Semester – II

Theory Courses

Course Code	Title	Scheme of Examination				Hrs./Week		
		Duration (hrs)	IA	UE	Total Marks	L	T	P
ITE-221	Fundamentals of Mechanical Engineering	3	40	60	100	3	1	0
ITE-222	Mathematics-II	3	40	60	100	3	1	0
ITE-223	C Programming	3	40	60	100	3	1	0
ITE-224	Basic Electrical Engineering	3	40	60	100	3	1	0
ITE-225	Engineering Physics	3	40	60	100	3	1	0
ITE-226	Eng. Chemistry & Env. Sciences	3	40	60	100	3	1	0
Total			**240**	**360**	**600**			

Laboratory Courses

ITE-231	C Programming	2	25	25	50	0	0	2
ITE-232	Basic Electrical Engineering	2	25	25	50	0	0	2
ITE-233	Engineering Physics	2	25	25	50	0	0	2
ITE-234	Eng. Chemistry & Env. Sciences	2	25	25	50	0	0	2
	Total		**100**	**100**	**200**			
Total (Theory + Lab)			**340**	**460**	**800**			

Semester II

Course Title: Fundamentals of Mechanical Engineering Max. Marks: 100
Course Code: ITE-221 University Exam: 60
Duration of Exams: 3 hours Sessional Assessment: 40

Unit-I

Basic concept of thermodynamics: Introduction, States, Work, Heat, Temperature, Zeroth, first, second and third law of thermodynamics, Concept of internal energy, enthalpy and entropy. Numerical problems.

Unit-II

Properties of Steam & Steam Generator Formation of steam at constant pressure, Thermodynamic properties of Steam, Use of steam tables, Measurement of dryness fraction by throttling calorimeter.

Unit-III

Refrigeration & Air conditioning: Introduction to refrigeration and air -conditioning, Rating of refrigeration machines, Coefficient of performance, Simple refrigeration vapour compression cycle, Psychometric charts and its use, Human comforts.

Unit-IV

Hydraulic Turbines & Pumps: Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Specific speed and selection of turbines, Classification of water pumps and their working. Introduction to IC Engines.

Unit-V

Motion, Power Transmission Methods and Devices: Rotational motion, angular velocity and rotational work & power. Introduction to Power transmission, Types of gears, power in gear set, Belt, Rope, Chain and Gear drive. Types and functioning of clutches.

Recommended Books:

1. Rajput R. K., Elements of Mechanical Engineering, Lakshmi Pub., Delhi
2. Kumar D.S., Elements of Mechanical Engineering, S.K. Kataria and Sons
3. Nag P.K. Engineering Thermodynamics, TMH, New Delhi
4. Arora & Domkundwar, Refrigeration & Air-conditioning, Dhanpat Rai & Co. Pvt Ltd
5. Ryder G.H., Strength of Materials, ELBS Publication
6. Modi and Seth, Hydraulic and Fluid Mechanics, Standard Book House, Publication, New Delhi
7. Arora C.P., Engineering Thermodynamics, TMH, New Delhi
8. Arora C.P., Refrigeration & Airconditioning, TMH, New Delhi
9. Ostwald, Munoz, Manufacturing Process and Systems, John Wiley, India

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

Semester II

Course Title: Mathematics-II **Max. Marks: 100**
Course Code: ITE-222 **University Exam: 60**
Duration of Exams: 3 hours **Sessional Assessment: 40**

Objective: The course is designed to provide basic knowledge of Partial Differential ,Fourier and Vector Analysis to engineering students.

Unit-I

Partial Differential Equations: Partial differential equations and its formation, Linear and non-linear partial differential equations of first order and their solutions, Charpit's method, Homogenous and non-homogenous linear partial differential equations with constant coefficients and their solutions.

Unit-II

Applications of Partial Differential Equations: Applications of Partial Differential Equations with initial and boundary conditions, Solution by the method of separation of variables, Partial differential equations of physical sciences and Engineering and their solution viz: vibration of a stretched string, wave equation, heat flow and electric transmission lines in one dimension, Two dimensional heat flow and Laplace's Equation.

Unit-III

Fourier series and Practical Harmonic Analysis: Periodic functions, Fourier series and Euler's formulae, Expansion of periodic functions in Fourier series, conditions for a Fourier expansion, Functions having points of discontinuity, Change of Interval, Expansion of even and odd functions, Half range series, Parseval's formula, Complex form of Fourier series and practical harmonic analysis.

