

COMMON CURRICULAM
FOR
FIRST YEAR
B. TECH DEGREE COURSES
IN
ENGINEERING & TECHNOLOGY

(Applicable from the academic session 2020-2021)



Haldia Institute of Technology
*An Autonomous Institute, NAAC Accredited Grade 'A' Institute, NBA
Accredited Departments: (CSE, CHE, BT, ME, AEIE, EE, ECE, IT, CE, FT).
NIRF Ranking: 163*

Approved by : All India Council for Technical Education (AICTE)
*Affiliated to : Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly Known as - WBUT)*

Haldia, Purba Medinipur, West Bengal, India, 721657

A. Definition of Credit

| | |
|------------------------------|-------------|
| 1 Hr. Lecture (L) per week | 1 credit |
| 1 Hr. Tutorial (T) per week | 1 credit |
| 1 Hr. Practical (P) per week | 0.5 credits |

B. Range of credits

All B. Tech. programs include a range of credits from 160 to 165.

C. Mandatory Additional Requirement (MAR) for earning B. Tech Degree

Every student, who is admitted to the 4 years B. Tech program from the academic year 2019-20 onwards, is required to earn *minimum 100* Activity Points, in addition to the required academic grades for getting B. Tech degree.

The MAR activities, (as per guideline of AICTE / affiliating University, MAKAUT) will provide necessary needs of modern industry and the society. Through this program, irrespective of one's technological field, each student develops the skill of active participation in the co-curricular and extra-curricular activities through SAWYAM based learning activities. Such activities enhance student's employability and global acceptances. Details are given in *Annexure-I*.

D. MOOCs for B. Tech Honours

A student will be eligible to get B.Tech Degree *with Honours*, if he/she completes an *additional 20 credits*, through Massive Open Online Courses (MOOCs). The complete description of the MOOCs relevant for the first year course is given in *Annexure-II*.

E. Guidelines regarding Mandatory Induction Program for the new students

The aim of the Induction Programme is to acclimatize the students to the environment of their engineering institution, give them a flavour of the exciting new world of education that they are entering, provide them with mentoring schemes, and make them aware of their neighbourhood, society and people. This will allow them to evolve as well rounded individuals. Details are given in *Annexure-III*.

F. Group division

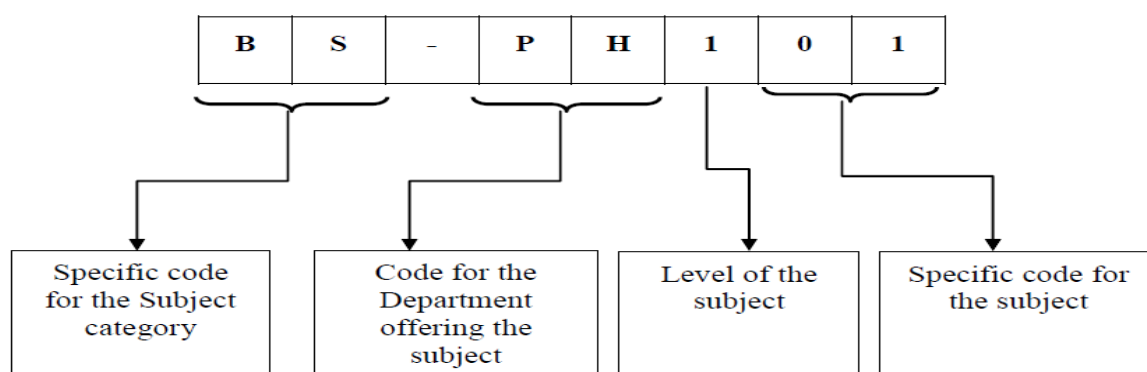
Group-A

All non-IT based programme like - Mechanical Engineering (ME), Chemical Engineering (CHE), Civil Engineering (CE), Electrical Engineering (EE), Applied Electronics & Instrumentation Engineering (AEIE), Biotechnology (BT), Food Technology (FT).

Group-B

All IT-based programme like – Computer Science & Engineering (CSE), Computer Science & Engineering (Cyber Security), Computer Science & Engineering (Data Science), Computer Science & Engineering (Artificial Intelligence & Machine Learning), Information Technology, Electronics & Communication Engineering (ECE).

Subject Numbering Scheme:



COURSE CURRICULA B.TECH, 1ST YR-1ST SEMESTER

| <i>Theory</i> | | | | | | | |
|----------------------------------|--|----------------------|-------|---|---|---|--------|
| Sl No | Paper Name | Paper Code | Marks | L | T | P | Credit |
| 1 | Mathematics-I [Group-A & B] | BS-M 101 | 100 | 3 | 1 | 0 | 4 |
| 2 | Physics-I [Group-A] / Chemistry-I [Group-B] | BS-PH 101/ BS-CH101 | 100 | 3 | 1 | 0 | 4 |
| 3 | Basic Elec. & Electro. Engg. [Group-A] / Programming for problem solving [Group-B] | ES-EE 101/ ES-CS 101 | 100 | 3 | 1 | 0 | 4 |
| 4 | English Language and Technical Communication. [Group-B] | HM-HU 101 | 100 | 2 | 0 | 0 | 2 |
| Total Marks: 300 | | | | Total Credit: 12.0 [Group-A] | | | |
| Total Marks: 400 | | | | Total Credit: 14.0 [Group-B] | | | |
| <i>Practical</i> | | | | | | | |
| 5 | Physics-I Lab [Group-A] / Chemistry-I Lab [Group-B] | BS-PH 191/ BS-CH 191 | 100 | 0 | 0 | 3 | 1.5 |
| 6 | Basic Elec. & Electro. Engg. Lab [Group-A] / Programming Lab [Group-B] | ES-EE 191/ ES-CS 191 | 100 | 0 | 0 | 3 | 1.5 |
| 7 | Workshop Practice [Group-A] / Engg. Drawing [Group-B] | ES-ME 191/ ES-ME 192 | 100 | 1 | 0 | 3 | 2.5 |
| 8 | Language Lab [Group-B] | HM-HU 191 | 100 | 0 | 0 | 2 | 1 |
| <i>Extra Curricular Activity</i> | | | | | | | |
| 9 | NSS [Group-A] | | | | | | |
| Total Marks: 300 | | | | &Total Credit: 5.5 [Group-A] | | | |
| Total Marks: 400 | | | | &Total Credit: 6.5 [Group-B] | | | |

COURSE CURRICULA
B.TECH, 1ST YR-2ND SEMESTER

| <i>Theory</i> | | | | | | | |
|---|--|--------------------------|-------|---|---|---|--------|
| Sl No. | Paper Name | Paper Code | Marks | L | T | P | Credit |
| 1 | Mathematics-II [Group-A & B] | BS-M 201 | 100 | 3 | 1 | 0 | 4 |
| 2 | Chemistry-I [Group-A]/ Physics-I [Group-B] | BS-CH 201/ BS-PH 201 | 100 | 3 | 1 | 0 | 4 |
| 3 | Programming for problem solving [Group-A]/ Basic Elec. & Electro. Engg. [Group-B] | ES-CS 201 / ES-EE 201 | 100 | 3 | 1 | 0 | 4 |
| 4 | English Language and Technical Communication [Group-A] | HM-HU 201 | 100 | 2 | 0 | 0 | 2 |
| Total Marks: 400 Total Credit: 14.0 [Group-A] | | | | | | | |
| Total Marks: 300 Total Credit: 12.0 [Group-B] | | | | | | | |
| <i>Practical</i> | | | | | | | |
| 5 | Chemistry-I Lab [Group-B]/ Physics-I Lab [Group-A] | BS-CH 291/ BS-PH 291 | 100 | 0 | 0 | 3 | 1.5 |
| 6 | Programming Lab [Group-A]/ Basic Elec. & Electro. Engg. Lab [Group-B] | ES-CS 291/ ES-EE 291 | 100 | 0 | 0 | 3 | 1.5 |
| 7 | Engg. Drawing [Group-A] / Workshop Practice [Group-B] | ES-ME292 / ES-ME191 | 100 | 1 | 0 | 3 | 2.5 |
| 8 | Language Lab[Group-A] | HM-HU 291 | 100 | 0 | 0 | 2 | 1 |
| <i>Extra Curricular Activity</i> | | | | | | | |
| 9 | NSS [Group-B] | | | | | | |
| Total Marks: 400 &Total Credit: 6.5 [Group-A] | | | | | | | |
| Total Marks: 300 &Total Credit: 5.5[Group-B] | | | | | | | |

| | |
|----------------------------------|---------------------------------------|
| Paper Name: Mathematics-I | Category: Basic Science Course |
| Paper Code: BS-M101 | Semester: First |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 45L

Course Objectives

- Providing the core concepts of higher Engineering Mathematics and describing the techniques, this works as an essential tool to solve the problems in their field of applications.
- To provide an overview of Differential Equations, Laplace Transform and Complex Analysis to engineers.

