



Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology, Pune – 411 037

Department of Engineering, Sciences and Humanities (DESH)



Bansilal Ramnath Agarwal Charitable Trust's

# Vishwakarma Institute of Technology

*(An Autonomous Institute affiliated to University of Pune)*

## Structure & Syllabus of F.E. (Common)

Pattern 'F11'

Effective from Academic Year 2013-14

Prepared by: - Board of Studies in Engineering, Sciences and Humanities

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune.

  
Chairman – BOS

Signed by,

  
Chairman – Academic Board



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	5.11b	HS16104	@ Management Technology	--
	5.11c	HS16106	@ Cost and Accounting	--
	5.11d	HS16108	@ Business Law	--
	5.12	##*General	Proficiency 2 – International Languages – II	--
	5.12a	HS15301	@ English I	--
	5.12b	HS15302	@ French I	--
	5.12c	HS15303	@ German I	--
	5.12d	HS15304	@ Spanish I	--
	5.12e	HS15305	@ Japanese I	--
	5.12f	HS15306	@ French II	--
	5.12g	HS15307	@ German II	--
	5.12h	HS15308	@ Spanish II	--
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@ Please Refer GP-PD-OE Structure & Syllabi Booklet



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## Program Educational Objectives (PEO)

### F.E. (Common)

PEO No.	Description of the Objective
I	<b>Logical Development:</b> To develop logical approach and reasoning for understanding, analyzing and designing of engineering applications / to unfamiliar situations
II	<b>Thought Process:</b> To promote the process of problem solving abilities, experimental, observational, manipulative, decision making, imagination, visualization and investigatory skills in the learners.
III	<b>Core Competence:</b> To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.
IV	<b>Professionalism:</b> To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
V	<b>Learning Environment:</b> To provide student with an academic environment aware of excellence, leadership, written ethical codes and guidelines, and the life-long learning needed for a successful professional career.

**Course Objectives:** Course objectives are specified in the course syllabus

#### 2. Program Outcomes,

- a. Learners will demonstrate basic knowledge in mathematics, science and engineering.
- b. Learners will be familiar with different materials used engineering applications.
- c. Learners will demonstrate an ability to design simple mechanical components.
- d. Learners will have the confidence to apply engineering solutions in global and societal contexts.
- e. Learners will demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results.
- f. Learners will demonstrate the ability of engineering drawing that meets desired specifications and requirements.
- g. Learners will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.
- h. Learners will demonstrate an ability to visualize and work on laboratory and multi-disciplinary tasks.
- i. Learners will be familiar with safety, product quality aspects and quality control.
- j. Learners will be able to communicate effectively in both verbal and written forms.
- k. Learners will be prepared to participate in competitive examinations like GATE, GRE.
- l. Learners will be able to understand electrical circuits and its analysis.
- m. Learners will be able to demonstrate psychomotor skills for effective use of engineering tools and equipment.
- n. Learners will be able to demonstrate understanding of professional, ethical and social responsibilities,
- o. Learners will be able to deliver oral presentations and can write well organized accurate reports,
- p. Learners will be motivated to engage in to self-learning.

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Department of Engineering, Sciences and Humanities (DESH)

# MODULE I

## Department of Engineering, Sciences and Humanities (DESH)

<b>Structure, F.E. (Module I)</b>		FF653, Issue No. 1, Rev 00, dt 25/05/2013			
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)		Credits
			Lect.	Practical	
S <sub>1</sub>	HS10101	Advanced Algebra and Analytical Geometry	3	0	3
S <sub>2</sub>	HS10103	Modern Physics	3	0	3
S <sub>3</sub>	CH10101	Chemistry	3	0	3
S <sub>4</sub>	ME10101	Engineering Graphics	3	0	3
T <sub>1</sub>	HS10201	Advanced Algebra and Analytical Geometry	0	1	1
T <sub>2</sub>	HS10203	Modern Physics	0	1	1
#S <sub>9</sub>	HS10107	Communication Skill	0	0	1
P <sub>1</sub>	CH10301	Science Lab (S2+S3)	0	0	1
P <sub>2</sub>	ME10301	Engineering Graphics Lab	0	0	1
MP <sub>1</sub>	HS17401	Mini Project	0	0	2
#SD <sub>1</sub>	HS14301	Engineering Workshop	0	0	1
**OE <sub>1</sub>		@Elective Course:	2	0	2
	HS16101	Sociology			
	HS16103	Psychology			
	HS16105	Philosophy			
	HS16107	Environmental Studies			
		<b>Total</b>	<b>16</b>	<b>2</b>	<b>23</b>
#*GP <sub>1</sub>	HS153XX	International Languages – I	0	0	1
##*GP <sub>2</sub>	HS153XX	International Languages – II	0	0	1

# The course Engineering Workshop and Communication Skill will be offered for both module I and module II in semester I,  
 \*\* Students have to select and register for only one course from this group,  
 #\* Students will register only one course in Semester I irrespective of Module,  
 ### Students will be allotted level II of International language they registered in Sem I for Semester II irrespective of Module.

#*	HS15302	French I	HS15301	English I	HS15305	Japanese I	HS15309	Japanese II
	HS15303	German I	##*	French I	HS15306	French II	HS15310	English II
GP <sub>1</sub>	HS15304	Spanish I	GP2	German I	HS15307	German II		
	HS15305	Japanese I		Spanish I	HS15308	Spanish II		



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## HS10101 :: ADVANCED ALGEBRA AND ANALYTICAL GEOMETRY

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

### Objectives:

This module I is about the understanding and application of fundamental techniques involved in the analysis of engineering systems. This aims to equip the students with mathematics needed to analyze and solve a range of engineering problems with focus on conceptual understanding.

- To make aware students about the importance and symbiosis between Mathematics and Engineering.
- Achieve a fluency with Mathematical tools which is an essential weapon in modern Graduate Engineer's Armory.
- Balance between the development of understanding and mastering of solution techniques with emphasis being on the development of student's ability to use Mathematics with understanding to solve Engineering problems by retaining the philosophy of "learning by doing".
- Mapping with PEOs: I, III V: (a, k, p)

By the end of this module-I students will be expected to demonstrate knowledge of

- Matrix calculation as an elegant and powerful mathematical language in connection with vector spaces, rank of a matrix, linear dependence and independence and linear system of equations.
- Interpretation of the eigen values and eigen vectors of a matrix in terms of the transformation it represents into a matrix eigen value problem.
- Determining a modal matrix from eigen vectors of matrix and spectral matrix from eigenvalues and reducing a matrix to diagonal form. Using matrices to represent transformation between coordinate systems. Definition of quadratic form and determining its nature using eigen value.
- Complex numbers, Argand's diagram, Euler's formula, De Moivre's theorem and their applications.
- Basic concepts of probability theory. Meaning of random variables which in terms form the analysis of certain games of chance and has found applications in most branches of science and engineering. Some standard discrete and continuous distributions viz. Binomial, Poisson, and Normal.
- Determination of the covariance of two random variables and understanding the concept of curve fitting- the principle method of least squares, regression analysis

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and the linear correlation coefficient.

- The three co-ordinate systems in the space, recognizing and using quadric surfaces with standard equations.

#### **Unit I**

##### **Matrices**

**(08 Hrs)**

Revision on elementary matrices. Vectors in n-dimension, Vector spaces and subspaces. Linear dependence and independence. Rank of a matrix and solution of Linear Systems. Inner product spaces. Linear transformations, matrices for linear transformations, Transition matrices and similarity and application of linear transformations.

#### **Unit II**

##### **Linear Algebra**

**(08 Hrs)**

Eigen values and Eigen vectors. Cayley-Hamilton theorem and its application. Diagonalization, symmetric matrices and orthogonal diagonalization. Application of eigen values and eigen vectors to rotation of axes (Quadratic forms and reduction of quadratic forms to canonical form).

#### **Unit III**

##### **Complex Numbers**

**(08 Hrs)**

Revision on complex numbers up to Argand Diagram. Polar form of a complex number. De Moivre's theorem and roots of a complex number. Exponential functions of a complex variable. Circular functions of a complex variable. Hyperbolic and inverse hyperbolic functions. Separation of real and imaginary parts of functions of complex variables.

#### **Unit IV**

##### **Probability and Statistics**

**(08 Hrs)**

Random variables, Probability distributions, Mathematical Expectation and variance. Binomial, Poisson, and Normal distributions.

#### **Unit V**

##### **Analytical solid Geometry**

**(08 Hrs)**

Coordinate systems in space. Sphere, Quadric Surfaces. Surface of revolution and Standard surfaces of revolution.

#### **Unit VI**

##### **Self Study**

**(08 Hrs)**





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- Orthogonal transformations and its (2-D and 3-D) geometrical interpretation.
- Application of eigen values and eigen vectors to principal axes theorem.
- Logarithm of a complex number.
- Special expansions and indeterminate forms (L'Hospital's rule).
- Equations of Cone, Right circular Cone and Cylinder, Right circular Cylinder with examples.

**Note:** Five assignments on self study, comprising of one assignment from each unit.

#### Text Books

1. "Text book of Calculus", Ron Larson and Bruce H. Edwards, Brooke/Cole, a part of Cengage Learning (Indian Edition),
2. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers,
3. "Linear Algebra: An Introduction", Ron Larson and David C. Falvo, Brooke/Cole, a part of Cengage Learning (Indian Edition).

#### Reference Books

1. "Calculus and analytic Geometry", Thomas G. B. and Finney, Wesley / Narosa,
2. "Linear Algebra and its Applications", Gilbert Strang, Cengage Learning (Indian Edition),
3. "Advanced Engineering Mathematics", Michael D. Greenberg, Prentice Hall International publishers.

#### Additional Reading

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Company,
2. "Mathematics for Engineers and Scientists", Alan Jeffrey, Champman and Hall/CRC,
3. "Applied Mathematics for Engineers and Physicists", Pipes and Harvill, McGraw-Hill,
4. "Advanced Engineering Mathematics", Alan Jeffrey, Academic Press,
5. "Advanced Engineering Mathematics", Dennis G. Zill and Michael R. Cullen, Narosa Publishing House,
6. "Linear Algebra and its applications", David C. Lay, Pearson Education, Inc.,
7. "Advanced Engineering Mathematics", C. Ray Wylie, Louis C Barrett R, McGraw-Hill Book Company,
8. "Advanced Modern Engineering Mathematics", James, G, Pearson Education.



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**HS10103 :: MODERN PHYSICS**

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

**Objectives:**

- To understand fundamental principles of modern physics specifically concern to optics and quantum physics and their engineering applications,
- To provide problem solving experience in optics and quantum physics, in both the classroom and the laboratory learning environment,
- To motivate the students through practical examples that demonstrates the role of physics in progress of engineering disciplines so as to inculcate the interdisciplinary academic environment.
- Mapping with PEOs: I, II, III, V : (a, e, h, o, p)

**Unit I**

(8 + 2 = 10 Hrs)

**[A]**

**Interference:** Coherence, Thin film Interference, Fringe width, Colours in Thin Films (Oil Film, Peacock Feather), Newton's Rings, Michelson's Interferometer, Applications: Wavelength of Light, Resolution of Spectral Lines, Interference Applications: Optically Plane Surface, Antireflection Coatings.

**Diffraction:** Fresnel and Fraunhofer Diffraction, Fraunhofer Diffraction at Single Slit (Geometrical Method), Conditions for Maxima and Minima, Intensity Pattern, Plane Diffraction Grating (Qualitative Results Only), Dispersive Power of Grating, Resolving Power, Rayleigh's Criterion of Resolution, Resolving Power of Grating and Telescope, X - Ray Diffraction from Crystals, Braggs Law.

**[B] Self Study**

Applications of Newton's Rings for Determination of (i) Radius of Curvature of Plano Convex Lens (ii) Refractive Index of Liquid, Applications of Michelson's Interferometer for Determination of (i) Wavelength of a Monochromatic Source (ii) Refractive Index / Thickness of a Transparent Thin Film, Interference Filters.

Diffraction at Circular Aperture (Results Only), Applications: Resolving Power of Microscope, Wavelength Determination using Grating, Braggs X-ray Spectrometer.



## Unit II

(7 + 2 = 9 Hrs)

[A]

### Polarization

Introduction, Malus Law, Double Refraction (Huygen's Theory), Huygen's Construction of Doubly Refracted Wave Fronts for Normal Incidence in Crystal cut with Optic Axis (i) Parallel to Surface, (ii) Inclined to Surface, Retardation Plates, Elliptically Polarized Light and its Production, Dichroism, Applications: LCD, Polaroids, Antennas.

### Introduction to Special Theory of Relativity

Frames of References, Galilean Relativity, Michelson Morley Experiment (Results only), Physical Event, Lorentz Transformations of Space and Time, Einstein's Formulation of Special relativity, Length Contraction, Time Dilation.

### [B] Self Study

Brewster's Law, Geometry of Calcite Crystal, Huygen's Construction of Doubly Refracted Wavefronts for Normal Incidence in Crystal cut with Optic Axis Perpendicular to Surface, Quarter Wave Plate (QWP), Half wave plate (HWP), Nicols Prism, Circularly Polarized Light, Detection of Light (PPL, CPL, EPL, Upl, Par PL).

Relative Velocity, Relativistic Mass and Momentum, Mass and Energy.

## Unit III

(9 + 2 = 10 Hrs)

[A]

### Elementary Quantum Mechanics

Limitations of Classical Mechanics and Need of Quantum Mechanics, Wave Particle Duality, Quantum Particle, de-Broglie's Hypothesis, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle, Electron Diffraction at Single Slit, Concept of Wave Function ( $\psi$ ), Max Born's Interpretation of  $\psi$ , Physical Significance of  $\psi$  and  $\psi^2$ .

### Quantum Mechanics

Schrödinger's Wave Equations, Applications of Schrodinger's Wave Equations to problems of (i) Particle in Rigid Box (1 D - Infinite Potential Well), Tunneling through a Potential Energy Barrier, Applications of Tunneling Effect, Tunnel Diode.

### Nanoscience and Nanotechnology

Introduction, Nanoscience and Nanomaterials, Nanoparticles Properties (Quantum Size Effects: optical, electrical, magnetic, structural, mechanical), Zero, One, Two Dimensional nanostructures, Applications.

### [B] Self Study

Rutherford's atomic model, Black body radiation, Photoelectric Effect, Bohr Atom model and its Limitations, Davisson and Germer's Experiment,  $\gamma$  – ray microscope.

Particle in a Non-rigid Box (Finite Potential Well), Qualitative (Results Only), Physical Structure & Syllabus of F.E. (Common) – Pattern 'F11', Issue No. 1, Rev 00, dated 21-05-2013



Interpretation of Quantum Numbers.

Techniques of nanomaterials synthesis (physical, chemical, biological, mechanical, vapour and hybrid methods), Applications of nanotechnology in textile, cosmetics, electronics, energy, automobiles, space, defence, medical, environmental.

**Unit IV**

**(9 + 2 = 10 Hrs)**

[A]

**Semiconductor Physics**

Kronig-Penny Model (Qualitative), Band Theory of Solids, Energy Bands in C (Graphite, Diamond), Ohm's Law (Microscopic), Temperature Dependence of Conductivity, Hall Effect, Fermi Level, Fermi-Dirac Probability Distribution Function, Fermi Level in Intrinsic (derivation) and Extrinsic Semiconductors (Effect of Temperature and Doping Level on Fermi Energy), Working of PN Junction Diode from Energy Band Diagrams, Photovoltaic Effect, Solar Cell Working and Characteristics.

**Superconductivity**

Introduction, Properties of Superconductors (Zero Resistance, Meissner Effect, Critical Fields, Persistent Currents, Critical Current Density, London Penetration Depth, Isotope Effect), BCS Theory, Preparation of High T<sub>c</sub> Superconductors, DC and AC Josephson Effect, Superconducting Quantum Interference Devices (SQUID), Applications.

**[B] Self Study**

Hybridization, Energy Bands in Li, Be, Na, Si, Valence Band, Conduction Band, Forbidden Gap, Classification of Solids into Conductors, Semiconductors and Insulators, Electrical Conductivity of Conductors and Semiconductors, PNP and NPN Transistors, Applications of Solar Cell.

Type I and II Superconductors, High T<sub>c</sub> Superconductors, Applications: Transmission Lines, Superconducting Magnets, Maglev Trains, Magnetic Resonance Imaging (MRI Scanning), Superconductors in Computing.

**Unit V**

**(7 + 2 = 9 Hrs)**

[A]

**Lasers and Applications**

Stimulated Absorption, Spontaneous and Stimulated Emission, Population Inversion, Basic Requirements for Lasing Action, Laser Properties, He-Ne Laser, Semiconductor Diode Laser, Carbon Dioxide Laser (Principle, Construction and Working).

**Nuclear Physics**

Binding Energy Curve, Nuclear Fission, Q - value of Nuclear Reaction, Nuclear Magnetic Resonance (NMR), Applications, Nuclear Fusion, Controlled Fusion, Ignition Temperature, Fusion Reactors, Confinement Schemes: Gravitational, Magnetic, Inertial, Laser Fusion Reactor.



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**[B] Self Study**

Ruby Laser, Applications of Lasers (Industry : Drilling, Welding and Micromachining, Medical: Laser Eye, Skin, Cosmetic Surgery, Communication: Fibre Optics, Military Applications: Laser range detection, Laser Guided Missiles)

Nuclear constituents, Atomic Mass Unit, Mass Defect and Packing Fraction, Binding Energy, Uranium Chain reaction, Distinction between Nuclear Fission and Fusion, Fusion: Future Source of Energy, Fusion reactions.

**Note:** Five assignments on self study, comprising of one assignment from each unit.

**Text Books**

1. "Engineering Physics", Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010,
2. "Physics for Scientists and Engineers with Modern Physics", Raymond J. Serway & John W. Jewett, Seventh Edition, Thomson / Cengage Learning, New Delhi, 2010,
3. "Concepts of Modern Physics", Beiser Arthur, (6th) New, Tata McGraw Hill Pub. Co, 2005.

**Reference Books**

1. "University Physics with Modern Physics", Young and Freedman – 12<sup>th</sup> Ed. (Pearson Education),
2. "Lectures on Physics", Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publishers / Pearson Education.

**Additional Readings**

1. "Fundamentals of Optics", Jenkins & White, M Hill Book Co, 1983,
2. "Fundamentals of Physics", Resnick and Halliday, John Wiley and Sons.



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**CH10101 :: CHEMISTRY**

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil.

**Objectives:**

- To develop analytical ability amongst students.
- To impart pure chemistry principles.
- To understand the chemistry behind development of fundamentals.
- Mapping with PEOs: II, III, V : (a, b, e, h, o, p)

**Unit I**

(9+2 Hrs)

[A]

**Chemical Bonding and Co-ordination Chemistry**

Types of Bonds, Valence Bond Theory, Concept of Hybridization, Molecular Orbital Theory, MO Diagrams for Homogeneous and Heterogeneous molecules, Interpretation of Bond Order and Magnetic properties of molecules. Types of ligands, Nomenclature of Co-ordination complexes, Isomerism in Co-ordination complexes. Theories of Co-ordination compounds (VBT and CFT).

[B] **Self Study:** M.O. Diagram for N<sub>2</sub> and NO, Calculation of bond order and magnetism,

**Unit II**

(9+1 Hrs)

[A]

**Molecular Spectroscopy**

Absorption Laws, Principle, Instrumentation and applications of UV-Visible, IR and NMR Spectroscopy, Woodward- Fieser Rule for calculating  $\lambda$  max. General idea of Mass spectroscopy, Numerical on all the three types of spectroscopy.

[B] **Self Study:** Additional numerical on UV-visible, IR and NMR spectroscopy.

**Unit III**

(8+2 Hrs)

[A]

**Thermodynamics**

Basic terms in Thermodynamics, First law of thermodynamics, concept of enthalpy, Limitations, Second law of thermodynamics, Clausius and Kelvin statement, Concept of Entropy, Change in entropy for isothermal, reversible and irreversible process. Free energy, Physical significance and application of Gibbs-Helmholtz equation, Vant Hoff's Isotherm and Isochore. Numerical.

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[B] **Self Study:** Numericals on first law of thermodynamics, entropy and enthalpy.

**Unit IV**

(7+1 Hrs)

[A]

**Chemical Kinetics**

Rate of reaction, experimental determination, Rate law and rate constant, Order and molecularity of reaction, Integrated rate equation for first and second order kinetics, Half life for first and second order kinetics, Arrhenius equation, Numericals on activation energy, Half life, rate constant for first and second order kinetics.

[B] **Self Study:** Characteristics of rate constant, comparison between rate of reaction and rate constant, comparison between order and molecularity of reaction.

**Unit V**

(7+2 Hrs)

[A]

**Structure and Reactivity of Organic Molecules**

Explanation and application of inductive, electromeric, mesomeric and hyperconjugative effect, Structure and stability of carbocation, carbanion, and free radical, Types of organic reactions (Substitution, Addition and Elimination), Optical isomerism, Geometrical isomerism, Conformational analysis of ethane.

[B] **Self Study:** Types of Bond cleavage, study of named reactions.

**Note:** Five assignments on self study, comprising of one assignment from each unit.

**Text Books**

1. "Engineering Chemistry", Dr. B. S. Chauhan, University Science Press, New Delhi, 3<sup>rd</sup> edition,
2. "Engineering Chemistry", Jain and Jain, Dhanpat Rai Publication.

**Reference Books**

1. "Principle of Physical Chemistry", B.R. Puri, L.R. Sharma, M.S. Pathania, S. Chand and Co. Ltd., New Delhi,
2. "Organic Chemistry- Vol 1", I L Finar, Pearson, 6<sup>th</sup> Edition,
3. "Selected Topics in Inorganic Chemistry" W. U. Malik, G. D. Tuli, R. D. Madan S. Chand and Co. Ltd., New Delhi.



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## ME10101 :: ENGINEERING GRAPHICS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

### Objectives:

- To develop 3 dimensional imagination
- To learn basic concepts of Lines, planes and solids.
- To visualize the basic principles of orthographic and isometric projections.
- Mapping with PEOs: I, II, III, V : (c, e, f, h, p)

### Unit I

(8 Hrs)

#### Engineering Curves

Ellipse, Parabola, Hyperbola, normal and tangents to these curves, Involute, Cycloid, Epi-cycloid, Hypo-cycloid, Archimedean Spiral, Helix on cone and cylinder.

#### Lines and Dimensioning in Engineering Drawing

Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

#### Orthographic Projections

Reference planes, Use of First angle and Third angle projection method

### Unit II

(8 Hrs)

#### Projections of Points and Lines and planes

Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP

### Unit III

(8 Hrs)

#### Projections of Solids and Sections of Solids

Projections of solids inclined to one reference plane, inclined to both the Reference Planes. Projections of cube, right regular prisms, right regular pyramids, right circular cylinder. Types of section planes, projections of above solids cut by different section

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planes, True shape of cut surfaces.

#### Unit IV

(08 Hrs)

##### **Interpenetration of solids and Development of Lateral Surfaces (DLS) of Solids**

Interpenetration of solids, cylinder, cone, prism, pyramid, Development of Lateral Surfaces (DLS) of Solids, Applications of DLS, method of development, development of lateral surface of above solids.

#### Unit V

(08 Hrs)

##### **Isometric Projections**

Isometric view, construction of Isometric view from given orthographic views (for simple engineering objects) Isometric view of a Pyramid, Cone.

#### Unit VI

(05 Hrs)

##### **Self Study**

- Sectional orthographic projections – full section,
- Distance between skew lines, True shape of a plane surface,
- Frustum of right circular cylinder and cone,
- Antidevelopment of lateral surface of cut solids,
- Isometric view of a Sphere

**Note:** Five assignments on self study, comprising of one assignment from each unit.

##### **Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.

##### **Reference Books**

1. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
2. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.



**HS10107 :: COMMUNICATION SKILL**

Credits: 01

Teaching Scheme: - Theory 2 Hrs/Week

Prerequisites: Nil

**Objectives:**

- To understand the basics of eight parts of speech.
- To guide the students with apt expressions in English language (both words and sentence construction).
- To improve reading, writing and listening skills.
- To make the students confident and impressive in front of a group.
- Mapping with PEOs: I, II, III, V : (j, k, n, o, p)

**Unit I**

(4 + 2 = 6 Hrs)

- [A] Self introduction, eight parts of speech, Use of Phrases, Clauses, Use of abbreviations and acronyms, Forms of sentences
- [B] To find phrases, abbreviations, acronyms and clauses used in any science subject (10 each)

**Unit II**

(5 + 2 = 7 Hrs)

- [A] Revision of basic rules related to grammar with respect to:
- a) *nouns and pronouns* followed by exercises (min 20 sentences),
  - b) *determiners and adjectives* followed by exercises (min 20 sentences),
  - c) *prepositions and conjunctions* followed by exercises (min 20 sentences)
- [B] Home Assignments related to the above topics (minimum 25 sentences on each topic).

**Unit III**

(5 + 2 = 7 Hrs)

- [A] Revision of basic rules related to grammar with respect to:
- a) *verbs and adverbs* followed by exercises (min 20 sentences)
  - b) *tense* followed by exercises (min 20 sentences)
  - c) *subject verb agreement* followed by exercises ( min 20 sentences )
- [B] Home Assignments related to the above topics (minimum 25 sentences on each topic).



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#### Unit IV

(5 + 2 = 7 Hrs)

##### [A] Developing Language Skills:

- a) Developing Reading Skills, To read, take notes and interpret the given information (text / diagrams / flow chart etc )
- b) Developing listening skills, How to be a good listener. Exercises with respect to listening.
- c) Developing writing skills, To compose emails, Business correspondence
- d) Developing formats.

[B] Home Assignments related to the above topics (Read the newspaper and write the gist of topic given by teacher, Listen to BBC, Doordarshan English News, Assignments related to non technical writing).

#### Unit V

(5 + 2 = 7 Hrs)

[A] Vocabulary Building. Glimpses of tests / exams organized by UPSC / Bank for Probationary officer/ TOEFL/IELTS

[B] Home Assignments related to the above topics (Puzzles, Quizzers, Previous years question papers of UPSC, Bank, TOEFL, IELTS).

#### Text Books

1. "Business communication" K.K.Sinha 2001 Revised Edition GALGOTIA Publishing Company, Delhi.
2. "Communication Skills" by Dr PC Pardeshi 2005 Nirali Prakashan Pune
3. "Functions of English "Student's edition Leo Jones , 2<sup>nd</sup> edition Cambridge University press Delhi

#### Reference Books

1. "High School English Grammar " with key Renin Martin 1989 S Chand & Co Ltd Mumbai
  2. "Punctuation Book " Nidhi Pathak 2010 published by Lotus Press Delhi
  3. "English for competitive examinations " Swarna Chawla , Vikas publishing house pvt ltd , UBS Publisher's distributors - Pune
- 1.



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**HS10201 :: ADVANCED ALGEBRA AND ANALYTICAL  
GEOMETRY (Tutorial)**

**Credits:** 01

**Teaching Scheme:** Tutorial 1 Hr/Week

**Prerequisites:** Nil.

**Objectives:**

Module I is a full one semester course taken by all junior freshmen engineering students. It starts with matrix, linear algebra, complex numbers, solid geometry and calculus of functions of one variable. The module I emphasize both theoretical foundations of calculus, linear algebra, complex number, solid geometry self study and their applications. It is intended to enable students to recognize mathematical structures in practical problems, to translate problems into mathematical language and to apply 'Engineering Mathematics I' to solve them as well as real world problems.

Upon completion of this module students will be able to:

- Recognize mathematical structures in practical problems.
- Translate problems into mathematical language and analyze problems using methods from all the units.
- Mapping with PEOs: I, III, V : (a, k, p)

**List of Contents**

In this module I students will work on problems to practice and apply methods introduced in the theory lectures. Discussions of problems in small groups is always encouraged and facilitated and students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

**Tutorial No. 1:** Summary on matrices, vectors in n-dimensions, vector spaces and subspaces, linear dependence and independence and problems solving.

**Tutorial No. 2:** Summary on rank of a matrix, solution of linear systems, inner product spaces and problems solving.

**Tutorial No. 3:** Summary on linear transformations, matrices for linear transformations, transition matrices and similarity and application of linear transformations and problems solving.



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- Tutorial No. 4:** Summary on Eigen values and eigen vectors, Cayley-Hamilton theorem and its application, diagonalization, symmetric matrices and orthogonal diagonalization and problems solving.
- Tutorial No. 5:** Summary on application of eigen values and eigen vectors to rotation of axis (quadratic forms and reduction of quadratic forms to canonical forms) and problems solving.
- Tutorial No. 6:** Summary on complex numbers upto Argand diagram, polar form of a complex number, De Moivre's theorem roots of complex numbers and problems solving.
- Tutorial No. 7:** Summary on exponential and circular functions of complex variables, hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts of functions of complex variables and problems solving.
- Tutorial No. 8:** Summary on random variable, probability distribution, mathematical expectation, variance and problems solving.
- Tutorial No. 9:** Summary on curve fitting – the method of least squares, regression, linear correlation coefficient and problems solving.
- Tutorial No. 10:** Problem solving sessions on standard probability distributions
- Tutorial No. 11:** Summary on co-ordinate systems in space and sphere and problems solving.
- Tutorial No. 12:** Summary on quadratic surfaces, surface of revolution and standard surfaces of revolution and problems solving.

**Text Books**

4. "Text book of Calculus", Ron Larson and Bruce H. Edwards, Brooke/Cole, a part of Cengage Learning (Indian Edition),
5. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers,
6. "Linear Algebra: An Introduction", Ron Larson and David C. Falvo, Brooke/Cole, a part of Cengage Learning (Indian Edition).

**Reference Books**

2. "Calculus and analytic Geometry", Thomas G. B. and Finney, Wesley / Narosa,
3. "Linear Algebra and its Applications", Gilbert Strang, Cengage Learning (Indian Edition),
4. "Advanced Engineering Mathematics", Michael D. Greenberg, Prentice Hall International publishers.



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### **Additional Reading**

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Co.,
2. "Mathematics for Engineers and Scientists", Alan Jeffrey, Chapman and Hall/CRC.
3. "Applied Mathematics for Engineers and Physicists", Pipes and Harvill, McGraw-Hill,
4. "Advanced Engineering Mathematics", Alan Jeffrey, Academic Press,
5. "Advanced Engineering Mathematics", Dennis G. Zill and Michael R. Cullen, Narosa Publishing House,
6. "Linear Algebra and its applications", David C. Lay, Pearson Education, Inc.,
7. "Advanced Engineering Mathematics", C. Ray Wylie, Louis C Barrett R, McGraw-Hill Book Company,
8. "Advanced Modern Engineering Mathematics", James, G, Pearson Education.



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**HS10203 :: MODERN PHYSICS (Tutorial)**

Credits: 01

Teaching Scheme: - 1 Hr/Week

Prerequisites: : Nil

**Objectives:**

- To understand fundamental principles of modern physics specifically concern to optics and quantum physics and their engineering applications,
- To provide problem solving experience in optics and quantum physics, in both the classroom and the laboratory learning environment,
- To motivate the students through practical examples that demonstrates the role of physics in progress of engineering disciplines so as to inculcate the interdisciplinary academic environment.
- Mapping with PEOs: I, II, III, V : (a, e, h, o, p)

**List of Contents**

In this module students will work on problems to practice and apply methods introduced in the theory lectures. Discussions of problems in small groups is always encouraged and facilitated and students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

- Tutorial No. 1:** Introduction to Waves, Superposition Principle, Phase Difference, Coherence,
- Tutorial No. 2:** Methods of production of Coherent Sources, Division of Amplitude, Division of Wavefront, Interference, Introduction to Diffraction,
- Tutorial No. 3:** Problems on Thin Film Interference, Fringe Width,
- Tutorial No. 4:** Problems on Newton's Ring Experiment, Problems on Michelson's Interferometer, Antireflection Coatings, Interference Filter
- Tutorial No. 5:** Problems on Diffraction due to Single Slit, Problems on Diffraction Grating,
- Tutorial No. 6:** Problems on Resolving Power of Grating, Telescope and Microscope,
- Tutorial No. 7:** Problems on Polarization, Malus Law, Brewster's Law, Retardation Plate etc.
- Tutorial No. 8:** Problems on Special Theory of Relativity: Length Contraction, Time Dilation, Relative Mass etc.
- Tutorial No. 9:** Problems on de-Broglies Hypothesis, Davisson & Germer Experiment,

Structure & Syllabus of F.E. (Common) – Pattern 'F11', Issue No. 1, Rev 00, dated 21-05-2013



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- Tutorial No. 10:** Problems on Heisenberg's Uncertainty Principle, Problems on Normalization and 1 D – Infinite Potential Well,
- Tutorial No. 11:** Problems on Semiconductor Physics: Conductivity, Hall Effect, Problems on Superconductivity: Critical Field,
- Tutorial No. 12:** Problems on Superconductivity: Isotope Effect, Penetration Depth, Problems on Nuclear Physics.

#### Text Books

1. "Engineering Physics", Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010,
2. "Physics for Scientists and Engineers with Modern Physics", Raymond J. Serway & John W. Jewett, Seventh Edition, Thomson / Cengage Learning, New Delhi, 2010,
3. "Concepts of Modern Physics", Beiser Arthur, (6th) New, Tata McGraw Hill Pub. Co, 2005.

#### Reference Books

1. "University Physics with Modern Physics", Young and Freedman – 12<sup>th</sup> Ed. (Pearson Education),
2. "Lectures on Physics", Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publishers / Pearson Education.





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**CH10301 :: SCIENCE LABORATORY (S<sub>2</sub> + S<sub>3</sub>)**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

**S<sub>2</sub> : MODERN PHYSICS LABORATORY**

- To understand and experience the basics of physics through expert member.
- To learn the proper methods and techniques utilized in gathering experimental data.
- To become familiar with the proper use of basic measuring instruments commonly found in physics laboratory.
- To develop the ability to recognize and apply the appropriate physics introduced in the lecture course to actual experimental situations by taking mini projects.
- To learn how to analyse data and then reach scientific conclusions based on analysis.
- Mapping with PEOs: I, II, III, IV, V : (a, e, h, g, j, o, p)

**List of Practical** (Experiments to be performed as per following code of conduct)

Sr. No.	Name of the Experiment	Mode of Conduct
1.	Newton's rings experiment (Wavelength, radius, refractive index)	<b>Experiment no 1:</b> Any one of two to be performed by students and other for demonstration of working principle.
2.	Michelson's Interferometer.	
3.	Use of diffraction grating for the determination of wavelength of spectral line.	<b>Experiment no 2:</b> Any one of four to be performed by the students and any two of remaining for demonstration of working principle.
4.	Determination of thickness of wire using LASER.	
5.	Determination of wavelength of a given laser source.	
6.	Resolving power of a telescope / Grating.	
7.	To verify cosine square law of Malus for plane polarized light using photocell.	<b>Experiment no 3:</b> Any one of four to be performed by the students and any two of remaining for demonstration of working principle.
8.	Determination of Brewster's angle for glass surface and refractive index of glass.	
9.	Determination of refractive indices for ordinary, extraordinary rays for a quartz crystal / Prism.	

Structure & Syllabus of F.E. (Common) – Pattern 'F11', Issue No. 1, Rev 00, dated 21-05-2013



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10.	Demonstration of Lissajous figures using a CRO (Principle of interference) concepts of polarization	
11.	Determination of band gap of a semiconductor.	<b>Experiment no 4 and 5:</b> Any two of five to be performed by the students and any two of remaining for demonstration of working principle.
12.	Characteristics of solar cell, calculation of fill factor.	
13.	Hall Effect, determination of Hall coefficient.	
14.	Study of diode characteristics ( PN, Zener, Tunnel )	
15.	Characteristics of a photocell.	

**Text Books**

1. "Engineering Physics", Hitendra K. Malik & A. K. Singh, Tata McGraw Hill, New Delhi, 2010,
2. "Physics for Scientists and Engineers with Modern Physics", Raymond J. Serway & John W. Jewett, Seventh Edition, Thomson / Cengage Learning, New Delhi, 2010.
3. "Concepts of Modern Physics", Beiser Arthur, (6th) New, Tata McGraw Hill Pub. Co, 2005.

**Reference Books**

1. "University Physics with Modern Physics", Young and Freedman – 12<sup>th</sup> Ed. (Pearson Education),
2. "Lectures on Physics", Volume 1, 2 and 3 by Richard P. Feynman, Narosa Publisers / Pearson Education.



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**Objectives:**

**S<sub>3</sub> : CHEMISTRY LABORATORY**

- To develop an analytical ability
- To integrate chemistry fundamentals with practical applications.
- To understand the chemistry behind physico-chemical phenomena.
- Mapping with PEOs: II, III, V : (a, b, e, h, j, o, p)

**List of Practical (any five):**

1. Experimental verification of Beer-Lambert's law by determining unknown concentration of solution of ferric ammonium sulphate using colorimeter.
2. To find out the heat of neutralization of sodium hydroxide and hydrochloric acid.
3. To determine the value of rate constant (k) for the hydrolysis of ethyl acetate catalyzed by hydrochloric acid.
4. Preparation of acetanilide from aniline.
5. Preparation of benzoic acid from ethyl benzoate.
6. Preparation of *tris*- (ethylenediamine) nickel thiosulphate.

**Text Books**

1. "Lab manual on Engineering chemistry", Dr. S Rani, Dhanpat Rai Publication,
2. "Applied Chemistry Theory and Practical", O P Virmani and A K Narola New Age International Publication.

**Reference Books**

1. "Practical Inorganic Chemistry", Vogel, Prentice Hall Publication,
2. "Practical Organic Chemistry", Vogel, Prentice Hall Publication.



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**ME 10301 :: ENGINEERING GRAPHICS LABORATORY**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

- To develop 3 dimensional imagination,
- To learn basic concepts of Lines, planes and solids,
- To visualize the basic principles of orthographic and isometric projections.
- Mapping with PEOs: I, II, III, V : (c, e, f, h, j, p)

Term Work should be prepared on Six A2 (594 × 420mm) (Half imperial) size drawing sheets as detailed below:

**List of Practicals**

- |  |           |
|--|-----------|
| 1. Lines, lettering and dimensioning                             | (2 weeks) |
| 2. Orthographic Projections (2 problem)                          | (3 weeks) |
| 3. Projection of Line and Planes (Each 1 problem)                | (2 weeks) |
| 4. Projections of Solids and Sections of Solids (Each 1 problem) | (2 weeks) |
| 5. Interpenetration of solids and DLS of Solids (Each 1 problem) | (3 weeks) |
| 6. Isometric Projections (2 problem)                             | (2 weeks) |

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana and P.Kannaiah, Scitech Publications, Chennai.

**Reference Books**

1. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi,
2. "Engineering Drawing", Venugopal K., New Age International Publishers.



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**HS 14301 :: ENGINEERING WORKSHOP**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

- To give students 'hands on experience' of craftsmanship
- To make students familiar with different work trades
- To develop quality and safety consciousness amongst the students
- To develop awareness of fire safety amongst the students
- To develop respect towards labor work amongst the students.
- Mapping with PEOs: I, II, IV, V : (b, c, f, g, i, j, m)

**Practical Details:**

**1. Carpentry**

Introduction, use of marking tools and hand tools such as marking gauge, try squares, steel rules, saws, jackplane, chisels, etc. Use of power tools, safety precautions.

**Practical**

One job involving different operations such as sawing, planning, chiseling, etc.

**2. Welding**

Introduction, principle of manual metal arc welding, equipment and it's operation, welding electrodes, welding joints, welding symbols, safety precautions.

**Practical**

One job on mild steel.

**3. Mini Project**

Besides the above jobs, students in groups will make an article / gadget / model / setup involving the work of above work trades and / or other work trades.

**Demonstrations**

**1. Fire Safety**

Introduction, fire prevention precautions, necessity of fire fighting, fire extinguishers, rules of fire fighting, risk elements in fire fighting and demonstration of use of fire extinguishers.



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2. **Gas Cutting**  
Introduction, principle, equipment and its operation, safety precautions and demonstration of Oxy-Acetylene Gas cutting process.

**Note:- Students should wear safety apron and safety shoes during the practicals.**

**Text Books**

1. S. K. Hajra Choudhary, Elements of Workshop Technology, Media Promoters and Publishers Pvt. Ltd.,
2. K.T. Kulkarni, Introduction to Industrial Safety, K.T. Kulkarni, Pune.

**Reference Books**

1. Hwaiyu Geng, Manufacturing Engineering Handbook, McGraw Hill Publishing Co. Ltd.,
2. Lawrence E. Doyle, Manufacturing Processes and Materials for Engineering, Prentice Hall Inc.



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# MODULE II

Department of Engineering, Sciences and Humanities (DESH)

<b>Structure, F.E. (Module II)</b>		FF653, Issue No. 1, Rev 00, dt 25/05/2013				
Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)		Credits	
			Lect.	Tutorial		Practical
S <sub>5</sub>	HS10102	Differential and Integral Calculus	3	0	0	3
S <sub>6</sub>	HS10104	Engineering Mechanics	3	0	0	3
S <sub>7</sub>	HS10106	Electrical Technology	3	0	0	3
S <sub>8</sub>	CS10102	Computer Programming	3	0	0	3
T <sub>3</sub>	HS10202	Differential and Integral Calculus	0	1	0	1
T <sub>4</sub>	HS10204	Engineering Mechanics	0	1	0	1
P <sub>3</sub>	HS10306	Engineering Lab (S6+S7)	0	0	2	1
P <sub>4</sub>	CS10302	Computer Programming Lab	0	0	2	1
MP <sub>2</sub>	HS17402	Mini Project	0	0	2	2
#P <sub>5</sub>	HS17301	General Seminar I	0	0	2	1
#SD <sub>2</sub>	HS14302	Trade Workshop	0	0	2	1
**OE <sub>2</sub>		@Elective Course	2	0	0	2
	HS16102	Economics				
	HS16104	Management Technology				
	HS16106	Cost and Accounting				
	HS16108	Business Law				
		<b>Total</b>	<b>14</b>	<b>2</b>	<b>10</b>	<b>23</b>
#*GP <sub>1</sub>	HS153XX	International Languages – I	0	0	2	1
##*GP <sub>2</sub>	HS153XX	International Languages – II	0	0	2	1
# The course Engineering Workshop and Communication Skill will be offered for both module I and module II in semester I,						
** Students have to select and register for only one course from this group.						
#* Students will register only one course in Semester I irrespective of Module,						
##* Students will be allotted level II of International language they registered in Sem I for Semester II irrespective of Module.						
	HS15302	French I	HS15301	English I	HS15305	Japanese I
#*	HS15303	German I	##*	HS15302	French I	HS15306
	HS15304	Spanish I	GP2	HS15303	German I	HS15307
	HS15305	Japanese I		HS15304	Spanish I	HS15308
						Japanese II
						English II





**HS10102 :: DIFFERENTIAL AND INTEGRAL CALCULUS**

<b>Credits:</b> 03	<b>Teaching Scheme:</b> - Theory 3 Hrs/Week
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**Prerequisites:** Nil.

**Objectives:**

This module II is about the understanding and application of fundamental techniques involved in the analysis of engineering systems. This aims to equip the students with mathematics needed to analyze and solve a range of engineering problems with focus on conceptual understanding.

- To make aware students about the importance and symbiosis between Mathematics and Engineering.
- Achieve a fluency with Mathematical tools which is an essential weapon in modern Graduate Engineer's Army.
- Balance between the development of understanding and mastering of solution techniques with emphasis being on the development of student's ability to use Mathematics with understanding to solve Engineering problems by retaining the philosophy of "learning by doing".
- Mapping with PEOs: I, III, V : (a, k, p)

By the end of this module-II students will be expected to demonstrate knowledge of

- Successive differentiation, Leibnitz theorem and mean value theorems. Convergence and divergence of a sequence and series with tests for convergence of the series.
- Partial differentiation, Euler's theorem on homogeneous functions, Jacobian and their applications. Maxima and minima of functions of several variables and Lagrange's method of undetermined multipliers.
- Using reduction formulae. Application of rule of differentiation under the integral sign. Recognizing the importance of special function viz. error function and its importance in mathematics and its relation to Normal distribution (Probability theory).
- Finding the length of an arc, surface area and volume of revolution, Mean values, and root mean square values and centre of gravity of an arc by single integration.
- Interpretation of the concept and components of double integrals. Introduction to special functions namely Gamma function and use of duplication formula to evaluate the gamma function for half integer arguments and the relationship between gamma and Beta function with applications.
- Formulating and evaluating triple integrals by expressing in other co-ordinate systems with Jacobian transformation. Application of multiple integration to find area, centroid and moment of inertia of plane areas and centroid and moment of inertia of volume of solids.



- Understanding the term exact differential equation and solution of linear differential equation using integrating factors. Finding orthogonal trajectories of Cartesian and polar equations and application of ODE to various branches of engineering problems.

**Unit I**

**Differential calculus (08 Hrs)**

Successive differentiation and Leibnitz theorem, Mean value theorem. The theorem of the mean. Taylor and Maclaurin's series. Sequence and Infinite series and tests for its convergence, Comparison, Ratio. Power series and its convergence.

**Unit II**

**Partial Derivatives (08 Hrs)**

Functions of two or more variables. Partial derivatives. Differentials, Theorem on differentials. Differentiation of composite functions. Euler's theorem on homogeneous functions. Jacobians and its properties. Partial derivatives of implicit functions using Jacobians. Application to maxima and minima.

**Unit III**

**Integral Calculus (08 Hrs)**

Beta and Gamma functions. Differentiation under integral sign, Error function. Introduction to curve tracing. Tracing of Cartesian, parametric and polar curves. Rectification of curves.

**Unit IV**

**Multiple Integrals (08 Hrs)**

Double Integrals. Triple Integrals and Transformation of multiple integrals. Areas, by double integration and volume of solids by triple integration.

**Unit V**

**Ordinary differential equations (08 Hrs)**

Exact differential equations and reducible to exact differential equations. Linear differential equations and equations reducible to linear form. Application to mass-spring system. Application to electrical circuits.



**Unit VI**  
**Self Study**

**(08 Hrs)**

- Indeterminate forms (L'Hospital's rule).
- Method of Lagrange's undetermined multipliers for maxima and minima.
- Reduction formulae. Applications of single integral to surface area and volume of revolution. Mean values and root mean square values. Application of single integral to centre of gravity of an arc.
- Centroid and moment of inertia of plane areas by double integration and Centroid and moment of inertia solids by triple integration.
- Application of ordinary differential equations to orthogonal trajectories and Simple Harmonic motion.

**Note:** Five assignments on self-study, comprising of one assignment from each unit.

**Text Books**

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2. "Text book of Calculus", Ron Larson and Bruce H. Edwards, Brooke/Cole, a part of Cengage Learning (Indian Edition).
3. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.

**Reference Books**

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Co.,
2. "Advanced Engineering Mathematics", Michael D. Greenberg, Prentice Hall International publishers,
3. "Mathematics for Engineers and Scientists", Alan Jeffrey, Champman and Hall/CRC.

**Additional Reading**

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Co.
2. "Advanced Engineering Mathematics", C. Ray Wylie, Louis C Barrett R, McGraw - Hill Book Company.
3. "Applied Mathematics for Engineers and Physicists", Pipes and Harvill, McGraw-Hill.
4. "Advanced Engineering Mathematics", Alan Jeffrey, Academic Press,
5. "Advanced Engineering Mathematics", Dennis G. Zill and Michael R. Cullen, Narosa Publishing House.
6. "Mathematics for Engineers and Scientists", Alan Jeffrey, Champman and Hall/CRC.
7. "Advanced Modern Engineering Mathematics", James, G, Pearson Education.



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Department of Engineering, Sciences and Humanities (DESH)

FF No. : 654

### HS 10104:: ENGINEERING MECHANICS

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

#### Objectives:

- To understand and predict physical phenomena to lay the foundation for engineering applications.
- To develop logical approach and reasoning for analysis and design of engineering applications / unfamiliar situations.
- To provide necessary background for the study of mechanics of deformable bodies and mechanics of fluids.
- To promote processes of problem solving abilities, experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Mapping with PEOs: I, II, III, V : (a, c, e, h, k, o, p)

#### Unit I: Basics of Statics:

(9+1 Hrs)

[A]

##### Statics Of Particles

**Forces In Plane:** Resolution of a force in to rectangular and skew components, Resultant and Equilibrant, Equilibrium of a particle.

**Forces In Space:** Rectangular component of a force in a space, Addition of concurrent forces in space to find resultant, equilibrium of particle in a space.

##### Statics of Rigid bodies:

**Forces In Plane:** Moment of a force about a point, couple, moment of couple, properties of couple, Varignon's theorem of moments, Resultant of parallel and non concurrent non parallel force systems.

**Forces In Space:** Moment of force about a point and about an axis, moment of a couple.

**[B] Self Study:** Six fundamental principles of mechanics, Principle SI units used in mechanics, SI prefixes and its rules for using.

**Vectors:** Force as a vector, triangle law for addition and subtraction of vectors, law of polygon of forces, vector product, scalar product.



**Unit II: Equilibrium of Rigid Bodies: (7+2Hrs)**

[A]

**Forces in Plane:** Conditions of equilibrium, Free body diagrams, Types of support and support reactions, Types of loading and its reduction to point loading, Concept of two and three force equilibrium, Equilibrium of simple beams, and mechanisms.

**Distributed Forces:** Centroid of area and line.

[B] **Self Study:** Derivation of formulas for centroidal distances of standard areas and lines by integration method.

**Forces In Space:** Types of support and support reactions, Equilibrium of Parallel force system.

**Unit III: Analysis of Structures and Friction (8+1Hrs)**

[A]

**Analysis of structures:** Assumptions in analysis of truss, Analysis of simple truss by a method of joint and method of section, Two force and multi force members, difference between truss and frame, analysis of simple frames (maximum number of 09 unknown)

**Friction:** Variation of frictional force for various condition viz. (No friction, No motion, Impending motion, and Motion conditions), Problems involving dry friction, Application to inclined planes, wedges, Belt friction, Band brake,

[B]**Self Study:** Theory and derivation of relation between tight side and slack side of flat and V belt, concept of Square threaded Screws, Journal bearings, Thrust bearings, Wheel friction.

**Unit IV: Kinematics of particles (8+2Hrs)**

[A]

**Rectilinear Motion:** Variable acceleration, Motion curves, concept of relative motion and simple dependent motion.

**Curvilinear Motion:** Concept of position, velocity and acceleration vectors, components of velocity and acceleration in three systems (i). Rectangular co-ordinate (x-y) system, (ii) normal and tangential (n-t) system, (iii) Radial and Transverse (r- $\theta$ ) system, Projectile motion.

[B] **Self Study:** Rectilinear Motion: Concept of position, Displacement, Distance, Speed, instantaneous and average velocity and acceleration, Uniform motion, Uniformly accelerated motion, Motion under gravity

Curvilinear Motion: Derivation of component of velocity and acceleration in three system (x-y, n-t, r- $\theta$ ), projectile on horizontal ground –derivation of equations of trajectory, time of flight, maximum range, maximum height, Projectile on inclined ground-derivation for sloping range, time of flight and maximum sloping range.



**Unit V: Kinetics of Particles**

**(8+1Hrs)**

**[A]**

**Force and acceleration:** Dynamic equilibrium, D’Almbert’s principle, Application of  $F= ma$  in three systems (i) rectangular co-ordinate (x-y) system, (ii) normal and, tangential (n-t) system, (iii) Radial and Transverse (r- $\theta$ ) system.

**Work Energy:** Work of a Force, power and efficiency, work energy principle, Conservative and non Conservative forces, Principle of conservation of energy.

**Impact:** Impulse momentum principle, direct and oblique impact.

**[B] Self Study:** Force and acceleration: Numerical on  $F= ma$ , in r- $\theta$  system.

Impact: derivation of coefficient of restitution for direct and oblique impact.

**Note:** Five assignments on self-study, comprising of one assignment from each unit.

**Text Books**

1. “Vector Mechanics for Engineers”, F. P. Beer and E. R. Johnston, 9<sup>th</sup> Edition –Mc Graw Hill Publications,
2. “Engineering Mechanics Statics and Dynamics”, R. C. Hibbler, Ashok Gupta, 11<sup>th</sup> Edition – Pearson Publications,

**Reference Books**

1. “Engineering Mechanics Statics”, J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons,
2. “Engineering Mechanics Dyanamics”, J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons.
3. “Engineering Mechanics Statics and Dynamics”, E.W. Nelson, C. L. Best, W. G. McLean, 5<sup>th</sup> Edition – Tata McGraw Hill.
4. “Engineering Mechanics Statics and Dynamics”, A. P. Boresi, R. J. Schmidt,– Thomson/Cangage Publications,



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Department of Engineering, Sciences and Humanities (DESH)

FF No. : 654

### HS10106 :ELECTRICAL TECHONOLOGY

Credits: 03

Teaching Scheme: - Theory 3 Hrs/Week

Prerequisites: Nil

**Objectives:**

- Understand basic concepts of electrical engineering.
- Gain knowledge of solving numerical problems related to electrical circuits.
- Understand basic concepts of electrical motors.
- Mapping with PEOs: I, II, III, V : (a, e, g, i, l, m, p)

#### Unit I – DC Circuits

(8+1 Hrs)

[A] Classification electrical networks, current and voltage sources and their conversions, Ohm's law, Kirchhoff's laws and their application for network solutions, simplification of networks using series - parallel combinations and star - delta transformations, superposition theorem, Thevenin's theorem,

[B] **Self Study:** Norton's Theorem, maximum power transfer theorem

#### Unit II – AC Circuits - 1

(8+1 Hrs)

[A] Concept of AC quantities, sinusoidal voltages and currents, their mathematical and graphical representations, Concepts of cycle, period, frequency, peak factor, form factor, concept of instantaneous, peak, average and rms value of AC quantity.

[B] **Self Study:** Phasor representation, phasor diagrams, phase difference, Study of AC through purely resistive, inductive and capacitive circuits, concept of impedance, Concepts of active, reactive and apparent power, power factor.

#### Unit III - AC Circuits - 2

(8+1 Hrs)

[A] study of single phase RLC series and RLC parallel circuits, Concept of three phase supply, phase sequence, concepts of line, phase, neutral etc., power relations in a three phase balanced star and delta connections, three phase phasor diagrams

[B] **Self Study:** p.f. improvement in a three phase circuit.



**Unit IV**

**(8+1 Hrs)**

**[A] DC Machines:** Working principle of d.c. machines, constructional features, types of d.c. machines, generating action, e.m.f equation. Motoring action, back e.m.f, motor equations, torque equation, characteristics of dc motor.

**[B] Self Study:** Starters of dc motors and applications.

**Unit V – Induction Motor**

**(8+1 Hrs)**

**[A]** Concept of rotating magnetic field; working principle of three phase induction motors; constructional features, torque equation; applications of Induction motor.

**[B] Self Study:** Single phase induction motor.

**Note:** Five assignments on self-study, comprising of one assignment from each unit.

**Text Books**

1. Electrical Technology by Edward Hughes, 7<sup>th</sup> Edition,
2. Electrical Technology - vol.- I and II by B. L. Theraja.

**Reference Books**

1. Basic Electrical Engineering by Nagarath and Kothari,
2. Principles of Electrical Engineering by Vincent Del Toro, PHI publications.
3. Electrical Technology by H. Cotton, CBS publication,
4. Fractional and sub fractional horse power electrical motors - C.E. Veinou and J.E. Martits, McGraw Hill





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**CS 10102 :: COMPUTER PROGRAMMING**

Credits: 3

Teaching Scheme: - 3 Hrs/Week

Prerequisites: Nil

**Objectives:**

- To understand use of efficient programming and documentation.
- To explore C programming language.
- Understand of how several fundamental algorithms work, particularly those concerned with string operations, sorting and searching.
- To learn basics of C++ programming language.
- Mapping with PEOs: I, II, IV, V : (a, d, e, g, k, p)

**Unit I**

(8 + 2 = 10 Hrs)

[A]

**Introduction**

Block diagram of computer system, Introduction to operating system (DOS and Unix), DOS internal and external commands, UNIX commands. Binary and decimal number representation. Levels of programming language: Machine Level, Assembly level and higher level languages. Assemblers, Compilers, Linker, Loader, Interpreter. Configuration of the Turbo C editor environment. Algorithm, Characteristics of algorithm, flowchart.

Introduction to C language as a middle level language. Basic structure of C program, standard library and header files, Preprocessor directives, Syntax and Semantics. Variable, constant (literal and named), Data types, variable declaration. Assignment, input and output statements, access specifier, escape sequences, buffered input. Operators: Arithmetic, logical, relational, Expressions, Precedence & Associativity.

[B]Self Study: How to compile and execute programs using command line in DOS, Use of vi editor and GCC in Linux. Conversion of numbers in decimal, octal and hexadecimal form.

**Unit II**

(8 + 2 = 10 Hrs)

[A]

**Flow of Control and Functions**

Selection Statement: if, Nested if –else, Conditional Expression, Switch statements, Iteration Statements: for loop, while loop, do-while loop, Jump Statements: go to, break & continue, nested loop, common programming error.

**Functions:** Need of functions, function definition, function declaration, function call,

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function prototype, inbuilt function and user defined function. Function and argument declaration, passing arguments to a function, returning values from a function, scope of variable, local and global variable.

**[B]Self Study:** Static variables and Constants in C language.

**Unit III**

**(8 + 2 = 10 Hrs)**

**[A]**

**Recursive Function and Arrays**

Need of Recursion, direct recursion, indirect recursion, impact of recursion on local & global variables, examples of recursive programs. Disadvantages of Recursion. Returning values through functions. Arrays: Concept, declaration and initialization of arrays, accessing individual elements of array. Concept of 2-D array (Matrix), row major and column major representation of array, address calculation for accessing the individual element. Passing arrays to functions. Strings: String Manipulation Functions, user defined functions.

**[B]Self Study:** Preprocessor: Macro Substitution, difference between macro and function, Readymade Library functions.

**Unit IV**

**(8 + 2 = 10 Hrs)**

**[A]**

**Pointers and Structure**

Concept of pointers, relevance of data type in pointer variable, dynamic memory allocation, type casting, pointer constant, array of pointers, pointer to pointer, passing pointers to a function and returning a pointer from function. Sorting and Searching algorithms: Bubble sort, selection sort, insertion sort, bucket sort, linear search & binary search, Time and Space complexity.

Structures: Notion, declaration and initialization, structure variables, accessing and assigning values of the fields, "size of" operator, functions and structures, arrays of structures, nested structures, pointers and structures, self-referential structures, passing structure to a function and returning structure from function.

**[B]Self Study:** Union, Nesting of Structure and Union. Sorting methods by pointers

**Unit IV**

**(8 + 2 = 10 Hrs)**

**[A]**

**Basic of Object Oriented Programming and Introduction to C++**

A. Limitations of Procedural Language, Need of Object oriented programming, fundamentals of Object Oriented programming: Objects, classes, data member and Structure & Syllabus of F.E. (Common) – Pattern 'F11', Issue No. 1, Rev 00, dated 21-05-2013



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member function, data encapsulation, data abstraction, information hiding, constructor, destructor, class initialization, inline function, scope resolution operator.

Inheritance: base class and derived class, multi-level inheritance, multiple inheritance and protected members of the class.

Polymorphism: Virtual functions, virtual base classes, virtual base class member access.

Pointer to base class

[B]Self Study: Function overloading, Exception handling in C++

Note: Five assignments on self-study, comprising of one assignment from each unit.

**Text Books**

1. "Programming with C- Schaum's outline Series", B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7,
2. "Let us C", Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.

**Reference Books**

1. "Programming language – ANSI C", Brian W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9,
2. " Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw Hill Publication, ISBN 0-07-462038-x.

**Additional Reading**

1. "A first book of C- Fundamental of C Programming", Gary Bronson and Stephen Menconi, ISBN: 0314073361,
2. "C++ Program Design: An introduction to Programming and Object-Oriented Design", Cohoon and Davidson, 3<sup>rd</sup> Edition, Tata McGraw Hill. 2003, ISBN-13: 978-0-07-122649-3.



**HS10202 :: DIFFERENTIAL AND INTEGRAL CALCULUS  
(Tutorial)**

**Credits:** 01

**Teaching Scheme:** - - Tutorial 1 Hr/Week

**Prerequisites:** Nil.

**Objectives:**

Module II is a full one semester course taken by all engineering students. It starts with partial derivatives, integral calculus, multiple integrals, ordinary differential equations, probability and statistics and self study. The module II emphasizes theoretical foundations of partial derivatives, integral calculus, multiple integral, ordinary differential equations and their applications, probability and statistics with application to real world problems. It is also intended to enable students to recognize mathematical structures in practical problems, to translate problems into mathematical language and to apply engineering mathematics II to solve real world problems.

Upon completion of this module students will be able to:

- Recognize mathematical structures in practical problems.
- Translate problems into mathematical language and analyze problems using methods from all the units.
- Mapping with PEOs: I, III, V : (a, k, p)

**List of Contents**

In this module students will work on problems to practice and apply methods introduced in the theory lectures. Discussions of problems in small groups is always encouraged and facilitated and students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

- Tutorial No. 1:** Summary on successive differentiation and Libnitz's theorem, Rolles' theorem, Lagrange's and Cauchy's mean value theorem and problems solving.
- Tutorial No. 2:** Summary on Taylor and Mclaurin's series and problems solving.
- Tutorial No. 3:** Summary on sequence and infinite series and test for its convergence, comparison, ratio and root test, power series and ts convergence and problems solving.
- Tutorial No. 4:** Summery on partial derivatives, theorem on differentials, Euler's theorem on homogeneous functions and problems solving.
- Tutorial No. 5:** Summery on Jacobians and their applications, maxima and minima and problems solving.
- Tutorial No. 6:** Summery on reduction formulae, differentiation under integral sign and error function and problems solving.

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- Tutorial No. 7:** Summery on rules to find curves in Cartesian, parametric and polar form and problems solving.
- Tutorial No. 8:** Summery on application of single integration and problems solving.
- Tutorial No. 9:** Summery on double integration, some special functions (gamma and beta functions) and problems solving.
- Tutorial No. 10:** Summery on triple integration, transformation of multiple integrals (Jacobian) and problems solving.
- Tutorial No. 11:** Summery on application of multiple integration and problems solving.
- Tutorial No. 12:** Summery on revision of ODE and exact DE, reducible to exact DE and problems solving.
- Tutorial No. 13:** Summery on LDE, Bernoulli's total and simultaneous total DE and problems solving.
- Tutorial No. 14:** Summery on application of ODE and problems solving.

**Text Books**

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.,
2. "Text book of Calculus", Ron Larson and Bruce H. Edwards, Brooke/Cole, a part of Cengage Learning (Indian Edition),
3. "Higher Engineering Mathematics", B.S. Grewal, Khanna Publishers.

**Reference Books**

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Co.,
2. "Advanced Engineering Mathematics", Michael D. Greenberg, Prentice Hall International publishers,
3. "Mathematics for Engineers and Scientists", Alan Jeffrey, Champman and Hall/CRC.

**Additional Reading**

1. "Advanced Calculus", Murray R. Spiegel, Schaum's out line series, McGraw Hill International Book Co.,
2. "Advanced Engineering Mathematics", C. Ray Wylie, Louis C Barrett R, McGraw - Hill Book Company,
3. "Applied Mathematics for Engineers and Physicists", Pipes and Harvill, McGraw-Hill,
4. "Advanced Engineering Mathematics", Alan Jeffrey, Academic Press.,
5. "Advanced Engineering Mathematics", Dennis G. Zill and Michael R. Cullen, Narosa Publishing House,
6. "Mathematics for Engineers and Scientists", Alan Jeffrey, Champman and Hall/CRC,
7. "Advanced Modern Engineering Mathematics", James, G, Pearson Education.



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**HS10204 :: ENGINEERING MECHANICS (TUTORIAL)**

**Credits:** 01

**Teaching Scheme:** - Theory 1 Hr/Week

**Prerequisites:** Nil

**Objectives:**

At the end of the course, students will be able to:

- Understand the fundamentals of statics and dynamics.
- Analyze a given problem and solve it confidently.
- Calculate the unknown parameters/ quantities involved in physical phenomena.
- Apply the principles, laws and fundamental equations of mechanics for particles & rigid bodies.
- Develop their communication (intra-personal and interpersonal) skills
- Mapping with PEOs: I, II, III, V : (a, c, e, h, k, o, p)

**List of Contents:**

All tutorials will be conducted in a group of about 20 students. These students will work on the problems/numericals to practice and apply methods taught in the theory lectures. Discussions of problems and its solution in small groups is always encouraged and will facilitate building of confidence in the minds of students.

**Tutorial No.1: Revision of basic Mathematical and Computing Skills:**

Students will answer the questions framed by the faculty on properties of circle, lines, triangles, basic trigonometry, solving simultaneous equations and quadratic equations, logarithms, and determinant etc.

**Tutorial No.2: Revision of Vector operations and fundamental principles of mechanics:**

Students will answer the questions framed by the faculty on scalars, vectors, unit vector, direction angles, direction cosines, expressing force as a vector, Addition/ Subtraction of vectors, dot and cross product of vectors, angle between vectors, Newton's three law of motion, and Newton's law of gravitation.

**Tutorial No.3: Statics of Particles:**

- Problems on resolution and composition of forces (Rectangular and non rectangular components)
- Resultant or equilibrant of concurrent coplanar force system.
- Resultant or equilibrant of non coplanar concurrent force system.

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**Tutorial No. 4: Statics of Rigid bodies:**

- Moments of a force about a point-(scalar treatment).
- Resultant of parallel and non concurrent non parallel coplanar force system.
- Moment of non coplanar force about a point and about an axis.

**Tutorial No: 5: Equilibrium of Rigid bodies:**

- Drawing free body diagrams of given coplanar force system.
- Problems on equilibrium of simple beams.
- Problems on three force equilibrium.

**Tutorial No. 6: Equilibrium of Rigid bodies and centroid**

- Problems on general equilibrium / mechanisms of coplanar force system.
- Problems on Centroid of area.
- Problems on Centroid of line.

**Tutorial No.7: Analysis of truss and frames.**

- Analysis of simple trusses by method of joint
- Analysis of simple trusses by method of section.
- Analysis of simple frames.

**Tutorial No.8: Applications of Friction:**

- Problems on wedge friction
- Problems on belt friction and band/brake
- Problems involving dry friction on rod/ bar/ ladder inclined planes.

**Tutorial No.9: Kinematics of particles: (Rectilinear motion)**

- Problems on variable acceleration, constant acceleration.
- Problems on motion curves.

**Tutorial No.10: Kinematics of particles: (Curvilinear motion)**

- Problems on Rectangular co-ordinate (x-y) system
- Problems on Normal and tangential (n-t) system.
- Problems on Radial and transverse (r- $\theta$ ).
- Problems on Projectile motion.

**Tutorial No.11: Kinematics of particles: (Force and acceleration)**

- Problems on application of Newton's 2<sup>nd</sup> law of motion using FBDE approach in rectangular co-ordinate (x-y) system- motion on horizontal and inclined plane, particles connected by in extensible cord.
- Normal and tangential (n-t) system.

**Tutorial No.12: Kinetics of particles: (Work energy)**

- Problems on application of work energy principle involving spring force, friction force, externally applied force.
- Problems on direct central and oblique impact.



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**Text Books**

1. “Vector Mechanics for Engineers”, F. P. Beer and E. R. Johnston, 9<sup>th</sup> Edition –Mc Graw Hill Publications,
2. “Engineering Mechanics Statics and Dynamics”, R. C. Hibbler, Ashok Gupta, 11<sup>th</sup> Edition – Pearson Publications,

**Reference Books**

1. “Engineering Mechanics Statics”, J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons,
2. “Engineering Mechanics Dyanamics”, J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons.
3. “Engineering Mechanics Statics and Dynamics”, E.W. Nelson, C. L. Best, W. G. McLean, 5<sup>th</sup> Edition – Tata McGraw Hill.
4. “Engineering Mechanics Statics and Dynamics”, A. P. Boreasi, R. J. Schmidt,– Thomson/Cangage Publications,





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**HS10306 :: ENGINEERING LABORATORY (S<sub>6</sub> + S<sub>7</sub>)**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

**S<sub>6</sub> : ENGINEERING MECHANICS LABORATORY**

- To understand and predict physical phenomena to lay the foundation for engineering applications.
- To develop logical approach and reasoning for analysis and design of engineering applications / unfamiliar situations.
- To promote processes of problem solving abilities , experimental, observational, manipulative, decision making and investigatory skills in the learns by using concept of Newtonian Mechanics
- To develop the ability to recognize and apply the appropriate physics introduced in the lecture course to actual experimental situations by taking mini projects.
- Mapping with PEOs: I, II, III, V : (a, c, e, h, k, o, p)

**List of Practical: Any five from following**

1. (A) Verification of Lami's theorem.  
(B) Verification of Varignon's Theorem
2. Reactive forces in beams (A) Simple, (B) Compound.
3. Equilibrium of spaces force system: (A) Concurrent, (B) Parallel.
4. Study of dépendent Motion.
5. Study of (A) Coefficient of Restitution.  
(B) Curvilinear Motion.
6. Solution of two problems each from statics and dynamics using computer application software.

**Text Books**

1. "Vector Mechanics for Engineers", F. P. Beer and E. R. Johnston, 9<sup>th</sup> Edition –Mc Graw Hill Publications,
2. "Engineering Mechanics Statics and Dynamics", R. C. Hibbler, Ashok Gupta, 11<sup>th</sup> Edition – Pearson Publications.



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**Reference Books**

1. "Engineering Mechanics Statics", J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons,
2. "Engineering Mechanics Dyanamics", J. L. Meriam, L. G. Kraige – 5<sup>th</sup> Edition, John Wiley & Sons.
3. "Engineering Mechanics Statics and Dynamics", E.W. Nelson, C. L. Best, W. G. McLean, 5<sup>th</sup> Edition – Tata McGraw Hill.
4. "Engineering Mechanics Statics and Dynamics", A. P. Boresi, R. J. Schmidt,– Thomson/Cangage Publications,



**Objectives:**

**S<sub>7</sub> : ELECTRICAL TECHNOLOGY LABORATORY**

- Understand connections of an electrical circuit
- Develop hands on experience of handling electrical appliances and instruments.
- Understand testing procedure of electrical motors.
- Mapping with PEOs: I, II, III, V : (a, e, g, i, l, m, p)

**List of Practical – (Any 3 from expt. No. 1 to 7 + any 2 from expt. No. 8 to 12)**

1. Study of wires and wiring components.
2. Wiring exercise - 1. (parallel lamp wiring and staircase wiring)
3. Wiring exercise - 2. (fluorescent tube wiring and fan-regulator wiring)
4. Study of KCL / KVL.
5. Study of superposition theorem.
6. Study of RL or RLC circuit.
7. Study of three-phase circuit.
8. Visit to a sub-station and study of a typical electrical control panel.
9. Load test on dc shunt motor.
10. Load test on dc series motor.
11. Study of dc motor starters.
12. Study of induction motor.

**Text Books**

1. Electrical Technology - vol.- I and II by B. L. Theraja.
2. Wiring, estimation and costing by S. L. Uppal

**Reference Books**

1. Fractional and sub fractional horse power electrical motors - C.E. Veinou and J.E. Martits , McGraw Hill



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**HS10302 :: COMPUTER PROGRAMMING LAB**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

- To understand use of efficient programming and documentation.
- To explore C programming language.
- Understand of how several fundamental algorithms work, particularly those concerned with sorting and searching .
- To learn basics of C++ programming language.
- Mapping with PEOs: I, II, IV, V : (a, d, e, g, k, p)

**List of Practical**

1. Study of DOS/UNIX commands.
2. Write a program in C to accept a character from user and display it in opposite case/ to generate a simple mathematical calculator.
3. Write a program in C to find largest element / average of given N elements/ sum/reverse of a given integer.
4. Write a program in C to read an integer and display each of the digits of an integer in English.
5. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
6. Write a program in C that use both recursive and non-recursive functions to find the Factorial / GCD (greatest common divisor) of two given integers / Fibonacci series etc.
7. Write a program in C to sort n integers using bubble / merge sort.
8. Write a program in C to search a number in a given list using linear / binary search.
9. Write a program in C to perform Addition / Subtraction / Multiplication of two Matrices. Also determine whether the matrix is symmetric / skewed.
10. Write a program in C to carry out following operations on strings using library function.
  - a. Length of a sting.
  - b. Copy of string.
  - c. Concatenation of strings.
11. Write a program in C to carry out following operations on strings without using library function.
  - a. Compare two strings.
  - b. Reverse given string.
  - c. To check if the given string is a palindrome or not.
12. Write a program in C to carry out following operations on strings using pointers.
  - a. Length of a sting.
  - b. Concatenation of strings.
  - c. Copy of string.
  - d. Compare two strings.

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13. Write a C program that represents complex number using a structure. Perform the following operations:
  - a. Reading a complex number.
  - b. Addition of two complex numbers.
  - c. Writing a complex number.
  - d. Multiplication of two complex numbers.
14. Write a C program to create a database of students by using array of structure and perform following operations on it.
  - a. Accept record of student
  - b. Search a particular record
  - c. Display all records
  - d. Modify a particular record.
15. Write a C++ program to demonstrate the use of constructor, destructor.
16. Write a C++ program to demonstrate multi-level inheritance and multiple inheritance.
17. Write a C++ program to demonstrate polymorphism

**Note:** Faculty members should frame 14 assignments from the above list.  
First assignment and any two C++ assignments in the list are compulsory.

#### Text Books

1. "Programming with C- Schaum's outline Series", B. Gottfried, Second edition, Tata McGraw Hill Publication, ISBN 0-07-463491-7,
2. "Let us C", Y. Kanetkar, Second Edition, BPB Publication. ISBN: 8176566217.

#### Reference Books

1. "Programming language – ANSI C", Brian W Kernighan and Dennis Ritchie, Second edition ISBN 0-13-110370-9,
2. " Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw Hill Publication, ISBN 0-07-462038-x.

#### Additional Reading

1. "A first book of C- Fundamental of C Programming", Gary Bronson and Stephen Menconi, ISBN: 0314073361,
2. "C++ Program Design: An introduction to Programming and Object-Oriented Design", Cohoon and Davidson, 3<sup>rd</sup> Edition, Tata McGraw Hill. 2003, ISBN-13: 978-0-07-122649-3.



**HS 14302 :: TRADE WORKSHOP**

**Credits:** 1

**Teaching Scheme:** - Laboratory 2 Hrs/Week

**Prerequisites:** Nil

**Objectives:**

- To give students 'hands on experience' of craftsmanship
- To make students familiar with different work trades
- To develop quality and safety consciousness amongst the students
- To develop respect towards labour work amongst the students
- To apply Workshop skills in various engineering disciplines
- Mapping with PEOs: I, II, IV, V : (b, c, f, g, i, j, m)

**Practical Details:**

Students from various groups of engineering disciplines like group of Mechanical, Industrial, Production, Chemical / Computer, Information Technology / Electronics, Electronics & Telecommunication, Instrumentation will perform different jobs / exercises / mini projects in Workshop out of which, one would essentially involve application of Workshop trades in their respective group of discipline. The jobs / exercises / mini projects etc. will be done individually or in group in consultation with the Workshop staff.

**Demonstrations**

1. **Plastic Injection Moulding:** Introduction, principle, equipment and its operation, mould introduction and settings, safety precautions and demonstration of plastic injection moulding process.
2. **Electroplating:** Introduction necessity, principle, safety precautions and demonstration of electroplating process.
3. **Press Work:** Introduction, die and punch, basic operations such as punching, bending, shearing, etc. safety precautions and demonstration of press working.

**Note:- Students should wear safety apron and safety shoes during the practicals.**

**Text Books**

1. S.K. Hajra Choudhary, Elements of Workshop Technology, Media Promoters and Publishers Pvt. Ltd.,



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2. K.T. Kulkarni, Introduction to Industrial Safety, K.T. Kulkarni, Pune.

**Reference Books**

1. Hwaiyu Geng, Manufacturing Engineering Handbook, McGraw Hill Publishing Co. Ltd.,
2. Lawrence E. Doyle, Manufacturing Processes and Materials for Engineering, Prentice Hall Inc.



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FF No. : 654

### HS10107 :: GENERAL SEMINAR I

Credits: 01

Teaching Scheme: - Theory 2 Hrs/Week

Prerequisites: Nil

#### Objectives:

- To improve pronunciation.
- To improve oral communication.
- To guide the students with apt expressions in English language (both words and sentence construction).
- To improve reading, writing and listening skills.
- To make the students confident and impressive in front of a group.
- Mapping with PEOs: I, II, III, V : (j, k, n, o, p)

#### List of Demonstration and Practical Sessions

Sr. No.	Name of the Experiment	Mode of Conduct
1.	Phonetics – vowels and diphthongs,	Demonstration and practice sessions
2.	Phonetics – consonants,	
3.	Elements of good presentation skills,	
4.	Elements of communication process, barriers and how to overcome barriers,	
5.	Presentations by 6 – 7 students (1 <sup>st</sup> Topic)	Student activities in groups: Each student must present any topic for 10 min followed by an evaluation by the teacher for 5 min using evaluation criterion. All other non participating must attend and can give suggestions. Each student will give minimum of two presentations per semester.
6.	Presentations by 6 – 7 students (1 <sup>st</sup> Topic)	
7.	Presentations by 6 – 7 students (1 <sup>st</sup> Topic)	
8.	Presentations by 6 – 7 students (1 <sup>st</sup> Topic)	
9.	Presentations by 6 – 7 students (2 <sup>nd</sup> Topic)	
10.	Presentations by 6 – 7 students (2 <sup>nd</sup> Topic)	
11.	Presentations by 6 – 7 students (2 <sup>nd</sup> Topic)	
12.	Presentations by 6 – 7 students (2 <sup>nd</sup> Topic)	

#### Text Books

1. “Developing communication skills “ – Krishna Mohan & Meera Banerji , 2008 Mcmilan Publishers Delhi
2. “Speaking and writing for effective business communication “ Francis Sounderaraj 2009 , Mcmilan Publishers India ltd, delhi

Structure & Syllabus of F.E. (Common) – Pattern ‘F11’, Issue No. 1, Rev 00, dated 21-05-2013





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**Reference Books**

1. “ Cambridge English for engineering “ Mark Ibbotson , Cambridge university press Delhi
2. “ Professional presentations “ Malcolm Goodale , Cambridge university press 2009



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# ACADEMIC INFORMATION



**A) Mid Semester Examination**

1. Students reporting in morning slot will have examination in morning slot. Those in evening slot will have examination in evening slot.
2. 20 multiple choice based questions to be attempted in 30 minutes x no. of theory courses i.e. 100 questions in 150 minutes for F.E., 80 questions in 120 minutes for S.E., T.E., B.E., M.E., 20 questions in 30 minutes for Honors, Minor, Fast Track, etc.
3. A scrambled mix of questions will be generated through software.
4. Mid Semester Examination will be based on Unit II & Unit III.
5. There will be one mark for each correct answer and (-) 0.25 marks for every wrong answer.
6. For a typical 3 hour Mid Semester Examination, first 15 minutes would be used for student attendance, record keeping, seat allocation, log in procedure if any, etc. Next 150 minutes for actual examination. A timer indicating time remaining to be provided by ERP. 15 minutes for processing & results.
7. A visual alarm / flash would be given 10 minutes before completion of 150 minutes as a warning. For auto generation of every theory course result out of 20 and dispatch of the marks on student mobile and mail ID as well as parent mail ID.
8. No repeat examination under any circumstances.



**B) Seminar – Conduct, Evaluation, etc.**

**Seminar– (T.E.- Semester I)**

1. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
2. Review – II : The last week of November (Optional)
3. For poor performing students identified by the examination panel, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.
4. Seminar is an individual activity with separate topic and presentation.
5. Duration of presentation – 20 minutes  
Question and answer session – 10 minutes

**Seminar Evaluation Scheme :**

1. Attendance during Semester	– 10 marks
2. Attendance during Seminar presentation self & peer	– 10 marks
3. Relevance of Seminar topic	– 10 marks
4. Timely Abstract submission	– 10 marks
5. Literature review	– 10 marks
6. Technical contents	– 10 marks
7. Presentation	– 25 marks
8. Question & answer Session	– 15 marks
	-----
	100 marks
	=====



**C) Equivalence**

For the courses belonging to 2008 structure counseling sessions for failure students will be arranged. The Head of Department will appoint faculty identified as subject experts as counselors. The previous examination scheme i.e.

Class Test – 10 marks

T.A. through Home assignment – 10 marks

A written paper MSE – 30 marks

A written paper ESE – 50 marks

Will be followed. The entire processing based on 2008 structure related coding scheme will be followed. Counseling + Administration + Examination charges will be the basis for fees considered for such students.



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**D) Extra Credits**

A student planning to take extra credits may be considered under following categories :

- (a) A student carrying a backlog and re-registering for the previous course – Re-registration charges as applicable. Consideration of all courses registered for during that Semester of Academic Year for SPI calculation.
- (b) Student planning to take extra courses as a fast track opportunity – Administration, processing and examination charges will be considered. In any case the student has to pay the college fees for four years. This fast track facility would enable the student to undergo an industrial training, an exchange programme, research contribution in I.I.T. under scheme such as KVPY without any academic compromises for credit transfer. The phasewise development and completion of project activity cannot be considered at an accelerated pace under fast track scheme. The registration under fast track is subject to having a CPI 8.0 or above and no backlog for consideration of registration to an additional course.
- (c) Students opting for earning extra credits by selection of courses in addition to the courses prescribed by respective BOS which are single Semester activities and not the part of Honors / Minor scheme. Such students will be expected to pay charges equivalent to re-registration (proportionate credit based payment). The registration for such courses is subject to permission given by the Chairman BOS of the Board in the purview of which the subject is identified. Such permissions will be given based on meeting with prerequisite subject.
  1. In any case (a), (b) or (c) the candidate cannot register for more than 8 credits.
  2. A suitable reflection of completion of the said course will be made in the candidate's Grade statement.For part (c) a separate grade & GPA will be calculated. That GPA will not be clubbed with the other regular courses for SPI, CPI calculation.



**E) Home Assignment**

A Home Assignment Calendar for Semester is prepared as under:

Week No.	Activity
1	No Home Assignments
2	No Home Assignments
3	No Home Assignments
4	S1 / S2 – HA1
5	S3 / S4 / S5* - HA1
6	S1 / S2 – HA2
7	S3 / S4 / S5* - HA2
8	S1 / S2 – HA3
9	S3 / S4 / S5* - HA3
10	S1 / S2 – HA4
11	S3 / S4 / S5* - HA4
12	S1 / S2 – HA5
13	S3 / S4 / S5* - HA5
14	No Home Assignments
15	No Home Assignments
16	No Home Assignments

The Home Assignments will be based on the self study component i.e. part B of every theory course syllabus. The Saturday or last working day will be the default deadline for submission of Home Assignment of that week. For example by the Saturday ending Week No. 9, Home Assignment No. 3 for subject S3/ S4/ S5 (if applicable) must be submitted.

1. \*S5 can be OE1 / OE2 / OE3 / Honors/ Minor / Re-registration category (a) / Category (b) / Category (c).
2. For subjects S1, S2, S3, S4 & S5 (if any), the composition of the Teacher Assessment marks will be as follows :



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	<b>S1,S2 with Tutorial</b>	<b>S3,S4,S5 without Tutorial</b>
Home Assignment	30 marks	30 marks
Tutorial	30 marks	
Test	30 marks	30 marks
Attendance :		
(a) > 90%	10 marks	10 marks
(b) 75% to 90%	5 marks	5 marks
(c) <75%	0 marks	0 marks
	100 marks converted to 15 marks	70 marks converted to 15 marks

**Explanation :**

1. Tutorials to be conducted with continuous assessment throughout the Semester. Final assessment out of 30 marks for Tutorial.
2. Class Test to be conducted during a regular theory class within the time period mentioned in the Academic Calendar.
3. Class Test marks are to be entered immediately as mentioned in Academic Calendar.
4. Attendance percentage to be calculated at the end of Semester after completing all lectures as per the lesson plan.





F) **Mini Project**

Teaching Scheme: Theory – 0 ; Tutorial – 0 ; Laboratory – 2 Hrs / week

For F.E., S.E. & T.E. students in every Semester a Mini Project be carried out. The objectives behind the Mini Project are:

1. Scope for creativity
2. Hands on experience
3. Academic occupancy

Mini Project will be based on all subjects of that Semester except GP.

1. The Semester Mini Project will be for a group of 3 to 5 students. Head of Department to appoint Mini Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.
2. Group formation, discussion with faculty advisor, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

The Assessment Scheme will be:

- |                           |          |
|---------------------------|----------|
| (a) Continuous Assessment | 50 marks |
| (b) End Semester          | 50 marks |

-----  
100 marks  
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**G) Project Stage I Evaluation**

The project activity is broken in 3 stages:

The Project Stage I will be in T.E Semester II irrespective of student module. The evaluation of Project Stage I will be as follows:

Group formation & attendance / reporting to guide	20 marks
Topic finalization / Statement	20 marks
Literature Survey	20 marks
Abstract	20 marks
Presentation	20 marks

Project Stage II and Project Stage III evaluations will be based on Department specific norms.



**H) Composition for Selection of 5 Credits for Honors / Minor Course**

**(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit**

**(B) Elective Component**

**a. Laboratory courses – Maximum Credits - 2**

(for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA guidelines for the compulsory lab courses.

**b. Research publication – Maximum Credits – 1**

(Research Publication in a Magazine / Transaction / Journal as decided by the honors / minor co-ordinator)

**c. Seminar - Maximum Credits – 1**

(Seminar to be given on a topic consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment and evaluation scheme would as per the guidelines used for Technical Seminar at UG level by respective Dept.)

**d. Honors / Minors Project – Maximum Credits – 2**

(Project Topic and Scope, its progress and final assessment consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment would as per the guidelines and evaluation scheme used for Project Work at UG level by respective Dept.)

**e. Industrial Training – Maximum credits – 4**

(An Industrial Training in an Industry identified by the student, approved by the honors / minor co-ordinator & Head of Department. The assessment would as per the guidelines and evaluation scheme used for Industrial Training at UG level by respective Dept.)



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**Note :**

- a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements
- b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements
- c. No Industrial Training less than 4 weeks be considered for award of 1 Credit
- d. No cumulative addition of Industrial Training period would be considered for award of credits

**The student is expected to earn 1 Credit from Part (A) and remaining 4 Credits from Part (B)**