Unit-IV

Vector Space and Matrices: Introduction to vector spaces, linear independence and dependence of vectors, subspaces, basis and dimensions. Rank of a matrix, Elementary transformation of a matrix, Inverse of a matrix, Normal form of a matrix, Characteristic equation, Eigen value and Eigen vectors, properties of Eigen values, Caley-Hamilton theorem, Diagonalization of matrices, Orthogonal, Symmetry, Unitary, Hermitian and Skew-Hermitian matrices.

Unit-V

Vector Analysis: Scalar and vector products of three and four vectors. Scalar and vector fields, Gradient of scalar field, Divergence and Curl of vector field. Line, Surface and Volume Integrals. Theorems of Green, Stoke, Gauss of Vector analysis.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, Khanna Publication, 40th Ed.
2. **Piaggio H.T. H.,** An Elementary Treatise on Differential Equations, Barman Press.

Reference Books:

1. **Weatherburn C. E.,** Vector Calculus, Ellis Horwood Publication.

Note for paper setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Semester II

Course Title: C Programming **Max Marks: 100**
Course Code: ITE-223 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: To enhance the logical skills of students with the basic programming concepts and implementation in C.

Unit-I

Introduction to C Programming: History of C, Structure of a C Program, Compiling & Executing a C program. Flow Charts, Constants, Variables and Data Types, Operators and Expressions, Data Input and Output.

Unit-II

Control Statements: Decision making and branching, IF statement, IF-ELSE statement, nested IF-ELSE statement, Switch statement, break statement, continue statement. Decision making and Looping, while statement, do-while statement, for statement.

Unit-III

Functions: Types of functions, function declaration, calling a function, passing arguments to functions, return values and their types, nesting of functions, recursion.

Unit -IV

Introduction to arrays: One dimensional arrays, Two dimensional arrays and Multidimensional arrays, basic operations on arrays, arrays and strings, basic string operations. Introduction to Unions, Structures and enumerated data types.

Unit-V

Introduction to Files & Pointers: Operations on pointers, pointers & multidimensional arrays, pointers & character strings. Dynamic Memory Allocation in C: malloc, calloc, realloc and free functions. Operations on files like open, close, read and write.

Text Books:

1. **Balaguruswamy**, Programming in ANSI C, TMH.
2. **Yashwant Kanitkar**, Let us C, TMH.

Reference Books:

1. **Gottfried, Programming** with C, TMH.
2. **Venugopal,** C Programming, TMH.
3. **Yashwant Kanitkar,** Pointers in C, TMH.

Note for paper setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

Semester II

Course Title: Basic Electrical Engineering **Max Marks: 100**
Course Code: ITE-224 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The objective of the course is to impart the knowledge of basic principles of Electrical Engineering and its applied aspects.

Unit-I

Review of Electric Circuit Laws and Energy Sources: Basic Electrical circuit terminology, concept of charge and energy, circuit parameters (resistance, inductance & capacitance), Ohm's law, Kirchhoff's current law, Kirchhoff's voltage law, series and parallel combinations of resistance, inductance & capacitance. Ideal and practical voltage, current sources and their transformations, dependent voltage and current sources.

Unit-II

D.C. Circuit analysis: Power & energy relations, analysis of series parallel DC circuits, Star Delta transformations (Δ'Y), Loop & Nodal methods, Network Theorems: Thevenin's, Norton's, maximum power transfer and superposition theorems.

Unit-III

Electromagnetism: Review of Fundamentals of Electromagnetism, Ampere's Law, analogies between electric circuits and magnetic circuits, Faraday's laws of electromagnetic induction, direction of induced emf, Lenz's law, magnetic saturation and leakage fluxes.

Unit-IV

A.C. Circuit analysis: Basic terminology and definitions, phasor and complex number representations, power energy relations in AC circuits, application of Network Theorems to AC circuits ,Resonance in series and parallel circuits, Concepts of active & reactive powers, Introduction to 3 phase circuits.

Unit-V

Transformers: Concept of Inductance, Self & Mutual Inductance, Conventions for magnetically coupled circuits, Transformers: introduction, classification & construction of single phase transformer, emf equation and phasor diagrams.

Text Books:

1. **David Bell**, Electrical Engineering Principles. PHI.
2. **Vincent Del Toro**, Electrical Engineering Principles, PHI.