Module-1[8L]

Matrix& Determinant:

Inverse and rank of a matrix; Elementary row and column operations over a matrix; System of linear equations and its consistency; Rank and nullity; Determinants; minors and cofactors; Eigen values and eigen vectors; Diagonalization of matrices; Cayley Hamilton theorem; Orthogonal transformation.

Module-2[9L]

Differential Calculus:

Successive derivative, Leibnitz's Theorem; Rolle's Theorem, Mean value theorem, Taylor's and Maclaurin's theorems with remainders;

Sequence and Series:

Basic concept of Convergence of sequence and series; Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test(statements and related problems on these tests), Raabe's test; Alternating series; Leibnitz's Test (statement only); Absolute convergence and Conditional convergence.

Module-3[8L]

Integral calculus:

Improper integrals; Beta and Gamma functions and their properties;Convergence of improper integrals; Applications of definite integrals to evaluate surface areas and volumes of revolutions.Differentiation under integral sign.

Module-4[10L]

Calculus of function of several variables:

Introduction to functions of several variables;Limit and continuity, Partial derivatives, Homogeneous functions and Euler's theorem up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their applications, Jacobians up to three variables Maxima, minima;Saddle points of functions; Lagrange Multiplier method and their applications; Concept of line integrals, Double and triple integrals.

Module-5[10L]

Vector Calculus:

Scalar and vector triple products with related problems, Equation of straight line, plane and sphere. Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Applications only, proofs not required).

Course Outcomes (COs)

- CO1. To provide students with skills in algebra and calculus which would enable them to devise engineering solutions for given situations they may encounter in their profession.
- CO2. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice by enhancing the power of knowledge and imagination
- CO3. Prepare students for realization of journal papers outcomes, and expose them to the world of research. Illustrate the current research works and publications of the subjects in different fields adopted by the students as per course curriculum in various journals and literature.
- CO4. To explore and enhance research potential explain how the ideas those are adopted can be implemented through projects and demonstrate various models, recent project proposals executing the knowledge adopted from the course.
- CO5. An ability to function on multi-disciplinary teams. Lighten on the latest and modern developments in the fields.
- CO6. Explain about ethical awareness and impact in the field of environmental, social and safety of the finished products. Describe the pollution, legal aspects and impacts may arise in large scale production.

Learning Resources

1. Advanced Engineering Mathematics , by Erwin Kreyszig is published by Wiley India
2. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
3. Higher Engineering Mathematics: John Bird (4th Edition, 1st Indian Reprint 2006, Elsevier)
4. Engineering Mathematics: S. S. Sastry (PHI, 4PthP Edition, 2008)
5. Advanced Engineering Mathematics, 3E: M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.

| | |
|-----------------------------------|---------------------------------------|
| Paper Name: Mathematics-II | Category: Basic Science Course |
| Paper Code: BS-M201 | Semester: Second |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 45L

Course Objectives

- Providing the core concepts of higher Engineering Mathematics and describing the Techniques, this works as an essential tool to solve the problems in their field of applications.
- To provide an overview of Differential Equations, Laplace Transform and Complex Analysis to engineers.

Module -1[10L]

Ordinary differential equation (ODE)- First order and first degree: Exact equations, Necessary and sufficient condition for exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear and non-linear differential equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).

Second order and first degree: General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations.

Module -2[5L]

Basics of Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Subgraph,; Walks, Paths, Circuits, Euler Graph, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph.

Module -3[10L]

Laplace Transform: Introduction to integral transformation, functions of exponential order, Definition and existence of LT (initial and final value theorem with applications proofs not required), LT of elementary functions, Properties of Laplace Transformations, Evaluation of sine, cosine and exponential integrals using LT, LT of periodic and step functions.

Definition and properties of inverse LT Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODEs with constant coefficients (initial value problem) using LT.

Module -4[12L]

Complex Variable: Complex functions, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems. Conformal mappings, Bilinear transformation, Mobius transformations and their properties.

Complex Integration: Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve.

Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function.

Module -5[8L]

Zeros and Singularities of an Analytic Function & Residue Theorem.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m. Examples on determination of singularities and their nature. Taylor's series, Laurent's series.

Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals: $\int_0^{\infty} \frac{\sin x}{x} dx$, $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta+c\sin\theta}$, $\oint_C \frac{P(z)}{Q(z)} dz$ (elementary cases, P(z) & Q(z) are polynomials of 2nd order or less). Evaluation of certain improper integrals using the Bromwich contour.

Course Outcomes(COs)

- CO1. Recall the earlier mathematical thoughts, such as idea of derivative, integration, ordinary differential equations and complex algebra.
- CO2. Exhibit the idea of ordinary differential equation of first and higher order. Recognize the concept of graph theory and Laplace transform and complex variable.
- CO3. Apply the knowledge of Laplace transform to reduce the complexity of differential equation. Use different graphical algorithm to find optimal solutions.
- CO4. Analyze the ideas of mentioned mathematical tools so that it can be implemented to real time engineering problems
- CO5. Justify and make gradation of above mentioned mathematical tools and determine the right approach to solve multidisciplinary engineering problems.
- CO6. Build up logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.

Learning Resources

1. Probability and Statistics for Engineers, Miller & Freund R.A.Johnson, Prentice Hall of India
2. Advanced Engineering Mathematics, Erwin Kreyszig, (Wiley Eastern)
3. Graph Theory: V. K. Balakrishnan, (Schaum's Outline, TMH)
4. Engineering Mathematics: B.S. Grewal (S. Chand & Co.)
5. Introductory Course in Differential Equations: Daniel A. Murray (Longmans & Green).
6. Graph Theory: N. Deo (Prentice-Hall of India)
7. Numerical Analysis and Computational Procedures, Sahajahan Ali Mollah, Books & Allied Ltd
8. Fundamentals of Mathematical Statistics, Gupta & Kapoor, (Sultan Chand & Sons).
9. Schaum's Outlines: Laplace Transforms ,Murray R. Spiegel,

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|--|---------------------------------------|
| Paper Name: Physics –I | Category: Basic Science Course |
| Paper Code: BS-PH 101 / BS-PH 201 | Semester: First / Second |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 42L

Course Objectives

- To introduce the rudimental and relevant concepts of physics to different branches of Engineering and Technology.
- To compile all the knowledge acquired from the course and to apply in industry, academia, and research keeping in the mind about ethical awareness and impact in the field of environmental (pollution), social (legal) and safety.

Module-1 [10L]

Vector Calculus

Gradient of a Scalar function, Divergence and Curl of Vector field, Vector Integration –Line-, surface and volume integration - Divergence and Stoke’s Theorem

Oscillations And Waves

Simple Harmonic Oscillation- Motion of simple and compound pendulum –Energy Considerations - Coupled oscillations, approximate solutions, linear and transverse oscillations. Damped Oscillations – Over damped - critical damping –oscillatory damping – Relaxation time & log decrement. Forced oscillation – Electromechanical Analogy between Mechanical Oscillator with Electrical circuit – Mechanical Impedance - Transient and Steady state oscillations – Resonance - Power considerations - Low and high frequency responses – Bandwidth – Quality factor - Sharpness of Resonance

Module -2 [11L]

Interference – Division of wave front and division of amplitude - Two-and Multiple Beam Interference, Interference in parallel and wedge shaped films - Newton’s rings - determination of wave length and thickness - Thin film Interference - Anti-reflection Coating – its application.

