GOA UNIVERSITY

FIRST YEAR OF BACHELOR'S DEGREE COURSE IN ENGINEERING
(Revised in 2007-08)

SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER I (Common for all branches of Engineering)

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur	Marks				
		L	T	P	(Hrs)	Th.	S	P	O	Total
1.1	Applied Mathematics I	4	-	-	3	100	25	-	-	125
1.2	Applied Sciences I (Physics & Chemistry)	4	-	2	3	100	50	-	-	150
1.3	Basic Civil Engineering and Engineering Mechanics.	4	-	2	3	100	25	-	-	125
1.4	Basic Electrical Engineering	3	-	2	3	100	25	-	-	125
1.5	Engineering Graphics	2	-	4	4	100	50	-	-	150
1.6	Communication Skills	3	-	-	3	100	25	-	-	125
1.7	Workshop Practice - I	-	-	4	-	-	50	-	-	50
	TOTAL	**20**		**14**		**600**	**250**			**850**

L:Lectures, T : Tutorials, P : Practicals.
Th. Dur.:Duration of Theory Paper
Th: Theory, S : Sessional, P : Practical, O : Oral.

GOA UNIVERSITY

FIRST YEAR OF BACHELOR'S DEGREE COURSE IN ENGINEERING
(Revised in 2007-08)

SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER II: (Common for all branches of Engineering)

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur	Marks				
		L	T	P	(Hrs)	Th.	S	P	O	Total
2.1	Applied Mathematics II	4	-	-	3	100	25	-	-	125
2.2	Applied Sciences II (Physics & Chemistry)	4	-	2	3	100	50	-	-	150
2.3	Information Technology	4	-	2	3	100	25	-	-	125
2.4	Basic Mechanical Engineering	3	-	2	3	100	25	-	-	125
2.5	Basic Electronic Engineering	3	-	2	3	100	25	-	-	125
2.6	Environmental and Social Sciences	4	-	-	3	100	50	-	-	150
2.7	Workshop Practice II Modern	-	-	4	-	-	50	-	-	50
	TOTAL	**22**		**12**	**-**	**600**	**250**	**-**	**-**	**850**

L: Lectures, T : Tutorials, P : Practicals.
Th. Dur. : Duration of Theory Paper
Th : Theory, S : Sessional, P : Practical, O : Oral.

1.1 APPLIED MATHEMATICS-I

1. Total no. of lectures per week : 04 hours
2. Duration of the semester end examination : 03 hours
3. Maximum marks for semester end examination : 100
4. Maximum marks for internal assessment : 25
5. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

1. **Beta and Gamma functions:** Various forms and properties, relation between Beta and Gamma functions, Legendre's duplication formula, Error function.
2. **Infinite sequence and Infinite series**: Convergence and Divergence of sequences and series, tests for Convergence and Divergence of infinite series such as Integral test, Comparison test, D' Alemberts ratio test, Cauchy's root test and Leibnitz test for Alternating series, Power series and Radius of Convergence.

MODULE II

Complex variables: Complex numbers and their properties, Modulus and Argument of Complex number, Polar and Exponential form of Complex number, Geometric interpretation of Complex numbers, De Moivre's theorem and its applications, Exponential, Trigonometric, Hyperbolic and Logarithmic functions, Inverse Trigonometric and Hyperbolic functions, Continuity, Differentiability and Analytic functions. Cauchy-Reiman equations, Harmonic functions.

MODULE III

Differential Calculus: Leibnitz theorem, Taylor's theorem (without proof), Taylor's and Maclaurin's series expansion, Indeterminate forms, Partial Differentiation, Total Differentiation.

MODULE IV

Partial differential Equations and Extreme Values of Functions : Formation of first order Partial Differential Equations, Methods to solve first order Partial Differential Equations, Euler's theorem on Homogenous functions, Extreme values of functions of two and three variables, Langrange's method of Undetermined Multipliers.

Text books:

1. Applied mathematics-P.N.Wartikar and J.N.Wartikar Vol- I and Vol-II

References:

1. Advanced Engineering Mathematics-Erwin Kreysig.
2. Applied Mathematics: Ch. V. Ramana Murthy and N. C. Srinivas
3. Higher Engineering Mathematics: Dr. B. S. Grewal

1.2 APPLIED SCIENCES-I

1. **Total no of Lectures per Week : 04 hours**
2. **Practicals per week : 02 hours**
3. **Duration of semester end examination : 03 hours**
4. **Max. marks for Semester end Examination : 100**
5. **Max marks for internal assessment : 50**
6. **Total Marks : 150**
7. **No. of Sections : 02**

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I (APPLIED PHYSICS)

MODULE – I

INTERFERENCE OF LIGHT:
Interference based on division of amplitude, phase change at reflection, geometric and optical path, Interference due to reflected and transmitted light in thin parallel films, Interference in wedge shaped film, Newton's rings for reflected and transmitted light. Determination of radius of curvature of plano-convex lens, wavelength of light used and refractive index of liquid. Applications of interference, optical flatness, Antireflection films–amplitude and phase conditions, Derivation of formula $\mu_f = \sqrt{\mu_g}$, $\mu_f t = \lambda/4$ (10hrs)

SEMICONDUCTORS:
Mobility, drift velocity, conductivity of charge carriers, generation and recombination of charges, Diffusion, Continuity equation, Hall effect

(5hrs)

MODULE – II

ULTRASONICS:
Production of ultrasonic waves, magnetostriction, Piezo-electric oscillator, detection of ultrasonic waves, properties, cavitation, Applications of ultrasonics in various fields. Measurement of wavelength, velocity by means of acoustic diffraction grating.