Reference Books:

1. **Cotton H.,** Electrical Technology.
2. **Gupta B.R.,** Principles of Electrical Engineering.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit

Semester II

Course Title: Engineering Physics **Max Marks: 100**
Course Code: ITE-225 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Objective: The course is designed to acquaint the students with ultrasonic, acoustics, atomic physics, their applications and electromagnetic waves.

Unit-I

Wave Motion & Introduction to Acoustics: Longitudinal and transverse waves, transfer of energy, momentum and Intensity. Impedance offered by a string. Introduction to ultrasonic waves, magnetostriction and piezoelectric effect, productions of ultrasonic waves and their applications. A brief introduction to acoustics, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time (qualitative treatment only). Simple related numerical problems.

Unit-II

Atomic & Molecular Physics-I: Uncertainty principle, matter waves and their characteristics properties, de-Broglie wave hypothesis and its experimental verification, photo-electric effect and Compton Effect. Bohr's quantization condition. Emission & Absorption spectra. Introduction to Zeeman, Paschenback and Raman's effects.

Unit-III

Atomic & Molecular Physics-II: Wave Function, Its physical significance, limitations imposed on wave function. Schrodinger's time dependent and time independent wave equations and its application to one dimensional problems. Potential steps, Potential barrier, infinite potential well and simple harmonic oscillator.

Unit-IV

Lasers: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Helium-Neon Laser, Ruby Laser, Applications of Lasers.

Unit-V

Electromagnetic Waves: Concept of Electric Field and Potential, Polarization of di-electrics, Guass's law and its applications to uniformly charged hollow sphere, uniformly charged plane sheet and cylinder, Electro Static Energy, Lorentz Force, Integral and differential Amperes law, Brief introduction to Maxwell's Equations.

Text Books:

1. **Pathania K. S.** & **Khera S. K.**, Waves and Vibration,
2. **Beiser**, **Arthur**, Concepts of Modern physics, TMH.

Reference Books:

1. **Ghatak A. K., Dass P.,** Laser theory & application of ultrasonic waves,
2. **David J. & Cheek**, Fundamentals and application of ultrasonic waves,
3. **Avadhanulu M. N. & Khsirsagar P. G.,** Engineering Physics (S. Chand & Co.)
4. **Vijaya K. K., Chandralingam S.**, Modern Physics, S. Chand & Co. Ltd, New Delhi

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

Semester II

Course Title: Engineering Chemistry & Env. Sc. **Max Marks: 100**
Course Code: ITE-226 **University Exam:60**
Duration of Exam: 3 hours **Internal Assessment:40**

Objective: The course is designed to acquaint the students with environmental science, water treatment and application of chemical properties of materials and alloys.

Unit-I

Environmental Chemistry: Concept of Environmental chemistry, segments of environment (a brief idea about atmosphere, hydrosphere & lithosphere), Air pollution- Introduction, Air pollutants and control of air pollution, water pollution- Introduction, water pollutants, methods of controlling water pollution.

Unit-II

Effects of Environmental Pollution: Acid rain, ozone chemistry, Green House effect & Global warming. Chemicals & metal Toxicology, Biochemical effects of Pb, Hg, As, Zn, Cd, Ni, Se, Cn & pesticides in brief on man.

Unit-III

Inorganic Chemistry materials cement & lime: Optical isomerism, racemerization, asymmetric synthesis. Water treatment; Introduction, types of water, softening of water by different processes, disadvantages of hard water, numericals on hardness of water. Introduction & classification of lime, manufacture & properties of lime, setting & hardening of lime. Cement, types of cement, manufacture of Portland cement, setting & hardening of cement.

Unit-IV

Alloys and Lubricants: Introduction, purpose of making alloys, preparation of alloys, classification of alloys, (ferrous & non-ferrous alloys), alloy steels & copper alloys.
Definition, functions of lubricants, mechanism of lubrication, classification of lubricants (lubricating oils, semi-solid lubricants, solid lubricants) synthetic lubricant, flash & fire points, oiliness, cloud & pour points.

Unit-V

Rubber and Dyes: Introduction, types of rubber, vulcanization of rubber, preparation, properties & uses of following synthetic rubber: Buna–S, Buna-N & Butyl rubber. Dyes, classification & applications of dyes.

Text Books:

1. **Jain & Jain**, Engineering Chemistry, Dhanpat Rai Publishing Co. 15th Ed.
2. **Sharma, B.K.,** Engineering Chemistry, Krishna Publications.

