Bharati Vidyapeeth

Deemed University, Pune

B. Tech. (Chemical) – 2014 Course

Sem. - I

Total Duration : 29 Hours/week **Total Credits : 25** **Total Marks : 700**												
Sr. No.	**Subject**	**Teaching Scheme (Hours/week)**				**Examination Scheme (Marks)**						**Credit**
		L	**P/D**	**T**	**Total**	**End Semester Examination**	**Continuous Assessment**			**TW**	**Total**	
							Unit Test	**Assign-ments**	**Atten-dance**			
1	Engineering Mathematics-I	3	-	1	**4**	60	20	10	10	-	**100**	**4**
2	Fundamental of Civil Engineering	3	2	-	**5**	60	20	10	10	25	**125**	**4**
3	Engineering Graphics	4	2	-	**6**	60	20	10	10	25	**125**	**5**
4	Engineering Physics	4	2	-	**6**	60	20	10	10	25	**125**	**5**
5	Chemical Engineering Materials	3	-	1	**4**	60	20	10	10	25	**125**	**4**
6	Professional Skill Development-I	2	-	-	**2**	30	-	20	-	-	**50**	**2**
7	Workshop Technology	-	2	-	**2**	-	-	-	-	**50**	**50**	**1**
Total		**19**	**8**	**2**	**29**	**330**	**100**	**70**	**50**	**150**	**700**	**25**

Bharati Vidyapeeth

Deemed University, Pune

B. Tech. (Chemical) – 2014 Course

Sem. – II

Total Duration : 30 Hours/week **Total Credits : 25** **Total Marks : 700**												
Sr. No.	**Subject**	**Teaching Scheme (Hours/week)**				**Examination Scheme (Marks)**						**Credit**
		L	**P/D**	**T**	**Total**	**End Semester Examination**	**Continuous Assessment**			**TW**	**Total**	
							Unit Test	**Assign-ments**	**Atten-dance**			
8	Engineering Mathematics-II	3	-	1	**4**	60	20	10	10	-	**100**	**4**
9	Fundamental of Mechanical Engineering	3	2	-	**5**	60	20	10	10	25	**125**	**4**
10	Engineering Mechanics	4	2	-	**6**	60	20	10	10	25	**125**	**5**
11	Engineering Chemistry	4	2	-	**6**	60	20	10	10	25	**125**	**5**
12	Fundamental of Electrical Engineering	3	2	-	**5**	60	20	10	10	25	**125**	**4**
13	Professional Skill Development-II	2	-	-	**2**	30	-	20	-	-	**50**	**2**
14	Analytical Techniques in Chemical Engineering	-	2	-	**2**	-	-	-	-	50	**50**	**1**
Total		**19**	**10**	**1**	**30**	**330**	**100**	**70**	**50**	**150**	**700**	**25**

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ENGINEERING MATHEMATICS-I

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 3Hrs/Week	Semester Examination: 60 marks	Theory : 03
Tutorials: 1Hr/Week	Continuous Assessment: 40 marks	Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem.Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions,Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence. **(08 Hours)**

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

(08 Hours)

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Unit VI

JACOBIAN
Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA
Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8thedition(1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning,6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition(2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III
Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Civil Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:	
The Students should have	
1.	Concepts of units and conversions of units.
2.	Basic knowledge of Chemistry
3.	Basic knowledge of geography, concept of latitude and longitude.
Course Objectives:	
	To make student understand the scope and application of Civil Engineering
Course Outcomes:	
Students will be able to understand	
1.	Different building components and material
2.	Classification of surveying
3.	Levellingof the ground
4.	Planning of building
5.	Methods of irrigation and water supply
6.	Different methods of transportation

UNIT - I	**Civil Engineering Scope And Applications.**	**(06 Hours)**
	Civil Engineering scope, importance and applications to other	

	disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
UNIT - II	**Surveying**	**(06 Hours)**
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
UNIT - III	**Building Planning And Bye Laws**	**(06 Hours)**
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
UNIT - IV	**Foundations and Earthquakes**	**(06 Hours)**
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
UNIT - V	**Irrigation And Water Supply**	**(06 Hours)**
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	**Infrastructure**	**(06 Hours)**
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of	

	railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
Term Work:		
(Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
Text Books:		
1.	" Surveying- Vol I " - S.K. Duggal , Tata McGraw Hill Publication.	
2.	"Built Environment" – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	"Building Construction" – Dr. B.C. Punmia , Laxmi Publication	
4.	"Irrigation and water Power Engineering "- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	"Text book of Transportation Engineering "- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	"Basic Civil engineering"- M.S. Palanichamy- Tata McGraw Hill Publication	

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Reference Books:	
1.	"Surveying –Theory and Practice"-James Anderson- Tata McGraw Hill Publication

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: -60Marks	05
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	**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. **Curves used in Engineering Practice** Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.	(6)
Unit II	**Orthographic Projection** Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.	(6)
Unit III	**Isometric Projections** Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.	(6)
Unit IV	**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	(6)
Unit V	**Projection of Solids** Projection of prism, pyramid, cone and cylinder by rotation method.	(6)

Unit VI	**Section of Solids** Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.
Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1nd and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

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.

3.“Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India,

New Delhi ,

4. “Engineering Drawing and Graphics”, Venugopal K., New Age International

Publishers.

5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005

6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria

and Sons, 2005

7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks Term Work: 25marks	Practical: 01

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

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UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of j by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticals, properties of nanoparticals (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticals(Physicaland chemical), synthesis of clloids, growth of nanoparticals, synthesis of nanoparticals by colloidal rout, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC.

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

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UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.

5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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Chemical Engineering Materials

Teaching Scheme		Examination Scheme		Credits
Lectures	: 3Hrs/week	End semester examination:	60 Marks	3
Tutorials	: 1 Hr/week	Continuous assessment	: 40 Marks	
		Term work	: 25 Marks	1
		Total	: 125Marks	4

Course Pre-requisite: Basic understanding of chemistry of bonds

Course Objectives: To get knowledge of selection of material for process industry

Course outcome: Understand material properties, metal and their alloys, polymers, plastics, paints, coatings adhesives, ceramic, cement, glass, material failures and prevention measures.

Unit –I **(06 Hours)**

Introduction

Materials and criteria for selection of material in process industries. Material properties: Mechanical, thermal, chemical, electrical, magnetic and technological properties, modification and control of material properties.

Unit- II **(06 Hours)**

Metal and their alloys

A. Ferrous materials: Pure iron, cast iron, mild steel, stainless steels, special alloy steels-iron and iron carbide, phase diagram-heat treatment of plain-carbon steels.
B. Nonferrous materials: Lead, Tin, aluminium, zinc, nickel, copper, Magnesium and their alloys. Properties and applications in process industries**.**

Unit –III **(06 Hours)**

Hydrocarbon materials

Natural & synthetic polymeric materials

Selection of polymeric materials for equipment linings, fiber reinforced plastic, application of special polymers like Nylon 66, Teflon in engineering. Polymer Composites and blends.

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Paints, coatings and adhesives

Unit-IV **(06 Hours)**

Ceramic, glasses and cement

Definition of ceramics and glasses; interaction between structure, processing, and properties; Applications of ceramic and glass materials; Crystalline and non-crystalline ceramics, silicates, refractories, clays, glass, vitreous silica, and borosilicate

Cement and its properties- special cements, cement concrete, RCC- Pre stressed concrete.

Unit- V **(06 Hours)**

Material failure analysis

Thermal and mechanical failures: Creep,stress, crystal structure and defects.

Chemical failure: acid base environment, water, Corrosion:Corrosion attack methods, Different types of corrosion: chemical, biochemical, and electrochemical; Internal and external factors affecting corrosion of chemical equipments; corrosion charts for process equipments.

Unit-VI **(06 Hours)**

Material failure prevention

Property enhancement by electroplating, glass and ceramic linings, polymer lining, paints, coatings, alloy preparation, composite and blend formation.

Unit tests would follow as:

Unit test 1 : Unit 1 and unit 2

Unit test 2 : Unit 3 and unit 4

Unit test 3 : Unit 5 and unit 6

Term work includes assignments on

1. Basic criteria for material selection, material properties
2. Ferrous and non-ferrous material recent advanced material of actual application in industry
3. Polymeric advanced material presently applied in industry
4. Cement, ceramic and glass variety to be used in industry
5. Industrial example with analysis of thermal, mechanical and chemical failure.
6. Industrially applied case studies for prevention of material prevention

Text Books

1. Kodgire V. D. “Material Science and Metallurgy for Engineers”, Everest publication India
2. Gowarikar V. R., Vishwanath N V, JaydevShreedhar,“Polymer science”, New age International publication, India

References books

1. Budinsky K G and Budinsky K M “Engineering materials- Properties and Selection”,Prentice Hall of India.
2. Henry R Clauster, “Industrial and Engineering materials”, McGraw Hill Book Co.
3. James F. Shacketford, Introduction to Material Science, Mc-Millan Publishing Company, New-York.
4. D.Z. Jestrazebaski, Properties of Engineering Materials, 3rd Ed. Toppers. Co. Ltd.
5. J.L. Lee and Evans, Selecting Engineering Materials for Chemical and Process Plants, Business Works.

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Workshop Technology

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: -	End Semester Examination: -	01 Credit
Practical: 02 Hours / Week	Continuous Assessment: -	
	Term Work: 50 Marks	

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

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ENGINEERING MATHEMATICS-II

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 3Hrs/Week	End Semester Examination: 60 marks	Theory : 03
Tutorials: 1Hr/Week	Continuous Assessment:40 marks	Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE.Solutions ofVariable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series,Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Pola and Parametric Curves.Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

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Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area,Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8^{th}edition(1999).

2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)

3. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune, 7^{th} edition (1988).

4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42^{th} edition (2012).

5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning,6^{th} edition (2007).

6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2^{nd} edition(2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III
Unit Test II :- Unit IV,V,VI

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FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: -60Marks	04
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	**Thermodynamics-** Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)	(08)
UNIT-II	**Introduction to I.C. Engines and turbines-** Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams) **Introduction to refrigeration, compressors & pumps-** Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)	(08)
UNIT-III	**Energy Sources** - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power. **Heat transfer**- Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating	(08)

	materials and their properties, types of heat exchangers and their applications.	
UNIT-IV	**Properties of fluids-** Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow. **Properties of Materials and their Applications-** Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.	(08)
UNIT-V	**Mechanical devices** - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings. **Mechanisms-** Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism	(08)
UNIT-VI	**Machine Tools-** Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine. **Introduction to manufacturing processes and Their Applications-** Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.	(08)

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.

4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.

2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.

3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian

4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.

5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.

6. “Mechanics of Materials” Johston and Beer TMH, 5th edition

7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India**,** 2007.

8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

9 “A Textbook of production engineering” P.C. Sharma, S. Chand Publication,

New Delhi, 2nd edition.

10 “Fluid Mechanics & Fluid Power” D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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10: Engineering Mechanics

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Scalar and Vector
2.	Newton's law of motion
3.	Law of friction
4.	Concept of physical quantities, their units and conversion of units
5.	Concept of differentiation and integration

Course Objectives:

	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

1.	calculate resultant and apply conditions of equilibrium.
2.	analyze the truss and calculate friction force.
3.	calculate centroid and moment of inertia.
4.	solve problem on rectilinear motion.
5.	solve problems on curvilinear motion.
6.	useD'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

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UNIT - I	**Resultant and Equilibrium**	**(06 Hours)**
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane,Force and Couple system about a point.	
UNIT - II	**Truss and Friction**	**(06 Hours)**
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	**Centroid and Moment of Inertia**	**(06 Hours)**
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	**Kinematics of Rectilinear motionof a Particle**	**(06 Hours)**
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	**Kinematics of Curvilinear motionof a Particle**	**(06 Hours)**
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	**Kinetics of a Particle**	**(06 Hours)**
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	

Term Work:

A) The term-work shall consist of minimum **Five** experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B) The term-work shall also consist of minimum **Five** graphical solutions of the problems on different topics.

Text Books:

1) "Engineering Mechanics (Statics and Dynamics)",Hibbeler R.C., McMillan Publication.

2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)",Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.

3) "Engineering Mechanics",Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.

Reference Books:

1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.
3. "Engineering Mechanics (Statics and Dynamics)",Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
4. "Engineering Mechanics (Statics and Dynamics)",Timoshenko S.P. and Young D.H., McGraw Hill Publication.
5. "Engineering Mechanics (Statics and Dynamics)",Tayal A.K., Umesh Publication.
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

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ENGINEERING CHEMISTRY

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
		Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming

Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning

Numerical based on the zeolite process **(08 Hours)**

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications. **(08 Hours)**

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV. **(08 Hours)**

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping. **(08 Hours)**

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles. **(08 Hours)**

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Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

1. Effect of hard water on boilers and heat exchangers
2. Hydraulic/ Non-hydraulic cementing materials
3. Analysis of coal a) Proximate b) ultimate analysis of coal
4. Wet corrosion-mechanism, Electroplating, Hot dipping
5. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
6. Fuel cells

References / Text Books :

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
4. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
5. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
6. Engineering Chemistry by Dara S. S. S Chand Publications
7. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III
Unit Test II :- Unit IV,V,VI

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02: Fundamentals of Electrical Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have

1.	Mathematics
2.	Physics

Course Objectives:

	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all fist year engineering students.

Course Outcomes:

1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer
5.	Define basic terms of single phase and three phase ac circuits and supply systems
6.	Know and use electrical safety rules

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UNIT - I	**Basic concepts .**	**(06 Hours)**
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	**Network Theorems**	**(06 Hours)**
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	**Electrostatics**	**(06 Hours)**
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.	
UNIT - IV	**Magnetic Circuit & Transformer**	**(06 Hours)**
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
UNIT - V	**AC Fundamentals & AC Circuits**	**(06 Hours)**
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	

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UNIT - VI	**Electrical Wiring and Illumination system**	**(06 Hours)**
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
   a)Voltage and current ratios.
   b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi

2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi

3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

Reference Books:

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication

2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications

3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications

4. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications

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Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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Analytical Techniques in Chemical Engineering

Teaching Scheme:	**Examination Scheme:**	**Credits:**
Lectures: - -	**Term work: 50 Marks**	**01**
Practical: 2 Hr/week		

Course pre-requisite: Fundamental knowledge of chemistry involved in analytical techniques.

Course objectives:

1. To develop students acquaintancewith various basic analytical techniques available in Chemical Engineering**.**
2. To provide a base for effective understanding of the core subjects of Chemical Engineering such as Stoichiometry, Environmental Engineering etc.

Course outcome:

After successful completion of the course the student will be able:

1. To independently prepare standard solutions and solutions for given normality/ molarity/ molality
2. To carry out preliminary water and fuel analysis.

Minimum eight practicals should be conducted from the list given below:

I. Standardization

1. To prepare standard alkaline and acidic solutions.

II. Normality/ Molarity/ Molality Concepts

3. Find the strength of given alkaline solution using acidic solution or vice versa.
4. Preparation of solutions for given normality/ molarity/ molality

III. Water Analysis

1. To determine free CO_2 in the given water Sample.
2. Determination of Dissolved oxygen in the given water sample.
3. To determine Acidity of a given water sample.
4. To determine alkalinity of a given water sample.

IV. Fuel Analysis

1. Determination of octane/cetane number
2. Determination of kinematic viscosity
3. Determination of calorific value

4. Determination of moisture content
5. Ultimate/proximate analysis of solid fuel

Text books/References:

1. Practical organic chemistry, Arthur I. Vogel, Longman publication
2. Experiments in applied chemistry, Sunita Rattan, S. K. Kataria& Sons