(7hrs)

ELECTRON BALLISTICS: Electrostatic and Magnetic focusing, CRO and applications.

(6hrs)

PARTICLE DETECTORS: Ionisation chamber and GM counter. (2hrs)

SECTION – II (APPLIED CHEMISTRY)

MODULE – III

1. **ELECTROCHEMICAL ENERGY SYSTEMS**

   Single electrode potential, Definition, Sign conventions. Derivation of Nernst equation. Standard electrode potential, Definition, Construction of Galvanic Cell – classification, representation, emf of an electrochemical cell. Concentration cells. Reference electrodes, Calomel electrode, Ag/AgCl electrode. Numerical problems on electrode potential and emf. Ion-selective electrode, glass electrode, determination of pH using glass electrode. (8 Hrs)

2. **CONVERSION AND STORAGE OF ELECTROCHEMICAL ENERGY**

   Battery Technology – Batteries – Basic Concepts, battery characteristics, classification of batteries. Construction working and applications of Zn – air, Nickel – Metal hydride and Lithium – MnO_2 batteries.

   Fuel cells: Introduction, types of fuel cells – Alkaline, phosphoric acid and Molten Carbonate fuel cells. Solid polymer electrolyte and solid oxide fuel cells, construction and working of $H_2 – O_2$ and Methanol – Oxygen fuel cell. (7 Hrs)

MODULE IV

CORROSION SCIENCE

Corrosion: - Definition, chemical corrosion and Electrochemical theory of corrosion. Types of corrosion, Differential metal corrosion, Differential aeration corrosion (pitting and waterline corrosion), Stress corrosion. Factors affecting the rate of corrosion.

Corrosion control: - Inorganic coatings – Anodizing and phosphating, metal coatings – Galvanization and Tinning, corrosion inhibitors, cathodic and anodic protection. (8 Hrs)

2. **METAL FINISHING**

   Technological importance of metal finishing. Significance of polarization, decomposition potential and overvoltage in electroplating processes, effect of plating variables on the nature of electrodeposit, surface preparation and electroplating of Cr and Au.

   Electroless plating:-

   Distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Copper on PCB and Nickel. (7 Hrs)

EXPERIMENTS IN APPLIED PHYSICS

1) Newton's Rings
2) Air-Wedge
3) Zener diode characteristics
4) Voltage regulator
5) Rectifiers
6) Use of CRO

NOTE: Minimum of 4 experiments have to be completed per semester.

EXPERIMENTS IN APPLIED CHEMISTRY

1. Conductometric estimation of an acid using standard NaOH solution.
2. Determination of pKa of a weak acid using pH meter.
3. Determination of viscosity of oil using Redwood viscometer.
4. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
5. Colorimetric determination of copper.
6. Flame photometric estimation of sodium in the given water sample.

Reference

1. Vogels text book of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G.H. Jeffary, 4^{th} Ed.
2. Practical Engineering Chemistry by Sunita & Ratan.

APPLIED PHYSICS

Text books

1) Applied Physics – V R Doiphode
2) Engineering Physics – Uma Mukherji
3) Applied Physics – Patgaonkar

Reference books

1) Engineering Physics – Gaur And Gupta
2) Engineering Physics – M.N. Avadhanulu
   P.G. Kshirsagar
3) Engineering Physics – A.S.Vasudev

APPLIED CHEMISTRY

Text Books

1. A text book of Engineering chemistry by Jain and Jain
   Dhanapatrai Publications, New Delhi.
2. Engineering chemistry by M. M. Uppal
   Khanna Publishers, Sixth Edition, 2001.

Reference books

1. Principles of Physical chemistry B. R. Puri, L. R. Sharma & M. S. Pathama, S. Nagin Chand & Co.
2. Text book of polymer Science by F. W. Billmeyer, John Wiley & sons, 1994
3. Liquid crystals and plastic crystals, Vol –I, edited by G. W. Gray and P. A. Winsor, Ellis Horwood series in Physical chemistry, New York.
4. Corrosion Engineering – by M. G. Fontana, Mc Graw Hill Publications.
5. A text book of Engineering chemistry by S. S. Dara, S. Chand Publications, New edition.

1.3 BASIC CIVIL ENGINEERING & ENGINEERING MECHANICS

1. Total no. of lectures per week : 04 hours
2. Practicals per week : 02 hours
3. Duration of the semester end examination : 03 hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module.

CIVIL ENGINEERING

MODULE-I

1.3.1 Introduction to Civil Engineering: Scope of different fields of Civil Engineering Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

1.3.1.1 MATERIALS
Concrete: Ingredients, mixing, transporting, placing, curing. Grade of concrete, properties of hardened concrete.
Structural Steel: Structural forms of steel,
Advanced materials: FRP, Aluminum, RMC and SCC

1.3.1.2 BUILDING COMPONENTS
Framed and load bearing structures, Components of a building (Sub and Superstructure)

1.3.1.3 ROADS: Type of roads, Components and their functions.

1.3.1.4 BRIDGES: Types of bridges, typical sketches of RCC and Steel bridges.

ENGINEERING MECHANICS

MODULE-II

1.3.2 Introduction to Engineering mechanics: Basic idealizations - Particle, Continuum, Rigid body and Point force; Newton's laws of motion, Definition of force, Introduction to SI units, Elements of a force, Classification of force and force systems; Principle of transmissibility

of forces; Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, on equivalent force - couple system.

1.3.2.1 Composition of forces: Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.

Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.
Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent force system. Types of supports, statically determinate beams, Numerical problems on equilibrium of coplanar – non – concurrent force system and support reactions for statically determinate beams.

MODULE – III

1.3.2.2 Centroid of plane figures: Locating the centroid of triangle, semicircle, quadrant of a circle using method of integration, centroid of simple built up sections; Numerical problems. Moment of inertia of an area, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, circular and triangular areas from method of integration; Moment of inertia of composite areas; Numerical problems

1.3.2.3 Friction: Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Wedge friction; Ladder friction; Numerical problems.

MODULE – IV

1.3.2.4 D'Alemberts principle, Work energy, Impulse momentum

1.3.2.5 Simple Lifting Machines – Mechanical advantage, velocity ratio and efficiency of machines, law of machines, conditions for machine efficiency, self-locking, study of the following machines-Single-purchase crab, Double-purchase crab, Differential wheel and axle, Differential pulley block, worm and worm wheel, Simple screw jack; Coils and Springs

TEXT BOOKS

1. S.S. Bhavikatti, K. G. Rajashekarappa " Engineering Mechanics", New Age, International (P) Limited

2. T. R. Jagadeesh, M. A. Jayaram, "Elements of Civil Engineering & Engineering Mechanics", Sapna Book House

REFERENCES

1. R. S. Khurmi "A Text Book of Engineering Mechanics", S. Chand &Co.Publishers
2. A. K. Tayal " Engineering Mechanics", Umesh Publications
3. SCHAUM's Outline Series " Engineering Mechanics", McGraw Hill Publishers, New

Delhi
4. G. Shanmugham, M. S. Palanchamy, "Basic Civil and Mechanical Engineering", Tata McGRaw Hill Limited.

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5. Singer, F. L., Engineering Mechanics
6. Timoshenko and Young, Engineering Mechanics
7. Beer and Johnston, Engineering Mechanics, McGraw Hill
8. Shames, I. H., Engineering Mechanics, Prentice Hall
Haung, I C., Engineering Mechanics

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1.4 BASIC ELECTRICAL ENGINEERING

1. Total no. of lectures per week : 03 Hours
2. Practicals per week : 02 Hours
3. Duration of semester end examination : 03 Hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

DC CIRCUITS: Circuit parameters (R, L, and C) definition from circuital, geometrical and energy viewpoint, Ohm's law, Kirchoff's current and voltage law. Series and parallel connection of circuit parameters. Star and delta transformation. Analysis of simple circuits excited by independent voltage sources for power energy, current and voltage. Thevenin's, Norton's and Maximum power transfer theorem. Illustrative examples.

MODULE II

ELECTROMAGNETISM: Concept of magnetic flux and magnetic field. Definition of terms related to magnetic field, flux density, permeability. Amperes law, Faraday's law, Lenz's law their significance and application. Fleming's rules. Electromagnetic induction, statically and dynamically induced emf, self and mutual inductance. Magnetic circuit concept and its analogue with electric circuit. Comparison between electric and magnetic circuits. Coupled circuits, coefficient of coupling. Energy stored in magnetic field. Illustraitve examples covering above topic.

MODULE III

AC CIRCUITS: Generation of sinusoidal AC voltage. Definition of various terms related to AC wave, average value, RMS value, form factor, peak factor. Concept of phasor and representation of AC quantity by phasor. Concept of leading and lagging phase angle. Addition and subtraction of sinusoidal alternating quantity. Definition of real, reactive, apparent power, power factor. Analysis with phasor diagram of circuits with R –L, R-C, R-L-C elements. Illustrative examples. Three-phase circuits. Representation of three-phase system. Concept of phase sequence, balanced and unbalanced system. Relation between line and phase quantities for star and delta connections. Real reactive and apparent power in three-phase system.

MODULE IV

Principle of operation and construction of a single phase transformer (core and shell type). EMF equation, losses in transformer, efficiency and voltage regulation. Rating of transformer. Illustrative examples on EMF equation, efficiency, regulation current, voltage, turns ratio of transformer. Brief description of open and short circuit test on single-phase transformer.
Measurments: Construction, principle of operation of PMMC and moving iron and dynamometer type of instruments. Methods of measurement of power in three phase circuits, balanced and unbalanced load (no derivation and phasor diagram). Illustrative examples.

TEXT BOOKS

1) Principles of Electrical Engineering By V Del Toro. PHI Publication
2) Electrical and Electronics Technology By Edward Hughes Eighth edition, Pearson Education
3) Fundamentals of Electrical Engineering By Rajendra Prasad PHI Publication.

1.5 ENGINEERING GRAPHICS

1. Total no. of lectures per week : 02 Hours
2. Practicals per week : 04 Hours
3. Duration of semester end examination : 04 hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 50
6. Total marks : 150

The question paper will consist of 8 questions. There shall be 2 questions from each module. Total of 5 questions are to be attempted, answering 1 question from each module, each question will carry 20 marks.

MODULE I

1. Introduction to engineering graphics, different types of lines used in engineering graphics, curves involving conic sections, cycloid and in volute curves.
2. Projections of points, straight lines- when line is parallel to both the planes, parallel to one and perpendicular to other, line inclined to both the principle planes.

MODULE II

1. Projections of planes: circle, square, triangle, rectangle, pentagon, hexagon and combination of these.
2. Projections of solids: cube, tetrahedron, cylinder, cone, pyramid, prism.

MODULE III

1. Sections of solids.
2. Developments of lateral surfaces of the objects like cube, tetrahedron, cylinder, cone, pyramid, prism.

MODULE IV

1. Orthographic projection (using 1^{st} angle projection only) of machine parts and castings etc.
2. Isometric projection.

PRACTICE (Excluded from theory examination):

Introduction to at least one CAD software application limited to orthographic projection and isometric projection (Minimum 04 Hrs exposure).

TEXT BOOKS:

1. Engineering Drawing- N.D.Bhat – Charotar Publishing company.
2. Engineering Drawing- K.R.Gopalkrishna-- Subash Publications.
3. Engineering Drawing - K.R. Mohan – Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Engineering Drawing- P.J.Shah – Vol. 1 & 2 – Praveen Shah Publishers.
2. Engineering Drawing- Luzadeer & Duff - PHI.
3. Engineering Drawing- P.S.Gill – S.K.Kataria & Sons.

1.6 COMMUNICATION SKILLS

1. Total no. of lectures per week : 03 hours
2. Duration of semester end examination : 03 hours
3. Maximum marks for semester end examination : 100
4. Maximum marks for internal assessment : 25
5. Total marks : 125

Internal assessment will include internal tests (written) based on Modules 1 to 3 and an assignment (seminar/presentation) based on the oral component Module 4.
Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

Language construction

- Grammatical concepts like tenses, active and passive voice, direct and indirect speech, conjunctions, prepositions and prepositional phrases, prefixes and suffixes, degrees of comparison and idioms.
- Transformation of sentences (Affirmative, Negative, Interrogative and Exclamatory), use of 'too', 'no sooner…than', 'not only… but also', 'unless', 'so…that'.
- Correct usage of language and common errors.

Comprehension and vocabulary

- Ability to understand and interpret ideas, vocabulary building, vocabulary expansion, synonyms and antonyms, one-word substitution.
- Technical, scientific and general text with Multiple Choice questions to test analytical skills, comprehension, expression, vocabulary and grammar.

MODULE II

Summarization and Interpretation

- Techniques to summarize a given passage to test comprehension ability to present written matter in a brief and concise manner
- Precis writing.
- Note taking and Note making

Technical communication

- Report writing and Project proposal (in a letter format)
- Technical writing - framing definitions, classification, technical description of objects and process, writing instructions. (topics relevant to the first year engineering syllabus)

MODULE III

- Basic official correspondence (Notices, Minutes of the meeting, Agenda, Invitations, Memos)
- Principles of correspondence, language and style in official letters, formats of letters, claims and adjustments, methods of adjustment.

- Application letter with Curriculum Vitae/ Resume; letters of order, claims and adjustment; letters of enquiry and replies; letters requesting for duplicate marksheets, provisional marksheets, bonafide certificate, change in name etc.

MODULE IV

Oral Expression

- Principles of Effective Communication and Barriers to communication
- Types of Non Verbal Communication
- Good public speaking
    - Debates, Elocution,
    - Seminars, Presentation skills
- Effective Listening
- Attitudes in Team speaking and Do's and don'ts of Group discussion
- Job Interview – interview techniques, preparing for an interview and conducting an interview.

Text books:

1. Business Correspondence and Report Writing, R. C. Sharma, & Krishna Mohan, Tata McGraw Hill
2. Basic Communication Skills for Technology, Andrea J. Rutherford, Pearson Education Pte. Ltd.

References:

1. Objective English, Edgar and Showick Thorpe, Pearson Education
2. Professional Communications Skills, Pravin S. R. Bhatia & A. M. Sheikh, S. Chand & Company Ltd.
3. Principles and Practice of Business Communication, Rhoda A.Doctor and Aspi H. Doctor, Sheth Publications.

1.7 WORKSHOP PRACTICE – I

1. Practicals per week : 04 Hours
2. Maximum marks for internal assessment : 50

i) **FITTING: -** Demonstration of various tools and equipments used in fitting shop.
Practical: At least one job covering simple fitting practice.

ii) **PLUMBING: -** Demonstration of various tools and equipments used by plumber. Demonstration of various plumbing fittings.
Practical: At least two jobs as follows
1) G. I. Pipe fitting by threading. -------- One Job
2) P.V.C. Pipe fitting. ---------- One Job

iii) **CARPENTRY: -** Demonstration of wood cutting machines, tools and equipments.
Practical: At least two jobs as follows
1) Wooden joint. ---------- One Job
2) Wood turning. ---------- One Job

iv) **FORGING:-** Demonstration of various tools and equipments used in forging shop.
Practical: At least two different jobs covering forging practice.

2.1 APPLIED MATHEMATICS – II

1. Total no. of lectures per week : 04 hours
2. Duration of the semester end examination : 03 hours
3. Maximum marks for semester end examination : 100
4. Maximum marks for internal assessment : 25
5. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

1. Differentiation under the Integral sign: Integral with its limit as constant and as a function of the parameter.
2. Curve tracing and Rectification of Plane Curves: Tracing of Plane Curves in two dimensions, Polar and Parametric forms of Plane Curves such as Cardiod, Asteroid, Cycloid, Leminiscate etc., Rectification of Plane Curves in Polar, Cartesian and Parametric form, Vector Differentiation, Curves in space, Tangent, Normal and Binormal vectors, Torsion and Curvature, Serret- Frenet formulas.

MODULE II

Multiple Integrals: Double Integration in Polar and Cartesian co-ordinates, change of order in Double Integration, application of Double Integration to computation of Centre of Gravity; Triple Integration in Cartesian , Spherical and Cylindrical co-ordinate systems, Geometrical interpretation of Triple Integration and applications to surface area and volume.

MODULE III

Vector calculus: Scalar and Vector fields, Directional Derivatives, Divergence and Curl of Vector fields, Gradient of a Scalar field, Line Integrals and their applications, Greens theorem in a Plane, Surface and Volume Integrals, Divergence theorem and Stroke's theorem(both without proof) and their applications.

MODULE IV

Ordinary Differential Equations: First order and first degree Ordinary Differential Equations, Method of separation of variables, Homogeneous and Non- Homogeneous Equations reducible to Homogeneous form, Linear Differential Equations, Bernoulli's Differential Equation, Exact and Non- Exact Differential Equations; higher order Differential Equation with constant coefficients and with right hand side of the form $e^{ax,}$ Sin ax, Cos ax, e^{ax} f(x), x^n f(x) etc., Linear

equations with variable coefficients such as Cauchy Equation and Lagrange's Equation, D-operators and Inverse D- operators, method of Variation of Parameters.

Text Books:

1. Applied Mathematics - P.N.Wartikar and J.N.Wartikar Vol- I and Vol-II

References:

1. Vector Calculus: Shanti Narayan
2. Higher Engineering Mathematics: Dr. B. S. Grewal
3. Applied Mathematics: Ch. V. Ramana Murthy and N.C. Srinivas
4. Advanced Engineering Mathematics: Erwin Kreysig

2.2 APPLIED SCIENCES-II

1. **Total no of Lectures per Week : 04 hours**
2. **Practicals per week : 02 hours**
3. **Durations of Semester end examination : 03 hours**
4. **Max. marks for Semester end Examination : 100**
5. **Max marks for internal assessment : 50**
6. **Total Marks : 150**
7. **No. of Sections : 2**

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I (APPLIED PHYSICS)

MODULE – I

LASERS:

Interaction of radiation with matter from quantum mechanical view, Absorption, Spontaneous and stimulated emission of radiation, Active medium, metastable state, population inversion, non–equilibrium state, pumping, Conditions for light amplification, Einstein's theory of stimulated emission, Operating principle of a laser, pumping–schemes, Optical resonator, Properties of laser, He–Ne laser, Ruby Laser, Applications

(9hrs)

FIBRE OPTICS:

Total internal reflection, propagation of light in optical fibre, structure of an optical fibre and fibre cable, acceptance angle and cone, Numerical aperture of an optical fibre, Types of optical fibres, Modes of propagation, single and multimode fibres, frequency or V-number of fibre ,Applications- Fibre optic communication and Fibrescope

(6hrs)

MODULE – II

MODERN PHYSICS:

Compton Effect, wave nature of particle, de Broglie hypothesis, Davison Germer experiment (5 hrs)

X-rays- Continuous and characteristic x-ray spectra , Moseley's law, X-Ray diffraction-Bragg's spectrometer. (5 hrs)

Super conductors-Meissner effect, type-I and II, high Tc superconductors, BCS theory (qualitative analysis only) properties and applications.

SECTION – II (APPLIED CHEMISTRY)

MODULE – III

1. **HIGH POLYMERS**

Definition, classification – Natural and synthetic with examples. Polymerization – definition, types of polymerization – free radical mechanism (ethylene as an example), Methods of polymerization – bulk solution, suspension and emulsion polymerization. Glass transition temperature, structure and property relationship. Compounding of resins, synthesis properties and applications of Teflon, PMMA, polymethane and phenol – formaldehyde resin. Elastomers – Deficiencies of natural rubber and advantages of synthetic rubber. Synthesis and application of Neoprene, Butyl rubber. Adhesives – Manufacture and application of Epoxy resins. Conducting polymers – definition, mechanism of conduction in polyacetylene, structure and applications of conducting polyaniline. (8 Hrs)

2. **CHEMICAL ENERGY SOURCES**

Introduction to energy: Fuels – definition, classification, importance of hydrocarbon as fuels, calorific value definition, Gross and net calorific values. Determination of calorific value of solid/liquid fuel using bomb calorimeter. Petroleum cracking - fluidized catalytic cracking, Reformation of petrol. Knocking - mechanism octane number, cetane number, prevention of knocking, antiknocking agents, unleaded petrol, synthetic petrol – Berguis process and Fischer Tropsch process, power alcohol.

Solar Energy

Photovoltaic cells – Introduction, definition, importance, working of a PV cell, solar grade silicon, physical and chemical properties of silicon relevant to photovoltaics, production of solar grade (crystalline) silicon and doping of silicon.

(7 Hrs)

MODULE IV

1. **WATER TECHNOLOGY**

Impurities in water, water analysis – Determination of different constituents in water. Hardness, Alkalinity, chloride, Flouride, Nitrate, Sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Biochemical oxygen demand and chemical oxygen demand, Numerical problems on BOD and COD. Sewage treatment. Potable water, purification of water – Flash evaporation, Electro dialysis and Reverse osmosis. Hazardous chemicals with ill effects.

(8 Hrs)

2. **LIQUID CRYSTALS AND THEIR APPLICATIONS**

Introduction, classification. Thermotropic and lyotropic with examples. Types of mesophases, nematic, chiral nematic (cholestric), smectic and columnar. Homologues series (PAA and MBBA), Applications of liquid crystals in display systems.**Instrumental methods of analysis** Theory, Instrumentation and Applications of colorimetry,potentiometry, conductometry.

(7 Hrs)

EXPERIMENTS IN APPLIED PHYSICS

1) Thermistor characteristics
2) Hall effect
3) e/m by Thomson method
4) Velocity of Ultrasonic wave
5) Energy gap of a semiconductor
6) Planck's constant by photocell
7) He-Ne Laser/Diode Laser

NOTE: Minimum of 4 experiments have to be completed per semester.

EXPERIMENTS IN APPLIED CHEMISTRY

1. Determination of total hardness of a sample of water using disodium salt of EDTA.
2. Determination of Calcium oxide (CaO) in the given sample of cement by Rapid EDTA method.
3. Determination of percentage of copper in brass using standard sodium thiosulphate solution.
4. Determination of Iron in the given sample of Haematite ore solution using potassium dichromate crystals by external indication method
5. Determination of chemical oxygen demand (COD) of the given industrial waste water sample.
6. Determination of dissolved oxygen in the given sample by winkler method.

Reference

1. Vogels text book of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G.H. Jeffary, 4th Ed.
2. Practical Engineering Chemistry by Sunita & Ratan.

APPLIED PHYSICS

Text books

1. Applied Physics – V R Doiphode
2. Engineering Physics – Uma Mukherji
3. Applied Physics – Patgaonkar

Reference books

1. Engineering Physics – Gaur And Gupta
2. Engineering Physics – M.N. Avadhanulu
   P.G. Kshirsagar
3. Engineering Physics – A.S.Vasudev

APPLIED CHEMISTRY

Text Books

1) A text book of Engineering chemistry by Jain and Jain Dhanapatrai Publications, New Delhi.
2) Engineering chemistry by M. M. Uppal Khanna Publishers, Sixth Edition, 2001.

Reference books

1) Principles of Physical chemistry B. R. Puri, L. R. Sharma & M. S. Pathama, S. Nagin Chand & Co.
2) Text book of polymer Science by F. W. Billmeyer, John Wiley & sons, 1994
3) Liquid crystals and plastic crystals, Vol –I, edited by G. W. Gray and P. A. Winsor, Ellis Horwood series in Physical chemistry, New York.
4) Corrosion Engineering – by M. G. Fontana, Mc Graw Hill Publications.
5) A text book of Engineering chemistry by S. S. Dara, S. Chand Publications, New edition.

2.3 INFORMATION TECHNOLOGY

Lectures per week	: 4 hours
Practical per week	: 2 hours
Max. Marks for the paper	: 100
Max. Marks for Sessional	: 3 hours
Total no. of modules	: 4
Questions to be drawn from each module	: 2
Min. No. of questions to be answered from each module	: 1
Total no of questions to be answered in the paper	: 5

MODULE 1

Introduction to Computer: Specifications of Personal Computer (Pentium Based Computer), Anatomy of digital computer, Memory Units, Auxiliary storage units.
Input devices: Keyboard, mouse
Output Devices: Monitor: characteristics of monitor, Printers: Dot matrix, Inkjet printers
Operating Systems: Functions of an operating system, salient features and elementary operations with DOS, Windows and Linux.
Networks of computers:
Topologies
Network Architecture: Peer to peer, Client-Server architecture
Internet and World Wide Web: Domain Name, IP Address, URL, WWW, Web Browsers.
Email: How Email works, Email names and addresses, Spamming

MODULE 2

Database Management System:
Introduction to Database Management System: What is database, Characteristic of data in database, Types of database management systems.

Introduction to Programming languages: Introduction, Machine languages, Assembly languages, High level languages, types of high level languages. Functions of an assembler, interpreter and compilers, Compilation process.

Fundamental algorithms along with their Flow charts:
- Exchange of values of two variables
- Summation of set of numbers
- Factorial Computation
- Fibonacci Series
- Reversing the digits of an Integer

MODULE 3

Fundamentals of Programming using C Language:
Overview of C, Constants variables and data types, operators and expressions, data input output, Decision making and looping: If, If-else, while, do-while, for, switch.

MODULE 4

Functions: Function declarations and prototypes, Call by value, Call by reference.
Arrays: Introduction, One dimension array, two dimension array, array initialization, Passing array to a function.
File Input Output Operations: File management in C, Defining opening and closing of files.

Textbooks:

1. Fundamentals of Information technology by Alexis Leon (Module I and II)
2. How to solve it by computers by R.G Dromey(Module II)
3. Programming in ANSI C by Balagurusamy (Module III and IV)
4. Let Us C by Yeshwant Kanetkar (Module IV)

Experiments:

1) Components of PC and Network Components
2) Commands of DOS and Linux
3) Study of MS Word and Powerpoint
4) Study of MS Access and MS Excel
5) C program on Decision control structure
6) C program on Loop control structure
7) C program on Case control structure
8) C program on Functions
9) C program on Arrays
10) C program on Files

2.4 BASIC MECHANICAL ENGINEERING

1. Total no. of lectures per week : 03 Hours
2. Practicals per week : 02 Hours
3. Duration of semester end examination : 03 hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

BASICS OF THERMODYNAMICS

Basic concepts of thermodynamics – system, surroundings, property, process, heat and work (concepts only); First law-Non-Flow Energy equation (no proof) with the concept of internal energy and enthalpy; Reversible process - constant volume, constant pressure, isothermal and adiabatic only (restricted to basic calculations of heat and work transfer); First law applied to boiler, turbine, condenser and pump; Second law and degradation of energy, absolute temperature scale (concepts only); Air standard cycle (representation on P-V plane only)- Otto and Diesel cycle only (no derivation)- efficiency –definition, basic calculation

MODULE II

BASICS OF HEAT ENGINES AND REFRIGERATION

Internal Combustion (I.C) Engines: Basics- definition, taxonomy – Spark Ignition & Compression Ignition with two-stroke and four stroke - operating principles with basic parts, Systems - fuel, ignition, lubrication and cooling (elementary description with schematic sketches only)- basic calculations of brake power and specific fuel consumption, introduction to Multi-Point Fuel Injection (MPFI)

Thermal power plant – Working principle using schematic diagram; Steam Engineering – latent heat, dryness fraction (no steam table and Mollier diagram); Vapour power cycle - basic Rankine cycle only (preliminary treatment without numericals)

Refrigeration- Basics, refrigerants, working principle using schematic diagram, domestic refrigerator - tonne of refrigeration (preliminary treatment without numericals)

MODULE III

BASICS OF AUTOMOBILE ENGINEERING

Preamble, Components - basic structure, transmission-working principle of single plate clutch, gear box-construction and working principle of constant mesh gear box, universal joint, propeller shaft, differential - construction and working principle; brake system – lay out for air and power brake systems with working principles; Steering system - lay out for manual and hydraulic steering systems with working principles; Classification of automobiles; Automotive emissions and control – basic concepts only

MODULE IV

INTRODUCTION TO MANUFACTURING ENGINEERING- (BRIEF TREATMENT)

Casting – sand, die, centrifugal; Rolling – flat, shape; Forging-open die, closed die; Extrusion and drawing-hot, cold, impact, hydrostatic; Sheet metal forming processes - bending, tube bending, stretch forming, spinning; Machining processes to produce various shapes-turning, drilling, milling, tapping, grinding, relative motion between work piece and tool for each process; Joining processes-arc welding, laser-beam welding, brazing, soldering, adhesive bonding, mechanical fastening.

Text Books

- Rathakrishnan E. (2003), Fundamental of Engineering Thermodynamics, Prentice Hall of India Pub., New Delhi.
- Singh K. (1994), Automobile Engineering, Standard Publishers, New Delhi.
- Campbell J. S. (1985) Principles of manufacturing materials and processes, Tata McGraw Hill Pub., New Delhi.
- Palanichamy M.S. (1991), “Basic Civil & Mechanical Engineering”, Tata McGraw Hill Pub., New Delhi.

Reference Books

- Venugopal K. (1997), Basic Mechanical Engineering, Anuradha Publishers, Chennai
- Crouse. (2004), Automotive mechanics, Tata McGraw Hill Pub., New Delhi.
- Cengel Y. A., Boles M. A. (2002), Thermodynamics - an Engineering approach, Tata McGraw Hill Pub., New Delhi.
- Rao P. N. (2001), Manufacturing Technology, Tata McGraw Hill Pub., New Delhi.

Kalpakjian S. and Schmid S. R. (2000), Manufacturing Engineering and Technology, Addison Wesley Longman Pub., Singapore

2.5 BASIC ELECTRONIC ENGINEERING

1. Total no. of lectures per week : 03 Hours
2. Practicals per week : 02 Hours
3. Duration of semester end examination : 03 Hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

SEMICONDUCTOR DIODES: Ideal Diode; Semiconductor Diode; Resistance Levels; Diode Equivalent Circuits; Transition and Diffusion Capacitance; Effect of temperature; Avalanche Breakdown. DIODE APPLICATIONS: Load Line Analysis; Diode Approximations; Series, Parallel

and Series-Parallel Diode Configurations; Half-wave, Full-wave and Bridge Rectifiers; PIV; DC and r.m.s. voltages, Derivation of Ripple Factor, Transformer Utilization Factor; Basic Concept of a Capacitor-filter; Voltage Regulation; Zener diodes ; Clippers; Clampers; Voltage Multiplier Circuits.

MODULE II

BIPOLAR JUNCTION TRANSISTOR(BJT): Transistor Construction; Transistor Operation; Common-Base Configuration; Transistor Amplifying Action; Common-Emitter Configuration; Common-Collector Configuration; Limits of Operation.

DC BIASING: Operating Point; Fixed-Bias Circuit; Emitter-Stabilized Bias Circuit; Voltage-Divider Bias; Transistor Switching Networks; Bias Stabilization (Fixed Bias, Emitter-Bias and Voltage-Divider Bias).

MODULE III

FIELD-EFFECT TRANSISTORS: Construction and Characteristics of JFETs; Transfer Characteristics; Depletion-Type MOSFET; Enhancement-Type MOSFET; CMOS. FET BIASING: (JFETs and Depletion –type FET) -Fixed-Bias, Self-Bias and Voltage-Divider Bias Configurations(both n- and p-channel); Enhancement-Type MOSFETs-Feedback Biasing Arrangement, Voltage –Divider Biasing Arrangement.

MODULE IV

DISCRETE AND IC MANUFACTURING TECHNIQUES: Discrete Diodes; Transistor Fabrication; Integrated Circuits; Monolithic Integrated Circuit.

OPERATIONAL AMPLIFIERS: Introduction.

FEEDBACK AND OSCILLATOR CIRCUITS:Feedback Concepts; Feedback Amplifier-Phase and Frequency Considerations; Oscillator
Operation.

OTHER TWO-TERMINAL DEVICES:Photodiodes; Photoconductive Cells; IR Emitters; Liquid-Crystal Displays; Solar Cells;
Thermistors.

pnpn AND OTHER DEVICES. Silicon- Controlled Rectifier(SCR); Basic SCR Operation; SCR Characteristics and Ratings.

OSCILLOSCOPE (CRO):Cathode Ray Tube- Theory and Construction; CRO-Operation; Voltage Sweep Operation; Synchronization and Triggering.

SESSIONALS:
1. Eight Assigments to cover the syllabus.
2. A minimum of six experiments based on the syllabus.

TEXT BOOKS:

1. R. Boylestad and L. Nashelsky, Electronic Devices and Circuits, 6th Edn. PHI.
2. A. Mottershead, Electronic Devices and Circuits PHI.

REFERENCES:

1. N.N.Bhargava., Basic Electronics and Linear Circuits, Tata McGraw-Hill.

2.6 ENVIRONMENTAL AND SOCIAL SCIENCES

1. Total no. of lectures per week : 04 Hours (2+2)
2. Duration of semester end examination : 03 hours
3. Maximum marks for semester end examination : 100
4. Maximum marks for internal assessment : 50 (25+25)
5. Total marks : 150
6. No. of sections : 02

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I
ENVIRONMENTAL SCIENCES

MODULE-I

The Environment: Definition, scope, nature and its importance. Need for public awareness.

Natural Resources and Associated Problems

a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Usage and exploitation, environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, need for conservation of energy, use of alternate energy sources.
f) Land resources: Land as a resource, its degradation, man induced land-slides, soil erosion and desertification.
g) Role of an individual in conservation of natural resources
h) Equitable use of resources for sustainable lifestyle.

Ecosystems: Concept, structure and function of an ecosystem, producers, consumers and decomposers. Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystems
A) Grassland ecosystem,
B) Pond ecosystem

MODULE-II

Environmental Pollution: Definition, causes, effects and control measures of:
a) Air pollution b) Water pollution d) Marine pollution e) Noise pollution.
Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Global Issues: Acid rain, Ozone layer depletion and Global warming.

Social Issues and the Environment

From unsustainable to sustainable development, urban problems related to pollution, water conservation, rain water harvesting
Functions of CPCB and SPCB

SECTION – II

SOCIAL SCIENCES

MODULE- III

Personality: Types (Heredity + Environment Tolerance)

1. Personality and Motivation
2. Coping with Stress- Repetitive Prayer, Meditation, yoga
3. Adjustment
4. Positive thinking and Positive Living: balanced diet, proper habits and healthy living
5. Personal Grooming

Inter-Group Relations

1. Inter-Personal Relations and Inter- Group relations (working as a team, cooperation and competition)
2. Empowerment of Women
3. Responsibility: Personal, Moral and Social
4. Business Manners- Etiquettes and Social behaviour

MODULE- IV

Society and Culture

1. Education- Nature and Significance, Limitations and Evaluation, different kinds of education systems
2. Ethics: Moral foundations of social order
   Professional ethics
3. Our Culture: different aspects
4. Culture and Identity
5. Changes in culture: Cross cultural interactions, Acculturation, enculturation, cultural diffusion etc.
6. Globalisation
7. Religious Tolerance

TEXT BOOKS:

Environmental Studies

1. A Basic Course in Environmental Studies by S. Deswal
   Publisher: Dhanpat Rai and Co. Pvt. Ltd.
2. Principles of Environmental Science and Engineering by R. Pannirselvam SPGS Publisher, Chennai.

Social Sciences

1. Psychology, Robert A. Baron, Pearson Education Pte. Ltd.
2. Sociology (Principles of Sociology with an Introduction to social thought), C. N. Shankar Rao, S. Chand Publications.

References: Environmental Studies

1. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
2. Desh Ka Paryavaran - Anupam Misra, Ganolai santi Pratisthan. New Delhi.
3. Down to Earth, Centre for Science and Environment
4. Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
5. Mckinney, M. L. & Schocl. R. M. 1996, Environmental Science Systems
6. Odum, E. P. 1971, Fundamentals of Ecology, W. B. Saunders Co. USA,
7. Rao M. N. & Datta, A. K. 1987, Waste Water Treatment, Oxford & IBH Publ.Co.
8. Sharma B. K., 2001, Environmental Chemistry, Goel Publ. House, Meerut Society, Bombay (R)
9. Trivedi R. K. and P. K. Goel, Introduction to air pollution, Techno-Science
10. Trivedi R. K., Handbook of Environmental Laws, Rules, Guidelines, Compliances

References: Social Sciences

Sociology, Richard T. Schaefer and Robert P. Lamm, Tata Mcgraw Hill publications
Articles in relevant Journals/Publications
The New Encyclopedia Britannica, Macropedia.

2.7 WORKSHOP PRACTICE – II

1. Practicals per week : 04 Hours
2. Maximum marks for internal assessment : 50

i) **WELDING:-**Demonstration of various welding machines and equipments.
Practical: At least one job on Electric Arc welding.

ii) **TURNING: -** Demonstration of lathes, tools and equipments. Demonstration of drilling machines, grinding machines, shapers, and milling machines.
Practical: At least one job on lathe covering simple lathe operations.

iii) **PATTERN MAKING: -** Timber classification, seasoning defects in Timber, Knowledge of plywood, hardwood, adhesive glues, paints, varnish, and polish.
Practical: At least one simple pattern of wood.

iv) **FOUNDRY: -** Demonstration of hand tools, equipments, and furnaces used in foundry shop.
Practical: At least four various types of sand moulds.