Diffraction – Fresnel and Fraunhofer diffraction - Single Slit, Double Slit and N-Slit Diffraction (Qualitative discussion only)

Polarization – Introductory discussion of Polarization – States of Polarization – Brewster’s law –Malus Law – Phase Retardation Plate –Optical Activity

Lasers – Characteristics of Laser – Classification of Laser - construction and working - Einstein’s coefficients – Example of Gas Laser, Solid state laser and semiconductor lasers - Applications of Laser

Module -3 [5L]

Statistical Mechanics

Phase Space (μ - and Γ - phase space) – Macro states and Microstates – Density of States - Statistical Ensemble and Thermodynamic Probability

Classical Statistical systems (Maxwell - Boltzman statistics) and quantum statistical systems (Fermi-Dirac and Bose-Einstein Statistics) and their applications

Module -4 [10L]

Quantum Mechanics

Blackbody Radiation – Stefan-Boltzmann law - Wein's displacement law - Wein's distribution law - Rayleigh-Jeans law - Ultraviolet catastrophe - Planck's Radiation law, Compton Effect, Dual Nature of Matter – De' Broglie hypothesis – Heisenberg's Uncertainty Principle – Group velocity and Phase velocity, Wave function – Postulates of Quantum Mechanics – Quantum Mechanical operator – Eigen function and Eigen value - Schrödinger's time dependent and time independent wave equation – Particle in 1D box – Particle in 3D box – Concept of degeneracy

Module -5[6L]

Dielectric Polarization

Fundamentals of Dielectric polarization – Macroscopic and microscopic field – Electronic, Ionic, Orientational and Space charge polarization (Qualitative overview) - dielectric loss- Loss tangent - Application of dielectric materials

Magnetic Properties

Fundamentals of magnetic properties – Classification (Dia, Para, Ferro, Anti-ferro, Ferri, Superpara) of magnetic materials – Curie temperature – Magnetic domain – Hysteresis – hard and soft magnetic materials – Applications of Magnetic materials

Course Outcomes(COs)

- CO1. Describe how different electronic tools, various parameters & variables of fundamental physics related to the programme. To overcome & eliminate different constraints those may arise by solving the physical and numerical problems.
- CO2. Overall enhancement of innovative problems solving ability by enhancing the power of knowledge and imagination.
- CO3. Describe the current research works and publications of the subjects in different fields adopted by the students as per course curriculum in various journals and literature.
- CO4. Describe how the ideas those are adopted can be implemented through projects and demonstrate various models, recent project proposals to execute the knowledge adopted from the course.
- CO5. Define how the ideas can be share with the multi - disciplinary personals. Lighten on the latest and modern developments in the fields.
- CO6. Explain about ethical awareness and impact in the field of environmental, social and safety of the finished products. Describe the pollution, legal aspects and impacts may arise in large scale production.

Learning Resources

1. Vector Analysis – M.R.Spiegel
2. Waves and Oscillation – N.k.Bajaj
3. Introduction to Classical Mechanics R Takwale, P Puranik, McGraw Hill Education
4. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
5. Optics –A.K.Ghatak McGraw Hill Education India Private Limited
6. Modern Physics for Scientists and Engineers, J. R. Taylor, C.D. Zafiratos and M. A. Dubson, 2nd Ed., Pearson (2007)
7. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
8. Solid State Physics, S.O.Pillai

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|--|---------------------------------------|
| Paper Name: Chemistry-I | Category: Basic Science Course |
| Paper Code: BS-CH-101 / BS-CH-201 | Semester: First / Second |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 42L

Course Objective

- To develop the interest among the students regarding chemistry and their applications in engineering
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.

Module I [11L]

Thermodynamics: (6L)

Preliminary information on First Law of Thermodynamics (Principle, Molar Heat Capacity; Relation of C_p and C_v (for Ideal and Real Gas); Joule's Experiment, Joule-Thompson Coefficient, Throttling, Adiabatic Relationship); Second Law, Engine; Carnot's Cycle; Entropy, Entropy change; Entropy of system/surrounding/Universe; Free Energy, Free energy expression; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations.

Electrochemistry: (2L)

Cell construction; Primary and Secondary Cell; Nernst Equation; Relation with ΔG , ΔH and ΔS ; pH of Cell; Batteries; Fuel Cell

Chemical Kinetics: (3L)

Rate equation; Collision and Activation Theory; Temperature dependency; Complex Reaction; Parallel reaction; Consecutive reaction; Chain Reaction; Homogeneous and Heterogeneous Catalyst; Acid base catalysis; Enzyme Catalysis; Michaelis Menten equation.

Module II [8L]

Atomic structure:(3L)

Preliminary Accounts on Bohr-Sommerfeld model of the atom (Electronic configuration and Quantum numbers; Shapes of s , p , d , f orbitals - Pauli's exclusion principle - Hund's Rule of maximum multiplicity – Aufbau principle). Emission and absorption spectra, line and band spectra; Hydrogen spectrum – Lyman, Balmer, Paschen, Brackett and Pfund series; de-Broglie's hypothesis; Heisenberg's uncertainty principle – wave nature of electron – Schrodinger wave equation (No derivation). Eigenfunctions and eigenvalues.

Chemical bonding and Coordination Chemistry: (5L)

Elementary information on Chemical bonding including VBT, Shapes of molecules with hybridization, Valency shell electron pair repulsion (VSEPR) theory. Molecular orbital of diatomic molecules (e.g. H_2 , O_2 , N_2 , CO , HF , CN^+ , NO^+). Pi-molecular orbital of butadiene and benzene. Crystal field theory of coordination compounds- magnetism, spin and orbital

contribution, quenching of magnetic moment: d-d transitions, color. Metallic bond – concept of conductor, semiconductor, insulator; photoelectric effect.

Module III [7L]

Organic Spectroscopy (7L)

UV-Visible Spectroscopy: Types of electronic transitions, chromophores and auxochromes; Bathochromic and Hypsochromic shifts; intensity of absorptions (Hyper-/Hypochromic effects); application of Woodward's Rules for calculation of λ_{max} for the following systems: conjugated dienes, relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect.

IR Spectroscopy: Introduction; modes of molecular vibrations (fundamental and nonfundamental); IR active molecules.

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance; NMR active molecules; equivalent and non-equivalent protons with examples; chemical shift. Significance of the terms: up-/downfield, shielded and deshielded protons.

Fluorescence, phosphorescence and their application.

Mass Spectroscopy: Introduction; Principles, Ion sources, Fragmentation and analysis of mass spectra.

Module IV [6L]

Polymer (3L)

Molecular weight of Polymers (number average, weight average, viscosity average), Polymerization processes (addition and condensation), Mechanism of addition polymerization (free radical, cationic, anionic, coordination), Poly Dispersity Index (PDI), Degree of Polymerization, Stereo-regularity of polymers (crystallinity and amorphicity). Vulcanization. Conducting, semi-conducting polymers and doping.

Corrosion (3L)

Types of corrosion (dry, wet), Pitting corrosion, Crevice corrosion, Galvanic series, Stress corrosion cracking, Corrosion of polymers. Protection from Corrosion (Surface treatments, Reactive coatings, Anodization, Biofilm coatings) Sacrificial anode protection, Rust removal, Passivation, Water treatment (waste, surface), Alkalinity, Scale-sludge.

Module V [6L]

Stereochemistry (4L)

Different types of isomerism; concept of chirality and optical activity (upto two carbon atoms); elements of symmetry [plane (σ), center (i) and alternating axis (S_n) of symmetry]; interconversion of Fischer and Newman representations; threo and erythro, D and L, CIP Rules: R/S (upto 2 chiral carbon atoms), E/Z nomenclature. Conformational analysis of ethane, *n*-butane.

Structure and reactivity of Organic molecule (2L)

Molecular Effects: Inductive, resonance, hyperconjugation, steric effects. Oxidation and reduction reactions for organic compounds. Some name reactions: Aldol, Cannizzaro, Michael, Claisen-Schmidt, Wittig reactions.

Module VI [4L]

Elementary Chemical Biology:

Origin of Life and Chemical Elements; Role of concentration of ions/small molecules in the growth profile of cells; Trace and Ultratrace elements; Basic Biomolecules, Elementary reactions in the biological system and roles of metal ions. Function of Fe (with special reference to Hemoglobin and Myoglobin) and Cu (with special reference to Hemocyanin) in Biological system. Toxicity of Hg, As, Pb, F, P(V). Synthesis of some commonly used drug molecules (Aspirin, Paracetamol, Salbutamol and Ibuprofen). Synthesis of some commonly used Pesticides and Insecticides in Agriculture: DDT, Dieldrin/Lindane (organochlorine group), Parathion (organophosphate group) and Carbaryl (carbamate group).

Course Outcomes(COs)

- CO1. To memorize the elementary topics of chemistry such as chemical thermodynamics, atomic structures, electromagnetic spectroscopy, corrosion chemistry, electrochemistry, organic reactions and synthesis of drug molecules.
- CO2. To acquire knowledge on the fundamental concepts of chemical thermodynamics, atomic structures, electromagnetic spectroscopy, corrosion chemistry, electrochemistry, organic reactions, polymers and synthesis of drug molecules.
- CO3. Making use of concepts of drug molecules, polymer chemistry, corrosion chemistry and battery technology to meet day to day necessities including application of the organic synthesis, Maxwell's equations, spontaneity and equilibrium reactions etc.
- CO4. analyse versatile and novel problems and sorting them out, covering all the topics of the entire course.
- CO5. rationalize, explain and corroborate several chemical problems, determine the most plausible approach of solving real life interdisciplinary chemical complications.
- CO6. To construct a purposeful and efficient model through which learners can be able to develop and solve trivial as well as up to date problems recognized by academia, researchers and industries.

Learning Resources

1. P.C.Rakshit, , Physical Chemistry Sarat Book House
2. S. Pahari, , Physical Chemistry New Central Book Agency
3. P. W. Atkins, & Paula, J. de Atkins', Physical Chemistry, Oxford University Press
4. J. D. Lee, Concise Inorganic Chemistry, 5th Ed., Wiley India Pvt. Ltd.
5. F.A. Cotton, G. Wilkinson, and P.L. Gaus, Basic Inorganic Chemistry 3rd Ed.; Wiley India.
6. J. E. Huheey, E. A. Keiter, & R. L. Keiter, Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed., Harper Collins 1993, Pearson, 2006.

7. J. Clayden, N. Greeves, S. Warren, Organic Chemistry, Second edition, Oxford University Press.
8. S. Sen Gupta, Reaction Mechanisms in Organic Chemistry, Oxford University Press
9. L. Finar, Organic Chemistry (Volume 1) Pearson Education.
10. R. N. Morrison, & R. N. Boyd, Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
11. D. Nasipuri, Stereochemistry of Organic Compounds, Wiley Eastern Limited.
12. E. L. Eliel, & S. H. Wilen, Stereochemistry of Organic Compounds, Wiley: London, 1994.
13. B. K. Sharma, Industrial Chemistry (including Chemical Engineering), GOEL Publishing House

| | |
|--|---|
| Paper Name: Programming for Problem Solving | Category: Engineering Science Course |
| Paper Code: ES-CS-101/ES-CS -201 | Semester: First / Second |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 40L

Course Objectives

- To introduce to students to the field of programming using language.
- To enhance their analyzing and problem solving skills .

Module 1 [12L]

Unit 1: Introduction to Programming (4 L)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Unit 2: Arithmetic expressions and precedence (2 L)

Unit 3: Conditional Branching and Loops (6 L)

Writing and evaluation of conditionals and consequent branching

Iteration and loops

Module 2 [12L]

Unit 1: Arrays (6 L)

Arrays (1-D, 2-D), Character arrays and Strings

Unit 2: Basic Algorithms (6 L)

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 3 [9L]

Unit 1: Function (5 L)

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Unit 2: Recursion (4 L)

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module 4 [7 L]

Unit 1: Structure (4 L)

Structures, Defining structures and Array of Structures

Unit 2: Pointers (2 L)

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list, dynamic memory allocation, Union (no implementation)

Unit 3: File handling (1 L)

Basic idea about read, write, append operation if time is available, otherwise should be done as part of the lab)

Course Outcomes (COs)

- CO1. To formulate simple algorithms for arithmetic and logical problems.
- CO2. To test and execute the programs and correct syntax and logical errors.
- CO3. To implement conditional branching, iteration and recursion.
- CO4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach. To use arrays, pointers and structures to formulate algorithms and programs.
- CO5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- CO6. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

Learning Resources

1. R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

| | |
|---|--|
| Paper Name: Basic Electrical and Electronics Engineering | Category: Engineering Science Courses |
| Paper Code: ES-EE101 / ES-EE201 | Semester: First / Second |
| L-T-P: 3-1-0 | Credit: 4 |

Total Lecture: 45L

Course Objectives

- To understand the impact of technology in a global and societal context.
- To Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.

Module 1 [3L]

Electromagnetism:

Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faradays' law, self and mutual inductance, Hysteretic and Eddy current losses, Self and Mutual inductance, B-H loop, Hysteresis and Eddy current loss

Module 2 [10L]

Circuits Analysis

DC Network Theorem: Definition of electric circuit, network, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit. Kirchhoff's law. nodal analysis, mesh analysis. Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, AC fundamental: Production of alternating voltage, waveforms, average and RMS values, peak factor, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behavior of AC series circuits, power factor, power in AC circuit.

Module 3 [6L]

Transformers

Single phase transformer: Core and shell type construction, ideal and practical transformer, EMF equation, no load and on load, operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation, Auto-transformer.

Module 4 [10L]

Electrical Machines

DC Machine :Construction, working, torque speed characteristic and speed control of separately excited dc motor.

AC Machine: Construction, Generation of rotating magnetic fields and working of a three-phase induction motor, Torque-slip characteristic, Brief idea about Single Phase Induction Motor and Synchronous generators

Module 6 [8L]

Transistors

Transistor Biasing and Bias stability: calculation of stability factor with variation of I_{co} Different operating modes; CE, CB, CC and their properties; small signal low frequency operation of transistors; equivalent circuits h parameters as a two port network. Transistors as amplifier:

expression of voltage gain, current gain, input impedance and output impedance, frequency response for CE amplifier with and without source impedance(qualitative)

Module 7 [5L]

Field Effect Transistor

Construction and characteristics of JFET (N channel only), Transfer characteristics; construction and characteristics of MOSFET (N channel only), depletion and enhancement type; CS, CG, CD configuration

Module 8 [3L]

Operational Amplifier

Concept of virtual earth, inverting and non-inverting mode of operation, voltage summing, difference, constant gain multiplier, voltage follower, comparator, integrator, differentiator.

Course Outcomes(COs)

- CO1. To acquire knowledge of different theorems for electric and magnetic circuits analysis. Explain the working principle, construction, applications of Transformer, DC machines, AC machines. Concept of 3 phase power, JFET, MOSFET, OPAMP, sinusoidal voltages and currents in different machines and circuits. Explain fundamental laws and theorems governing the working different electrical machines and circuits. Able to identify the procedures for calculations of different circuit parameters.
- CO2. Use the concepts of applying mathematics and science principles, trigonometry, complex algebra, phasor operations to provide solution of different simple problems; critical circuit problems related to electrical systems.
- CO3. Analyze series circuits, flow of currents, algebraic sum of voltages (voltage drops) in any closed path in a circuit to examine the behavior of electric circuits and performance characteristics and efficiency of electrical machines.
- CO4. Evaluate and judge whether the solutions obtained are correct and matches the required parameters and characteristics.
- CO5. Use the knowledge acquired to investigate unknown problems and design and assemble to find a solution to the problem.

Learning Resources

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
3. Basic Electrical Engineering, Nath & Chakraborti
4. Electrical Technology, Vol-I, Vol-II, Surinder Pal Bali, Pearson Publication
5. A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
6. Electrical Engineering Fundamentals, Vincent Del Toro, Prentice-Hall
7. Advance Electrical Technology, H.Cotton, Reem Publication
8. Basic Electrical Engineering, R.A. Natarajan, P.R. Babu, Sictech Publishers
9. Basic Electrical Engineering, N.K. Mondal, Dhanpat Rai

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|---|---|
| Paper Name: English Language and Technical Communication | Category: Humanities and Social Sciences including Management course |
| Paper Code: HM-HU 101/HM-HU201 | Semester: First / Second |
| L-T-P: 2-0-0 | Credit: 2 |

Total Lecture: 32L

Course Objectives

- To acquire language skills,
- to develop linguistic and communicative competencies for Engineering students.
- to study academic subjects more effectively using the theoretical and practical components of English syllabus, and hence will develop study skills and communication skills in formal and informal situations.

Module 1: Theories of Communication [6L]

Theories and Principles of Communication: Definition, Process, Model (Schematic diagram of Shannon and Weaver's Model of Communication), Types of Communication – Verbal and Non-verbal communication, Flows of communication

Barriers to communication

Workplace/ Business Communication which can have the following items:

- a) Scope of Oral Communication
- b) Oral Business Communication: Introducing oneself in a professional setup - brevity, context, understatement, body language –
Task: Introducing others - introducing a junior professional to a senior professional, introducing an employee to a customer, introducing a colleague from your firm to an employee of another firm.
- c) Telephone (audio and video) communication: choice of words, body language, paralinguistic elements of speech, enunciation, brevity, clarification, effective closure

Module 2 : Applied Grammar [9L]

Common Errors in English

- Subject-verb agreement
- Tenses
- Noun-pronoun agreement
- Articles and Prepositions
- Misplaced or dangling modifiers
- Redundancies
- Cliché

Transformation of Sentences

- Active and Passive voice
- Direct and Indirect speech
- Degrees of Comparison

Use of phrases and clauses in sentences

Synthesis of Sentences: Simple, Complex and Compound

Module 3 Vocabulary Building [3L]

The concept of word formation: Compounding, Backformation, Clipping and Blending

Root words from foreign languages and their use in English

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

Synonym, antonym, phrasal verbs, one word substitution and standard abbreviation

Module 4 Basic Writing Skills_ [4L]

Documenting: definition, meaning, basic concept of documenting (print and online media), types of technical documents

Importance of proper punctuation

Creating coherence: Arranging paragraphs & Sentences in logical order

Creating Cohesion: Organizing principles of paragraphs in documents

Techniques for writing precisely

Module 5 Professional Writing Skills [10L]

Technical Report Writing: Types and formats

Comprehension, Précis and Expansion Writing, Essay Writing, Writing SOPs and Project Proposals.

Business Letters; Cover letter & CV

Office Correspondence:

- Notice
- Agenda
- Minutes
- Memo
- E-mail

Course Outcomes(COs)

CO1. Understanding the mechanism of interpretation through language learning by practicing reading, writing and comprehension skills.

CO2. Understanding complex engineering problems by a sound grammatically correct knowledge of the English Language & honing writing, and reading skills for software research, solutions, marketing etc.

CO3. Equipping learners to solve various problems related to aptitude test through the practice of various Verbal reasoning and grammar practice.

CO4. Development of analytical thinking through practice of analytical essays, business correspondence.

CO5. Learning effective communication strategies for handling criticism and adverse remarks and also knowing strategies of effective intervention, kinesics and courtesies and different components of soft skills.

CO6. Awareness about the society, public health and safety, growth and changes in society, culture and environment through comprehension, technical report writing practice.

Learning Resources

1. Connect: A Course in Communicative English by Debashis Bandyopadhyay and Malathy Krishnan. Cambridge University Press. 2018.
2. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2015.
3. Communication Skills for Professionals. Nira Konar, Prentice Hall of India 2nd edition, New Delhi, 2011
4. High School English Grammar by Wren and Martin
5. Common Errors in English by S.Prasad & K.P.Thakur, Bharti Bhhawan Publishers
6. Business Correspondence and Report Writing – R.C. Sharma and Krishna Mohon, Tata McGraw-Hill Publishing company Ltd., New Delhi
7. English Vocabulary in Use- McCarthy
8. Communicative English – E. Sureshkumar and P. Sreehari – Orient Blackswan , 2007
9. Speaking Effectively, Developing Speaking Skills for Business English, Jeremy Comfort- Cambridge University Press, 1994
10. Practical English Usage. Michael Swan. OUP. 1995.
11. Remedial English Grammar. F.T. Wood. Macmillan. 2007
12. A Practical English Grammar – A.J. Thomson, A.V. Martinet – Oxford University Press
13. Guide to writing as an Engineer, John Willey - David F.Beer and David McMurrey,. New York, 2004

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|--|---------------------------------------|
| Paper Name: Physics Labotary –I | Category: Basic Science Course |
| Paper Code: (BS-PH-191 & BS-PH-291) | Semester: First / Second |
| L-T-P: 0-0-3 | Credit: 1.5 |

Periods: 36P

Course Objectives

- To provide exposure to the students with hand on experience for data acquisition, precession, statistical data analysis, graph plotting calculation of fundamental quantities and error estimation of different fundamental physics experiments relevant to various engineering discipline.

All students have to perform total 9 experiments taking at least one from Optics, Electricity & Magnetism, Quantum Mechanics, Miscellaneous experiments and Innovative experiment sections. (One Innovative experiment is mandatory)

List of Experiments

Optics Experiments

1. Determination of dispersive power of the material of a prism
2. Determination of wavelength of a monochromatic light by Newton's ring
3. Determination of wavelength of a monochromatic light by Fresnel's bi-prism
4. Determination of wavelength of the given laser source by diffraction method
5. Determination of numerical aperture, angle of acceptance and bending energy losses of an optical fiber

Electricity & Magnetism Experiments

1. Determination of thermo electric power of a given thermocouple.
2. Determination of specific charge (e/m) of electron by J.J. Thompson's method.
3. Determination of dielectric constant of a given dielectric material.
4. Determination of Hall coefficient of a semiconductor by four probe method.
5. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
6. Determination of unknown resistance using Carey Foster's bridge
7. Study of Transient Response in LR, RC and LCR circuits using Exp EYES
8. Generating sound from electrical energy using Exp EYES

Quantum Physics Experiments

1. Determination of Stefan-Boltzmann constant.
2. Determination of Planck constant using photocell.
3. Determination of Lande-g factor using Electron spin resonance spectrometer.
4. Determination of Rydberg constant by studying Hydrogen spectrum.
5. Determination of Band gap of semiconductor.
6. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.

Miscellaneous Experiments

1. Determination of Young's modulus of elasticity of the material of a bar by the method of flexure
2. Determination of bending moment and shear force of a rectangular beam of uniform cross-section
3. Determination of modulus of rigidity of the material of a rod by static method
4. Determination of rigidity modulus of the material of a wire by dynamic method
5. To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire
6. Determination of coefficient of viscosity by Poiseuille's capillary flow method
7. Measurement of wavelength and velocity of Ultrasonic wave by using Ultrasonic Interferometer.

Innovative Experiments

1. Studies on Bandgap measurement of thin film using UV-VIS spectrophotometer.
2. Basic UV-VIS absorbance study of organic dyes.
3. Basic UV-VIS study of nano-particles (NPs) and quantum dots (Q Dots).
4. Basic photoluminescence study of organic dyes.
5. Basic photoluminescence study of nano-particles (NPs) and quantum dots (Q Dots).
6. Studies on Basics of Vacuum system and Vacuum measurements.

Course Outcomes (COs)

- CO1. Describe the various aspects, parameters, scales of experimental tools and design to conduct the experiments in the laboratory.
- CO2. Analyze the methods of experiments and interpret the output results. Emphasis on the limitations of theoretical concepts, measuring instruments to perform the experiments and deviation of results from ideal one.
- CO3. Describe the needs of publication of the outcome results and correlate the results with published papers in various journals and literature in the respective fields.
- CO4. Describe how the ideas those are adopted can be implemented through projects and demonstrate various models, recent project proposals to execute the knowledge adopted from the course.
- CO5. Define how the ideas can be share with the multi - disciplinary personals. Lighten on the latest and modern developments in the fields.
- CO6. Explain about ethical awareness and impact in the field of environmental, social and safety of the finished products. Describe the pollution, legal aspects and impacts may arise in large scale production.

Learning Resources

1. B.Sc. Practical Physics – C.L.Arora
2. B.Sc. Practical Physics – Harnam Singh and Dr. P.S.Hemne – S.Chand

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|--|---------------------------------------|
| Paper Name: Chemistry Laboratory –I | Category: Basic Science Course |
| Paper Code: (BS-CH-191 & BS-CH-291) | Semester: First / Second |
| L-T-P: 0-0-3 | Credit: 1.5 |

Periods: 36P

Course Objective

- To be able to design, carry out, record and analyze the results of chemical experiments.
- To demonstrate creative and independent thinking in both learning and work environments.
- To be able to use modern instrumentation and classical techniques, to design experiments and to properly record the results of their experiments.

Name of the Experiments

1. Preparation of Phenyl and Hand Sanitizer owing to its disinfectant and germicidal values.
2. Determination of the partition coefficient of a substance between two immiscible liquids.
3. Complexometric titration for determination of calcium and magnesium hardness of water.
4. Conductometric and pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.

5. Determination of dissolved oxygen present in a given water sample.
6. Determination of chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
7. Determination of percentage composition of sugar solution by viscosity measurement method.
8. Saponification/acid value of oil.
9. Preparation of some useful organic compounds: Pthalimide, Aspirin
10. Study on Thin layer chromatography
11. Preparation of some useful polymer: PF resin, MF resin.

Course Outcomes(COs)

- CO1. To be able to design, carry out, record and analyze the results of chemical experiments. Students will demonstrate laboratory skills and show understanding in all major laboratory techniques and principles including instrumentation, synthesis, purification, analysis including green chemistry.
- CO2. To be skilled in problem solving, critical thinking and analytical reasoning. To operate a range of chemical instrumentation with adequate hands-on experiences.
- CO3. To be able to use modern instrumentation and classical techniques, to design experiments and to properly record the results of their experiments.
- CO4. To be able to use appropriate literature research and go through journal articles for useful information. Students will show proficiency at scientific communication including posters, presentations, laboratory reports and even journal articles.
- CO5. To demonstrate creative and independent thinking in both learning and work environments. Work independently and collaborate effectively with other people in a team. Self-evaluate their own learning progress and develop motivation and learning skills for lifelong learning.
- CO6. To learn the value of a professional work ethic including working as part of a diverse team. They will develop the ability to recognize ethical issues related to the impact of technological advances on society.

Learning Resources

1. A. I. Vogel, Elementary Practical Organic Chemistry, Part 2: Qualitative Organic Analysis, CBS Publishers and Distributors.
2. A. K. Nad, B. Mahapatra, A. Ghoshal, An Advanced Course in Practical Chemistry, New Central Book Agency; 3rd edition.
2. University Hand Book of Undergraduate Chemistry Experiments, edited by Mukherjee, G. N. University of Calcutta, 2003.
3. Furniss, B.S., Hannaford, A.J., Smith, P.W.G., Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012).
4. H. T. Clarke, A Handbook of Organic Analysis (Qualitative and Quantitative), Fourth Edition, CBS Publishers and Distributors (2007).
5. Practical Workbook Chemistry (Honours), UGBS, Chemistry, University of Calcutta, 2015.

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|--|---|
| Paper Name: Programming for Problem Solving | Category: Engineering Science Course |
| Paper Code: ES-CS-191/ES-CS -291 | Semester: First / Second |
| L-T-P: 0-0-3 | Credit:1.5 |

Periods: 36P

Course Objectives

- To formulate and test simple algorithms for arithmetic and logical problems, execute the programs and correct syntax and logical errors for implementing conditional branching, iteration and recursion.

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

Course Outcomes(COs)

- CO1. To formulate simple algorithms for arithmetic and logical problems.
To translate the algorithms to programs (in C language).
- CO2. To test and execute the programs and correct syntax and logical errors.
To implement conditional branching, iteration and recursion.

- CO3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- CO4. To use arrays, pointers and structures to formulate algorithms and programs.
- CO5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- CO6. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

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| Paper Name: Basic Electrical and Electronics Engineering Laboratory | Category: Engineering Science Course |
| Paper Code: ES-EE191 / ES-EE291 | Semester: First / Second |
| L-T-P: 0-0-3 | Credit: 1.5 |

Periods: 36P

Course Objectives

- Analyse fundamental theoretical concept, laws and theorems of Basic Electrical Engineering-I through experimental set up.

Choose 10 experiments from the following:

1. First activity: Introduction to basic safety precautions .
2. Introduction and uses of Voltmeter , ammeter , Wattmeter and Auto-transformer .
3. Introduction and uses of components of LT switchgear (MCB and different types of fuses .
4. Introduction and uses of following instruments :
5. Multimeter (b) Oscilloscope and c) Function Generator .Demonstration of real life resistors, capacitors, inductors with color code .
6. Calibration of ammeter and Wattmeter.
7. Observation of voltage phase differences of R-L and R-C seriescircuit when a pure sinusoidal supply is applied across it.
8. Open circuit and short circuit test of a single-phase transformer.
9. Connection and measurement of power consumption of a fluorescent lamp.
10. Voltage-current characteristic of incandescent lamps.
11. Measurement of power in a three phase unbalanced circuit by two wattmeter
12. method.
13. Determination of Torque –Speed characteristics of separately excited DC motor.
14. Determination of Torque speed characteristics and observation of direction
15. reversal by change of phase sequence of connection of Induction motor.
16. Verification of Thevenin’s Theorem .
17. Verification of Norton’s Theorem .
18. Verification of Superposition Theorem.
19. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Integrators and Differentiators.

Course Outcomes (COs)

- CO1. Identify and use of various electrical measuring devices.

- CO2. Practice different types of wiring and devices connections keeping in mind technical and economical safety issues.
- CO3. Evaluate and judge whether the solutions obtained are correct and matches the required parameters and characteristics.
- CO4. Familiarize with different active and passive electronic and electrical components, Trainer Kit, Function Generator, CRO and different measuring equipments and apply network theorems on DC and AC networks and Choose the proper type and specification of measuring procedure and measuring instruments for different industrial/commercial/domestic applications.
- CO5. Examine various real life situations in domestic or industrial scenario where measurements of electronics and electrical quantities are essential without measuring equipments i.e. alternate process of identification and characterization of components and build up the ability to work in a team to complete the task within a fixed time limit and proper resource utilization taking different responsibility with fully cooperation with other team mates

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| Paper Name: Workshop Practice | Category: Engineering Science Course |
| Paper Code: ES-ME191 / ES-ME291 | Semester: First / Second |
| L-T-P: 1-0-3 | Credit: 2.5 |

Periods: 39P

Course Objectives

- To gain significance of scaling pertinent to engineering drawing problems. The incumbents should also have knowledge about analytical curves and their relevance to understand different higher level mechanical engineering problems
- To represent pictorially different elements and components using basic engineering drawing guidelines.

[Before practice, background lectures will be delivered on the topics. Tool specifications and their materials will be described. Brief reports on the work done will be submitted by the students and evaluation will be made on the basis of examination of the report and viva, conducted by the teachers.]

Theory

1. Carpentry (Wood Working)

Timber, Seasoning and Preservation, Plywood and Plyboards, Carpentry Tools, Engineering applications. Different Joints

2. Metal Joining

Definitions of welding, brazing and soldering processes, and their applications. Oxy-acetylene gas welding process, equipment and techniques. Types of flames and their applications. Manual metal arc welding technique and equipment. AC and DC welding, electrodes, constituents and

functions of electrodes. Welding positions. Types of weld joint. Common welding defects such as cracks, slag inclusion and porosity.

3. Bench work and Fitting

Tools for laying out, chisels, files, hammers, hand hacksaw, their specifications and uses.

4. Metal Cutting

Introduction to machining and common machining operations. Cutting tool materials, geometry of cutting tool, cutting fluid. Definition of machine tools, specification and block diagram of lathe, shaper, milling, drilling machine and grinder. Common lathe operations such as turning, facing and chamfering and parting. Difference between drilling and boring. Use of measuring instruments like micrometer / vernier caliper.