Reference Books:

1. **Bahl, B. S.**, Organic Chemistry, S. Chand & Co. Ltd, New Delhi.
2. **Soni P. L.,** Organic Chemistry, Sultan Chand and Sons.
3. **De. A. K.,** Environmental chemistry, Willey Eastern Pvt. Ltd, New Delhi.
4. **Tyagi & Mehra,** Text Book of Engineering Chemistry, Vikas Publication House.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions, selecting one from each unit.

Semester II

Course Title: C Programming **Max Marks: 50**
Course Code: ITE-231 **University Exam: 25**
Duration of Exam: 3 hours **Internal Assessment: 25**

List of Experiments:

1. Basic program in Sequential Statement in C
2. Program of multiway control structure (Switch Case)
3. Program of different types of loops nested loops.
4. Program on function (Parameter passing - call by value)
5. Programs on recursion.
6. Programs on string manipulation with or without string function.
7. Program on 1-Dimesional Arrays.
8. Program on 2-Dimensional Arrays.
9. Programs on pointers
10. Programs on file handling.

Note: This is only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents

Semester II

Course Title: Basic Electrical Engineering **Max Marks: 50**
Course Code: ITE-232 **University Examination: 25**
Duration of Exam: 3 hours **Internal Assessment: 25**

List of suggested experiments:

1. Introduction to Circuit Elements.
2. Verification of Ohms Law.
3. Verification of Kirchhoff's Current and Voltage Law (KCL & KVL)
4. Verification of Thevenin's Theorem & Norton's Theorem.
5. Transformation of Star & Delta Networks.
6. Measurement of Power using 2-Wattmeter method.
7. Verification of Superposition Theorem.
8. Verification of reciprocity theorem.
9. To plot the Resonance curve for a Series & Parallel Resonance.
10. Determination of resonance frequency using LCR Meter.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Semester II

Course Title: Engineering Physics **Max Marks:50**
Course Code: ITE-233 **University Exam:25**
Duration of Exam: 3 hours **Internal Assessment:25**

List of Experiments:

1. To find out the intensity response of a solar cell/photo diode.
2. To find the angle of given prism using a spectrometer.
3. To analyze the atomic spectra of Neon/Sodium lamp.
4. To determine the laser parameters like diversions, wavelength, etc for a given laser source (2 or 3 experiments)
5. To find the dispersive power of a given prism using a spectrometer.
6. To find the refractive index of a given liquid using hollow prism/glass prism.
7. Determination of wavelength of light by Newton's rings experiment.
8. To determine the wavelength of monochromatic light (Sodium Lamp) with the help of Fresnel's biprism.
9. To determine the focal length of two lenses separated by a distance with the help of nodal slide.
10. Young's double slit experiment.
11. To find the wavelength of light by diffraction grating.
12. To find the frequency of AC main using an electrical vibrator.
13. To plot a graph between a distance of knife edges from the centre of gravity and the period of a compound pendulum and find acceleration due to gravity from the graph.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents

Semester II

Course Title: Engineering Chemistry & Env. Sc. **Max Marks: 50**
Course Code: ITE-234 **University Exam:25**
Duration of Exam: 3 hours **Internal Assessment: 25**

List of the experiments:

1. Determine the percentage of $CaCO_3$ in precipitated chalk (provided I NHCL and 0.1 N NaOH)
2. Determine volumetrically the percentage purity of given sample of ferrous sulphate, x gms of which have been dissolved per litre provided N/10 $KMnO_4$
3. Determine the alkalinity of a given water sample.
4. Organic analysis: Identify the following organic compounds (preparation of at least one derivative)
    - Carboxylic acid
    - Compounds containing alcoholic and phenolic OH group
    - Aldehydes and Ketones
    - Carbohydrates
    - Amides, amines, Anilides and nitro compounds
    - Hydrocarbons
    - Compounds containing sulphur or halogen
5. Determine volumetrically the number of molecules of water of crystallization present in the given sample of Mohr's salt, x gms of which is dissolved per litre provided N/10 $K_2Cr_2O_7$ (using external indicator)
6. Determine volumetrically the percentage of Cu in a sample of $CuSO_4$ crystals z gms of which is dissolved per litre, provided N/10 $Na_2S_2O_3$.
7. Determine the coefficient of viscosity of an unknown liquid using Ostwald viscometer.
8. Determine the surface tension of an unknown liquid using stalagmometer.
9. To prepare pure and dry sample of Glucosazone
10. Determine the aniline point of given lubricating oil.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents