

PH 1101	PHYSICS I	1.0 UNIT	BE – SEM I
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Module 1: Waves and Oscillations

(SS*: Wave motion: longitudinal and transverse waves, plane waves, phase velocity) Wave packets and group velocity, wave equation, superposition of waves, equation of motion of simple harmonic oscillator and solution, damped harmonic motion, forced oscillations.

Module 2: Fields

Vector and scalar fields, gradient, divergence and curl (Cartesian coordinates only), Gauss's theorem and Stokes' theorem (Statements only)

Module 3: Electromagnetic Theory

Gauss's law in integral and differential form, electric potential and relation with **E** (SS*- capacitance and electric energy density), dielectrics, three electric vectors, dielectric susceptibility, boundary conditions on **E** and **D**, Ampere's law in integral and differential form, applications, Hall effect, three magnetic vectors, magnetic permeability and susceptibility, boundary conditions on **B** and **H** (5)
3.3 Faraday's law in integral and differential form, (SS*-Inductance, magnetic energy density), Continuity equation for charge, displacement current, Maxwell's equations in free space, electromagnetic wave equation for plane waves in dielectric medium and free space, relation between **E**, **B** and **k**, Pointing vector

Module 4: Plasma Physics

Plasma State, Types of plasma, applications of plasma

Module 5: Physical Optics

Interference: Two-beam interference, interference in thin films and wedge-shaped layers, reflection and anti-reflection coatings, applications of interferometry: Newton's rings, Michelson's interferometer, Diffraction: Fraunhofer diffraction by single slit, double slit and grating, limit of resolution, Rayleigh criterion and Fresnel diffraction (qualitative), Polarization: (SS*- Polarization of light, Malus law, polarization by reflection, Brewster's law, double refraction), analysis of linearly and circularly polarized light, Fresnel's equations and their applications.

SS*- Self Study

Reference Text Books:

1. Mathew N.O. Sadiku- Elements of electromagnetics, Oxford Univ. Press. (2001)
2. A.Ghatak- Optics, 3rd edition, Tata McGraw Hill. (2005)
3. Resnick, Halliday and Krane- Physics Part- I & II, 5th edition, John Wiley (2002)
4. F.F.Chen-Introduction to Plasma Physics, 2nd edition, Plenum Press (1984)
5. M.R.Srinivasan- Physics for Engineers, New AGE International (1996)
6. H.J.Pain- The Physics of Vibrations and Waves, 6th edition, John Wiley (2005)
7. S.N.Sen- Introduction to Plasma Physics, Pragati Prakashan, Meerut-1, India

MA 1101	MATHEMATICS I	1.0 UNIT	BE – SEM I
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Module 1: Analytical Trigonometry

De-Moivre's theorem and its applications, Expansion of Sin x and Cos x in powers of x, Complex arguments, Separation into real and imaginary parts, Gregory's result, Expansions, Summation of Trigonometric series, Hyperbolic functions

Module 2: Differential Calculus

Successive Differentiation- Leibnitz theorem, Rolle's theorem, Lagrange's and Cauchy's mean value theorem, Generalised mean value theorem, Taylor's and Maclaurin's infinite series, Cartesian and polar subtangent and subnormal Pedal equations, Orthogonal intersection of curves, Curvature and radius of curvature in case of Cartesian parametric, polar, pedal and tangential polar forms, Centre of curvature and evolute, Indeterminate forms, L'Hospital's Rule, Concavity, Convexity and points of inflexion, Asymptotes (Cartesian coordinates only)

Functions of two variables, Partial derivatives, Euler's theorem on homogeneous functions-its generalization and extension, Total differential and derivatives, Errors and approximations, Taylor's series in case of two variables, Maxima and Minima of two variables, Lagrange's method of undetermined multipliers in case of two and three variables, Jacobians, Envelope of curves, Tangent planes and Normal lines.

Module 3: Integral Calculus

Reduction formula, Beta and Gamma functions, Area, Length, Volume and Surface area without the use of multiple integrals.

Module 4: Infinite Series

Convergency and Divergency of infinite series, Tests for Convergence, Comparison Test, p series Test, Cauchy's Root Test, D'Alembert's Ratio Test, Raabe's Test, Gauss's Test, Logarithmic and Higher Logarithmic Ratio Test (No Proof), Leibnitz Rule for Alternating Series Test.

Reference Text Books:

1. Higher Trigonometry- Das and Mukherjee (U.N.Dhur & Co)
2. Differential Calculus- Pran Nath and Agarwal (Tara Publications, Varanasi)
3. Integral Calculus- Das and Mukherjee (U.N.Dhur & Co)
4. Engineering Mathematics- H.K.Dass
5. Higher Engineering Mathematics- B.S.Grewal (Khanna Publishers)

ME 1103	ENGINEERING GRAPHICS I SESSIONAL	1.0 UNIT	BE – SEM I
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Basic concepts of orthographic projections of points, straight lines, planes and solids; Section of solids; Development and intersection of surfaces; Concepts of Isometric views; Nuts, bolts and screw fasteners.

Assembly Drawing from the given details or details from the given assembly drawing of the following machine element parts:

- a) Foot-step bearing
- b) Rigid flanged coupling
- c) Simple eccentric

Reference Text Books:

1. Engineering Drawing (Plane and solid geometry)- N.D.Bhatt
2. Machine Drawing- N.D.Bhatt

CP 1201	UNIX AND C PROGRAMMING (SESSIONAL)	1.0 UNIT	BE – SEM I
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Module 1:

Fundamentals of Unix operating system, Login and Password, Different Commands, Unix Directory, Structure and working with directories, Vi-editor, History and importance of C, Sample programming, Basic Structure and execution of C programs, Constants, Variables and Data Types and various types of declarations, different type Operators and Expressions, Evaluation of Expressions, Operator Precedence and Associability, Mathematical Functions.

Module 2:

Managing Input and Output operations, Decision Making and Branching, Decision Making and Looping.

Module 3:

One- dimensional arrays and their Declaration and Initializations, Two- dimensional Arrays and their Initializations, Multidimensional Arrays, Dynamic Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on Characters, Putting Strings together, Comparison of Two Strings, String-Handling Functions, Table and other features of strings.

Module 4:

Need and Elements for user-defined Functions, Definition of functions, Return values and their types, Function Calls and Declaration, Arguments and corresponding return values, Functions that return multiple values, Nesting of Functions, Recursion, Passing arrays and strings to functions, The Scope, Visibility and Lifetime of variables.

Module 5:

Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialization of Structure, Comparing Structure Variables, Operation on individual members, Arrays of Structures, Structures within Structures, Structures and Functions, Unions, Size of Structures, Bit Fields.

Module 6:

Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays, Pointers and Character Strings, Arrays of Pointers, Pointers and Function Arguments, Functions returning Pointers, Pointers to Functions, Pointers and structures, File Management in C.

Reference Text Books

1. Programming in ANSIC – E Balaguruswami (TMH) New Delhi
2. Introduction to Unix System – H Morgan

ME 1101	ENGINEERING MECHANICS	1.0 UNIT	BE – SEM I
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Module 1: Equivalent Force System and Equilibrium

Review of vectors, Vector representation of forces and moments, Principle of statics, Laws of mechanics, Free body diagram, Conditions of equilibrium, Co-planar, Non coplanar and spatial force system, Equivalent forces and moment, Wrench.

Module 2: Structural Mechanics

Analysis of plane trusses by method of joints and by method of sections, Analysis of plane frames with hinged joints, Analysis of parabolic suspension cables, Relation between load, shear force and bending moment, Shear force and bending moment of cantilever and simply supported beam with concentrated, uniformly distributed and triangular distributed loads and moments.

Module 3: Interfacial Friction

Laws of dry friction, Static and kinetic co-efficient of friction, Analysis of static, kinetic and rolling friction

Module 4: Moment of Inertia

Calculation of area moment of inertia of different geometric sections, Parallel and perpendicular axis theorem, Moment of inertia of composite sections, Principal axis and principal moments of inertia, Calculation of mass moments of inertia of thin plates, thin rectangular plates, thin circular disc, Mass moment of inertia of solids- rods, cylinder, prism, sphere, cone

Module 5: Kinematics and Kinetics of Particles

Rectilinear motion of particle, Determination of motion of a particle- displacement, velocity, acceleration, relative motion, Curvilinear motion of particle, Rectangular components, Projectile motion, Projection on inclined plane, escape velocity, uniform circular motion, tangential and normal acceleration, Equation of motion, D'Alembert's principle, Analysis of lifting(pulley) motion, motion of several connected bodies, linear momentum, angular momentum

Module 6: Kinematics and Kinetics of Rigid Bodies

Types of rigid body motion- translation, rotation about a fixed axis, Equations defining the rotation of a rigid body about a fixed axis, plane motion, absolute and relative velocity in plane motion, instantaneous center of rotation, Equation of translational and rotational motion, Newton's law and D'Alembert's principle- inertia force and inertia couple, center of percussion, constrained motion- non centroidal motion

Module 7: Work, Energy and Impulse Momentum

Translation and rotation of a rigid body about a fixed axis, Conservation of energy, Energy and work equations in translational and rotational motion, Virtual work, Impulse force and momentum, Conservation of momentum, coefficient of restitution, moment of momentum equation

Reference Text Books:

1. Engineering Mechanics- Statics and Dynamics by S.Rajasekaran and G.Sankara Subramanian (Vikas Publishing House Pvt. Ltd, New Delhi)
2. Engineering Mechanics(3rd edition) by Dr.K.L.Kumar(TMH, 1998)
3. Engineering Mechanics by Irving H.Shames(PHI)

CH 1201	ENGINEERING CHEMISTRY	1.0 UNIT	BE – SEM I
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Module 1: Chemical Bonding

Trends in periodic properties (ionization energy, electron affinity, electro negativity), VBT, VSEPR theory, MOT for diatomic molecules and polyatomic molecules, coordination complexes and ligands, CFT, colour and magnetism of coordination complexes, spectrochemical series

Module 2: Kinetics and Catalysis

Kinetics of chain reactions, parallel reactions, side reactions, fast reactions in solutions, flash photolysis, kinetics of catalytic action (acid base catalysis, biological catalysis), application of catalyst in industrially important processes (Haber's process, Ostwald process, Bergius process)

Module 3: Thermo-Chemistry and Fuels

Hess's law, entropy, enthalpy and combustion calculations, characterization and application of fossil fuels, solid fuel (carbonization and gasification), liquid fuels (refining, reforming, petrol and diesel, knocking characteristics, octane and cetane number), and gaseous fuels (water gas, producer gas, coal gas and biogas), lubricants and its properties.

Module 4: Electrochemistry and Corrosion

Redox process cell, potential and free energy, galvanic cells, electrolysis and Nernst equation, fuel cells and its applications, chemical and electrochemical corrosion, general methods of corrosion prevention (with brief introduction to chemistry of paints, varnishes and enamel)

Module 5: Fundamentals of Spectroscopic Techniques

Basic principles of vibrational, rotational and Mossbauer spectroscopy

Module 6: Macromolecules

Classification, Addition and Condensation polymers, molecular weight of polymers (M_n , M_w , M_v), glass transition temperature (T_g), structure property relation in polymers (chemical, electrical, optical and mechanical), examples and use of inorganic polymers, synthesis of some commercially important polymers and their use (Nylon 6, Nylon 66, PE, PET, PS)

Module 7: An Introduction to Computational Chemistry

Reference Text Books:

1. Applied Chemistry- A textbook for engineers and technologists- H.D.Gesser, Plenum Publishers
2. Physical Chemistry- P.W. Atkins
3. Inorganic Chemistry- J.D. Lee
4. Fundamentals of Molecular Spectroscopy- C.N. Banwell, TMH Publication
5. Computational Chemistry- E. Lewars, Kluwer Publication
6. Engineering Chemistry- Sashi Chawla

CH 1202	ENGINEERING CHEMISTRY LABORATORY	1.0 UNIT	BE – SEM I
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List of experiments for B.E (First Year)

An integrated laboratory course designed to expose the students to classical methods of analysis as well as instrumentation methods. Some experiments deal with the conventional volumetric, gravimetric techniques, semi-micro techniques, highlighting the importance of sample and solution preparation, precision and sensitivity of analytical techniques, percentage reproducibility of a given procedure while some have been designed to expose the students to various instrumentation techniques using ion-selective electrodes, conductometric methods, spectroscopic methods and thermal analytical methods. The emphasis will be on “green chemistry”, as far as possible, chemicals derived from readily available household products will be used. This will be helpful in preventing pollution and also reduce the cost of waste disposal. Emphasis of all the experiments designed will be on

- a) Chemical substitution (substituting non- hazardous materials for hazardous chemicals in lab experiments)
- b) Micro scaling i.e.scaling down of amounts used in traditional experiments by use of semi-micro and micro techniques.
- c) Alternative approaches- application of computational techniques and combinational chemistry to completely eliminate or reduce the generation of waste.

(Preferably one experiment from each module to be carried out)

- 1.Introduction to various analytical techniques (conventional techniques like volumetric, gravimetric and electrochemical, separation and spectrophotometric techniques), statistical methods employed in analytical techniques, general awareness regarding laboratory upkeep and safety
- 2.Qualitative semi-micro analysis of cations and anions
- 3.Qualitative semi-micro analysis of mixture of cations and anions by group separation methods
- 4.Chromatographic techniques:
 - a)Identification of unknown mixture by spot test analysis
 - b)Quantitative determination of Limonene using gas chromatography
 - c)Acetylation of ferrocene and analysis using TLC
 - d)Pesticide analysis using HPLC
- 5.Spectroscopic techniques:
 - a)Quantitative analysis of total Fe/Cu/Cr/As/Hg present in given sample of water using AAS
 - b)Verification of Beer-Lambert’s law using UV-vis spectrophotometer
- 6.Electrochemical techniques:
 - a)Determination of dissociation constant and titration using conductance of electrolytic solutions
 - b)Acid hydrolysis of ethyl acetate
- 7.Thermo chemical measurements:
 - a)DSC of a given Sample
 - b)Determination of calorific values using Junker/Bomb calorimeter
- 8.Water pollution monitoring and control:
 - a)DO determination
 - b)BOD
 - c)COD
 - d)Free chlorine
 - e)pH and alkalinity

- f) Total hardness
- g) MPN count
- h) Optimizing the dose of added coagulant by Jar test
- i) Analysis of alum and determination of water soluble alum compounds as alumina(Al_2O_3)

9. Air pollution monitoring and control:

- a) Flue gas analysis using Orsat apparatus
- b) Analysis of SO_2
- c) Analysis of NO_x , CO and CO_2

10. Use of advanced techniques for chemical waste minimization:

- a) Application of computational techniques in chemistry
- b) Application of combinational chemistry

11. Fuel and lubricants:

- a) Determination of open and close flash points
- b) Determination of Viscosity using Redwood-I viscometer
- c) Proximate analysis of a given solid fuel
- d) Ultimate analysis

PE 1101	WORKSHOP PRACTICE - I	1.0 UNIT	BE – SEM I
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To make the students conversant with different trades/shops such as machine shop, forging, welding, foundry, fitting and wood working which includes the basic knowledge of tools, machineries, equipments and operations performed. Some of the specific practice exercises are:

1. MACHINE SHOP:

To study different parts of center lathes and make a cylindrical job of given dimension by plain turning, facing and parting. To study different parts of shaper and make a square block by shaping

2. FITTING SHOP:

To study various tools used and operations performed in fitting. To make a key as per given dimensions.

3. FORGING SHOP:

To study forging operations, tools and equipments used in hand forging. To make a square shape specimen from a given rod.

4. WOOD WORKING:

To study different types of tools used in carpentry shop. To make a rectangular block of wood

5. WELDING SHOP:

To join two pieces of given metal by arc welding process.

6. FOUNDRY SHOP:

To study the concept of metal casting and different tools and equipments used. To make a green sand mould using solid pattern. To make a sand mould using two piece pattern.