and definitions, average value and rms values for sinusoidal and non sinusoidal currents and voltages, phasor representation of an alternating quantity.

Unit – V: Diodes and rectifiers (07)

Overview of Semiconductor physics and p-n junction theory, Junction diode, construction and characteristic of p-n junction diode, zener diode, LED, photodiode, Half wave, full wave and bridge rectifiers, need of capacitor filter, rectifier operation with capacitor filter, zener diode as a voltage regulator, block diagram of Regulated power supply

Unit – VI: Junction Transistor Amplifiers (07)

Bipolar junction transistor, Construction of BJT, Types of biasing:-fixed bias and self bias circuit, BJT characteristics for-CE,CB,CC configurations, relationship between α and β, load line for a transistor, application of transistor as a switch and amplifier.

Text Books:

1. Hughes, **'Electrical and electronic technology'**, *pearson education,* (9^{th} edition), (2009)

Reference Books:

1. D.P. Kothari and I.J. Nagrath, '**Basic Electrical Engineering**', *McGraw-Hill*, (3^{rd} edition),(2010)
2. A.E.Fitzgerald, A.Grabiel,'**BasicElectrical Engineering**',*McGraw-Hill*, (5^{th} edition),(2009)
3. Floyd, '**Electronic devices and circuits**', *Pearson education, (*7^{th} edition),(2008)

ES 1102 Fundamentals of Programming Languages- I

Teaching Scheme: **Examination Scheme:**

Lectures: 1Hr/Week In-Semester: **25** Marks

Credits: 1

Course Objectives:

1. Learn the fundamentals of building blocks of computer.
2. Understand how to formulate the programming language statements from description of a problem in English.
3. Understanding of decision and iteration interpretation in a programming language.
4. Understand basic building blocks of simple website.

Course Outcomes:

1. Students will understand the building blocks of computer.
2. Students will know the syntax of C language.
3. Students will be able to convert a simple problem description to logical steps.
4. Students will be able to convert a mathematics problem in Programming code.
5. Students will be able to convert logical steps into a Programming code.
6. Students will be able to design a website using CMS.

Unit – I: Introduction to Programming **(02)**

Introduction to computer, Anatomy of a computer: Hardware and software, Operating system, Types of programming languages: Machine language, Assembly language, High level languages, Selection of language, Algorithm: As a program, As a flow-chart, Pseudo code

Unit – II: Writing First C Program **(02)**

Structure of a C program, Writing C program, Introduction to library functions in C, Files generated in C program, Comments, Indentation

Unit – III: Variables and Operations **(03)**

C language variables: Numeric, Character, Declaring and Initializing variables, Constants: Integer, Floating point, Character, String, Operators: Arithmetic, Relational, Equality, Logical, Unary, Conditional, Bitwise, Assignment, Comma, Sizeof, Operator precedence, variable scope: Local and Global scope, Type casting and conversion

Unit – IV: Control flow in C Language **(03)**

Conditional branching statements: if statements, if-else Statement, Switch case, Iterative statements: while loop, do-while loop, for loop, Nested loops, break and continue statements

Unit – V: Arrays **(02)**

Introduction to Arrays, Accessing Array elements, Internal representation of Arrays in C, Working with one-dimensional array, Introduction to two-dimensional arrays

Unit – VI: Introduction to Website Development **(02)**

Introduction to blogging and WordPress : Creating a simple website, Content creation, Pages and Blogs, Page linking, Comments, Adding contents like Multimedia, Presentations, Themes

Text Books:

1. ReemaThareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES 1103 Engineering Graphics

Teaching Scheme:
Lectures: 2Hrs/Week

Examination Scheme:
In-Semester: **25** Marks
End-Semester: **25** Marks

Credits: 2

Course Objectives:

1. To apply theory of projections and standard conventions in engineering drawing.
2. To understand the methods to draw various engineering curves.
3. To develop the visualization and interpretation skills, for the physical objects.
4. To develop free hand sketching skills.

Course Outcomes:

Students will be able to,

1. Draw orthographic views of given object.
2. Draw engineering curves by applying the given method.
3. Draw isometric projection and development of surfaces of the given object.
4. Draw free hand sketches of simple machine elements.

Unit – I: Introduction to Engineering Drawing **(02)**

Layout and sizes of drawing sheets, drawing instruments, types of lines used in drawing practice, dimensioning systems, representation of tolerances, standard codes by B.I.S (SP-46).

Unit – II: Curves in Engineering Practice **(05)**

Construction of ellipse, parabola, hyperbola, involute, cycloid, archimedean spiral, helix on cone and cylinder.

Unit – III: Orthographic Projections **(08)**

Theory of projections, methods of obtaining orthographic views,sectional orthographic projections.

Unit – IV: Isometric Projections **(08)**

Isometric axes, Isometric scale, isometric projections and views, construction of isometric view from given orthographic views.

Unit – V: Development of lateral surfaces of solids **(05)**

Parallel line development, radial line development, methods to transfer points for development of prisms, pyramids, cylinder and cone.

Unit – VI: Free hand sketching **(02)**

Free hand sketching of front view and/or top view of standard machine elements –thread forms, hexagonal headed bolt and nut, screws, shaft and keys, spring, welded and riveted joint.

Text Books:

1. N. D. Bhatt and V. M. Panchal,**'Engineering drawing, plane and solid geometry'**, *Charotor Publication House.*

2) R. K. Dhawan,**'A text book of Engineering Drawing'**, *Pearson Education Inc*.

3) P.S. Gill, **'Engineering Graphics'**, *Kataria and sons Publications.*

4) M.L.Dabhade, **'Engineering Graphics'**, *Vision Publications.*

Reference Books:

1) Warren J. Luzzader, **'Fundamentals of Engineering Drawing'**, *Prentice Hall of India, New Delhi.*

2) Fredderock E. Giesecke, Alva Mitchell, **'Principles of Engineering Graphics'**,*Maxwell McMillan Publishing.*

3) Dhananjay A. Jolhe, **'Engineering Drawing'**, *Tata McGrawHill Publishing Co. Ltd.*

ES 1104 ENVIRONMENTAL STUDIES

Teaching Scheme:
Lectures: 2 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: **25** Marks
End-Semester: **50** Marks
Credits: 3

Course Objectives:

1. It is an interdisciplinary approach to understand environment.
2. It enhances the ability to understand Environmental Problems.
3. Understand the relevance and importance of natural resources in the sustenance of life on earth and living standard.
4. To develop the ability and understand role of Individual in Environmental Protection.

Course Outcomes:

A student should be able to:

1. Gain knowledge of fundamental principles in environmental science and policies.
2. Create awareness about sustainable development.
3. Identify different types of environmental pollution and control measures.
4. To learn different Modern Techniques for sustainable Development

Unit – I: Multidisciplinary nature of environmental studies **(05)**

- Scope and importance
- Human Interface with the natural environment and its impact
- Environmental Issues – Types of Pollution : Causes and Effects – Air, Water, soil, Noise, Thermal, Marine pollution, Nuclear Hazard, Greenhouse Effect, Global Warming, Climate Change

Unit – II: Environmental Laws and policies **(04)**

- Environmental Laws in India- Environmental Protection Act, Air(Prevention and Control of Pollution) Act, Wild Life Protection Act, Forest Conservation Act
- International Agreements and Laws – Kyoto Protocol, Montreal Protocol
- Role of an individual in the conservation of natural resources and in preventing pollution
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Unit – III: Natural Resource Management **(05)**

- Energy Resources – Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies
- Solar Energy – Direct method of solar energy collection, Process of photovoltaic energy conservation, Solar energy conservation Technologies and application
- Water Resources – Water conservation, Rain water Harvesting and watershed management, Water Harvesting Techniques, case studies

Unit – IV: Solid Waste Management **(05)**

- Generation and characteristics of Waste
- Types of waste – Solid waste, Industrial waste, Construction and demolition waste, Special waste, Hazardous waste, E-waste
- Waste Disposal Methods – Landfills, Incineration, biological reprocessing, recycling, ocean dumping, Plasma Gasification

Unit – V: Sustainable Development **(04)**

- Meaning of Sustainable development and framework to measure sustainable development
- Urbanization and its Effects on environment
- Integrated Built Environment, Building rules and Bye-Laws, Principles of building planning

Environmental Impact Assessment

Unit – VI: Smart City and Green Buildings **(05)**

- Concept , Features and Advantages of Green Buildings, Rating systems of Green Buildings
- Engineering Materials – Traditional, Eco-friendly and Smart materials used in construction
- Concept and features of smart city, selection process, strategy

Text Books:

Shashi Chawla **– A Textbook of Environmental Studies** – *McGrawHill Education, Sixth reprint,2015*

Reference Books:

R.Rajagopalan – **Environmental Studies from Crisis to Cure** – *Oxford Publication, Third edition,2016.*
Ajith Sankar R.N.- **Environmental Management** - *Oxford Publication, First edition,2015.*
D.L. Manjunath – **Environmental Studies**- *Pearson Education*
Erach Bharucha- **Text Book of Environmental Studies** – *UGC, Universities Press*
D.K. asthana ,Meera Asthana – **A Text Book Of Environmental Studies** – *S.Chand*
Dr. J.P. Sharma **– Environmental Studies** – *University Science Press*
Dr. Suresh K. Dhalmeja **-Environmental Studies** – *S.K.Kataria & Sons*
Anubha Kaushik, C.P.Kaushik- **Perspectives in Environmental Studies** – *New Age International Publishers*
Shah, Kale, Patki – **Building planning and Built environment** -*Tata McGraw Hill*
Shashi Chawla – **A Textbook of Environmental Studies** – *McGrawHill Education*

ES 1105 Basic Electrical and Electronics Engineering Lab - I

Teaching Scheme:
Practical: 2 Hrs/Week

Examination Scheme:
Practical Exam: 25 marks

Credits: 1

List of experiments:

1. Study of different electrical and electronics components and instruments.
2. To perform electrical wiring.
3. Determination of Temperature Rise of a Medium Resistance
4. Performance analysis of fluorescent lamp circuit.
5. Verification of kirchoff's laws & superposition theorems
6. Verification of Thevenin's theorem
7. Performance analysis of half wave,full wave rectifier with center tap transformer and bridge rectifier with and without filter.
8. Operation of three terminal IC voltage regulator.
9. Determination of current gain of transistor in CE configuration
10. Determination of frequency responce of CE amplifier

ES 1106 Fundamentals of Programming Language Lab- I

Teaching Scheme:
Practical: 2 Hrs/Week

Examination Scheme:
Practical: **25** Marks

Credits: 1

Section – I: Understanding of IDE **(02)**

Learning of basic commands of Linux OS and Understanding of IDE to execute a C program.

Section – II: Simple C Assignments **(16)**

Assignments in C to make student learn and understand accepting of data, displaying the data with different ways of formatting, various operators, conditional statements, looping structure, control flow and basics of array.

Section – III: Word Problems **(06)**

Assignments based on word problems to make the student read, analyze and understand the solution to a given problem to implement in C Language.

Section – IV: Mini Project **(04)**

Mini project type assignment to develop a Website.

ES 1107 Engineering Graphics

Teaching Scheme:
Practical: 2Hr/Week

Examination Scheme:
Practical: 25 Marks

Credits: 1

I: Introduction to Engineering Drawing **(01)**

Drawing sheet layouts, drawing instruments, standard codes by B.I.S (SP-46)

II: Assignments and Drawing Sheets **(12)**

- Engineering Curves.
- Orthographic Projections
- Isometric Projections
- Development of surfaces of solids.
- Free hand sketching.

III: Introduction to computer aided drafting package **(02)**

Features and applications of computer aided drafting packages, basic operations, and various commands for drawing, dimensioning, editing, saving and plotting the drawings.