5. Tin Smithy

Sheet metal introduction, tools and operations, Shearing and Bending of sheets, types of joints

Jobs to be made in the Workshop

Group A (6 P)

Carpentry Shop: T-Lap joints and Dovetail joint

Group B (6 P)

- a. Gas Welding practice on mild steel flat/sheet (upto 3mm thick)
- b. Lap joint by Gas Welding (upto 3mm thick)
- c. Manual Metal Arc Welding practice (upto 5mm thick)
- d. Square butt joint by MMA Welding
- e. Lap joint by MMA Welding

Group C

Fittings work: Sawing and Finishing by Filing. (6 P)

Group D

- a. Jobs on lathe with turning, facing, chamfering and parting operations (6 P)
- b. Job on shaper and milling machine for finishing two sides of a job (6 P)
- c. Drilling of holes of size 5 and 12 mm diameters on the jobs / External threads making by dies, Tap size drill hole/ hand tapping operations

Group E

Smithy - making simple products on sheet metal (6 P)

Course Outcomes (COs)

- CO1. To represent pictorially different elements and components using basic engineering drawing guidelines.

- CO2. To gain significance of scaling pertinent to engineering drawing problems. The incumbents should also have knowledge about analytical curves and their relevance to understand different higher level mechanical engineering problems.
- CO3. To understand the concept of projections for 1D, 2D and 3D object representation.
- CO4. To develop an idea and ability to view complex interior sections of a solid object, and they will also be able to analyze and explain how different surfaces are generated when a solid object is cut along a plane and its surfaces are stretched out.
- CO5. To draw isometric to orthographic views and vice versa.
- CO6. To apply the comprehensive knowledge by using a suitable computer aided drafting package.

Learning Resources

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, “Manufacturing Technology – I” Pearson Education, 2008.
4. Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
5. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

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|---|---|
| Paper Name: Engineering Graphics | Category: Engineering Science Course |
| Paper Code: ES-ME191 / ES-ME291 | Semester: First / Second |
| L-T-P: 1-0-3 | Credit: 1.5 |

Periods: 42P

Course Objectives

- To teach students to communicate using **graphic** techniques.
- To accomplish this the student must learn the principals and standards of mechanical **drawing** and dimensioning.

[Sessional work should be completed in the class. Problems sheet will be provided. Students should attempt to solve the problems given in the Problem Sheet. Home assignments will be given. Evaluation will be made on the basis of sessional work and viva-voce examination.]

Scales (3P)

Plain scales, Diagonal scales, Vernier scales

Geometrical Construction and Curves (3P)

Conic Section: Parabola, Hyperbola, Ellipse

Projection of Points, Lines, Surfaces (9P)

Orthographic Projection – First angle and third angle projection More no. of problems should be practiced in first angle projection. Projection of lines inclined to the planes Projection of surfaces
Pentagon, Hexagon

Projection of Solids (12P)

Cube, Pyramid, Prism, Cylinder, Cone, Frustums

Isometric View And Isometric Projection (6 P)

(Prism, Pyramid, Cylinder, Cone and examples of simple solid objects / models).

Sectional Views of Solids, True Shape of a Section (6 P)

Development of Surfaces (3 P)

(Cube, Prism, Cylinder, Truncated Cone)

Course Outcomes (COs)

- CO1. Define, describe and determine the types and nature of the physical parameters like cutting speed, feed, depth of cut etc applied on mechanical manufacturing systems.
- CO2. Classify and explain the effects of the above physical parameters as applied on mechanical manufacturing systems for proper comprehension.
- CO3. Train the students in metal joining process like welding, soldering, etc
- CO4. Impart skill in fabricating simple components using sheet metal
- CO5. Cultivate safety aspects in handling of tools and equipment
- CO6. Develop the collective skill and potentiality and leadership quality to work in a group or team.

Learning Resources

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kanniah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals

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| Paper Name: Language Laboratory | Category: Humanities and Social Sciences including Management |
| Paper Code: HM-HU 191/ HM-HU291 | Semester: First / Second |
| L-T-P: 0-0-2 | Credit: 1 |

Periods: 22P

Course Objectives

- To provide advanced skills of Technical Communication in English through various activities performed in the Language Lab Practice Sessions to 1st Semester U.G. students of Engineering and Technology.
- To instil confidence in them so that they can competently communicate in English language in all spheres.
- To make them efficient enough to communicate about day-to day events and experiences of life, comprehend lectures delivered in English, read and understand relevant materials written in English and also to write grammatically correct English.
- To make them capable of shedding their fear of communication and public speaking.

List of Experiments

1. Developing active ‘Listening Skill’ and its sub skills through Language Lab Audio device; (Listening to conversations, passages, stories, news bulletin, speeches by famous personalities – Listening for general and specific information etc.,) (3P)
2. Developing ‘Speaking Skill’ and its sub skills; (Interpersonal Communication, Oral Presentations — Debate –Extempore – Speech Presentation– Conversational Practice – Face to Face / Telephonic Conversation) (5P)
3. Developing ‘Reading Skills’ and its sub skills through reading excerpts from plays, poetry, news and various technical/non technical passages using Visual / Graphics/Diagrams /Chart Display etc. and using Literary text(s):
The Homecoming by Rabindranath Tagore
We’re Not Afraid to Die... if We’re Together by Gordon Cook and Alan East(4P)
4. Developing ‘Writing Skill’ and its sub skills by using Language Lab Audio –Visual input; Practice Sessions (Analytical essay writing, dialogue writing, story writing, etc.) (3P)
5. Pronunciation: Basic Rules (with emphasis on Accent Neutralisation)
Organs of Speech (2P)
6. Introducing ‘Group Discussion’ through audio –Visual input and acquainting them with key strategies for success; GD practice sessions (unstructured and structured) (4P)
7. SWOT analysis (1P)

Learning Resources

1. Nira Konar: English Language Laboratories, A Comprehensive Manual, PHI Learning Pvt. Ltd.
2. Dr. D. Sudharani: Manual for English Language Laboratory. Pearson Education (WB edition),2010
3. Board of Editors: Contemporary Communicative English for Technical Communication, Pearson Longman, 2010
4. A Textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan India Ltd.
5. Communicative English – E. Sureshkumar and P. Sreehari – Orient Blackswan , 2007
6. Speaking Effectively, Developing Speaking Skills for Business English, Jeremy Comfort- Cambridge University Press , 1994
7. Pocket Style Manual - Diane Hacker, Bedford Publication, New York, 2003. (ISBN 0312406843)

Course Outcome (COs)

- CO1. Improving comprehension ability in English & understanding the mechanism of interpretation through language learning.
- CO2. Honing conversation skills by learning to substantiate conclusions in grammatically correct English
- CO3. Honing ‘Reading Skills’ and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension for technical competence.
- CO4. Learning effective, real life communication skills in English through several language lab activities pertaining to the four basic skills of LSRW
- CO5. Learning basic soft skills and leadership qualities
- CO6. Engaging the learner in a positive and imaginative environment to hone socio-cultural, ethical and moral skills.

| | |
|------------------------|--|
| Paper Name: NSS | Category: Universal Human Value |
| Paper Code: | Semester: First / Second |
| L-T-P: 0-0-2 | Credit: 0 |

Periods: 24P

Course Objectives

- To create awareness for women’s education, old age education saving of girl child. Medical issue-blood donation and Thalassemia test.
- To realize, synthesize, and evaluate their personal readiness for leadership by group work, communicating effectively and to overcome & eliminate different constraints those may arise in their academic and daily life.

1. Creating Awareness in Social Issues

Blood Donation Camp, Road Safety Awareness, Poster Competition (Saving of Girl child, saving of water and fuel for future, Pollution and control, Global warming, Equal education for girls), Thalassemia awareness Programme, Eye Check-Up Camp.

2. Participating in Mass-Education Programme

- a. Poster Presentation on Education for All
- b. Elocution competition, SA writing on education for all
- c. National Education Day celebration (11th Nov)

3. Proposal for Local Slum Area Development

- a. Road and Coastal Side Cleaning Programme
- b. Local Hospital Area Cleaning Programme (with collaboration Haldia Municipality)
- c. Campus Cleaning Programme

4. Environmental Awareness Programme

- a. Resource Conversation (By Poster Competition)
 - i. Water
 - ii. Energy
- b. Poster Competition on Global warming
- c. Plantation Programme (5th September)
- d. Fire Safety Awareness Programme (With Haldia Fire Station)

5. Relief and Rehabilitation work during Natural Calamities

Course Outcomes (COs)

- CO1. To Create awareness for women's education, old age education saving of girl child. Medical issue-blood donation and Thalassaemia test.
- CO2. To Realize, synthesize, and evaluate their personal readiness for leadership by group work, communicating effectively and to overcome & eliminate different constraints those may arise in their academic and daily life.
- CO3. To Define and correlate different kind of social, cultural and ethical issue in light of saving of girl child, women education, saving of fuel. Manifest an ethics and service to the nation as a fundamental duty by organizing seminar symposia, work shop, essay writing, poster presentation etc.
- CO4. To Apply problem solving skills by taking on volunteer and community service in their professional and social life and show interest to think about eco-friendly projects for the betterment of the society.
- CO5. To Recognize the importance of civic engagement and community activism through volunteerism, community and campus service, team projects.
- CO6. To Realizing his/her importance and duty, feel interest about ethical awareness and impact in the field of environmental, social and safety of the finished products.

Annexure-I

Mandatory Additional Requirement (MAR) for earning B. Tech Degree

The additional requirement of MAR points applies to - every student, who is admitted to the 4 years B.Tech program under Autonomy, as per following:

| Level of Entry in B.Tech Course | Total duration for earning Points | Minimum Points |
|---|---|----------------|
| 1 st Year from the academic year 2020-21 onwards | 1 st to 4 th Year | 100 |
| 2 nd Year from the academic year 2020-21 onwards (Lateral Entry) | 2 nd to 4 th Year | 75 |

These points must be earned on the basis of active participation in co-curricular and extracurricular activities spanning through all the semesters of study. Every student may choose, as per his/her liking, activities in order to achieve the mandatory points (as per Table- I, depending on his/her entry level), before becoming eligible for award of the Degree. These activities can be spread over the years, as per convenience of the student.

Notes:

- Every student shall participate in the co-curricular and extra-curricular activities and produce documentary proof to the designated Faculty Members appointed by the Head of Department / Principal / Director in the respective college. Thereby the student should earn the required Points before *her* she appears for his/ her Final Examinations.
- A student's result of his/her Final Examinations will be withheld until he/she completes the minimum Activity Points by the end of his/her B.Tech Program.
- In every semester, every student is required to prepare a file containing documentary proofs of activities, done by him / her. This file will be duly verified and Activity Points will be assigned by the teachers as appointed above, at the end of every semester.
- The college will form a 3 members committee and finalize the Activity Points for each student before entering them into the Online Point Entry System of the Institute
- Every student has to earn at least 100 / 75 (for lateral) activity points. The points students has earned will be reflected in the student's mark sheet.
- Activity points earned by Lateral Entry students will be multiplied by 1.33.

Table I provides a List of Activity Heads and Sub-Activity Heads along with their capping of the Activity Points that can be earned by the students during the entire B.Tech duration.

| Sl. No. | Name of the Activity | Points | Maximum Points Allowed |
|---------|--|--------|------------------------|
| 1. | MOOCS (SWAYAM/NPTEL/Spoken Tutorial) (per course) | 20 | 40 |
| 2. | Tech Fest/Teachers Day/Freshers Welcome | | |
| | Organizer | 5 | 10 |
| | Participants | 3 | 6 |
| 5. | Rural Reporting | 5 | 10 |
| 6. | Tree Plantation (per tree) | 1 | 10 |
| 7. | Participation in Relief Camps | 20 | 40 |
| 8. | Participation in Debate/Group Discussion/ Tech quiz | 10 | 20 |
| 9. | Publication of Wall magazine in institutional level (magazine/article/internet) | 10 | 20 |
| 10. | Publication in News Paper, Magazine & Blogs | 10 | 20 |
| 11. | Research Publication (per publication) | 15 | 30 |
| 12. | Innovative Projects (other than course curriculum) | 30 | 60 |
| 13. | Blood donation | 8 | 16 |
| | Blood donation camp Organization | 10 | 20 |
| 15. | Participation in Sports/Games | | |
| | College level | 5 | 10 |
| | University Level | 10 | 20 |
| | District Level | 12 | 24 |
| | State Level | 15 | 30 |
| | National/International Level | 20 | 20 |
| 21. | Cultural Programme (Dance, Drama, Elocution, Music etc.) | 10 | 20 |
| 22. | Member of Professional Society | 10 | 20 |
| 23. | Student Chapter | 10 | 20 |
| 24. | Relevant Industry Visit & Report | 10 | 20 |
| 25. | Photography activities in different Club(Photography club, Cine Club, Gitisansad) | 5 | 10 |
| 26. | Participation in Yoga Camp (Certificate to be submitted) | 5 | 10 |
| 27. | Self-Entrepreneurship Programme | 20 | 20 |
| 28. | Adventure Sports with Certification | 10 | 20 |
| 29. | Training to under privileged/Physically challenged | 15 | 30 |
| 30. | Community Service & Allied Activities | 10 | 20 |

Annexure- II

MOOCS list for B.Tech (Hons) 1st Yr

(Credit based courses are only opt by students from this bucket, which may change time to time as on the basis of availability of online courses)

| Module | Course | Provider | Duration (Weeks) | Credits |
|--|--|-----------------|-------------------------|----------------|
| Ethics | Ethics in Engineering Practice | NPTEL | 8 | 2 |
| | Ethics and Law in Data and Analytics | edX | 6 | 2 |
| | A Life of Happiness and Fulfilment | Coursera | 6 | 2 |
| | Introduction to Philosophy | Coursera | 5 | 2 |
| | Ethical Leadership Through Giving Voice | Coursera | 4 | 1 |
| Soft Skills | Enhancing Soft Skills and Personality | NPTEL | 8 | 2 |
| | Soft Skill Development | NPTEL | 8 | 2 |
| | Psychology at Work | Coursera | 6 | 2 |
| | Communication in the 21st Century Workplace | Coursera | 4 | 1 |
| | Successful Career Development | Coursera | 7 | 2 |
| | Working in Teams: A Practical Guide | edX | 4 | 1 |
| | Communication theory: bridging academia and practice | Coursera | 9 | 3 |
| | Write Professional Emails in English | Coursera | 5 | 2 |
| | Effective Writing | NPTEL | 4 | 1 |
| | Technical Writing | Coursera | 5 | 2 |
| | Interpersonal Communication for Engineering Leaders | Coursera | 4 | 1 |
| | Enhancing Soft Skill and Personality | NPTEL | 8 | 2 |
| | Employment Communication A Lab based course | NPTEL | 8 | 2 |
| | Speaking Effectively | NPTEL | 8 | 2 |
| English Language for Competitive Exams | NPTEL | 12 | 3 | |
| Programming Skills | Introduction to Programming with MATLAB | Coursera | 9 | 3 |
| | Introduction to Computer Science and Programming Using Python | edX | 9 | 3 |
| | Introduction to R for Data Science | edX | 4 | 1 |
| | Java Programming: Solving Problems with Software | Coursera | 4 | 1 |
| | Responsive Website Basics: Code with HTML, CSS, and JavaScript | Coursera | 4 | 1 |
| | Joy of computing using Python | NPTEL | 12 | 3 |
| | Programming, Data Structures and Algorithm Using Python | NPTEL | 8 | 2 |
| | Web Design for Everybody (Basics of Web Development and Coding) Specialization | Coursera | 15 | 4 |
| Statistics | Inferential Statistics | Coursera | 7 | 2 |
| | Introduction to Data Analysis using Excel | edX | 4 | 1 |
| | Multivariable Calculus | NPTEL | 8 | 2 |
| Environmental Studies | The Science of Well Being | Coursera | 6 | 2 |
| | Ecology: Ecosystem Dynamics and Conservation | Coursera | 5 | 2 |
| | Effective Problem-solving Decision- Making | Coursera | 4 | 1 |
| | Moralities of Everyday Life | Coursera | 6 | 2 |
| | Introduction to Logic | Coursera | 10 | 3 |
| | Digital Security and Human Rights | edX | 3 | 1 |

Annexure-III

Guidelines regarding Mandatory Induction Program for the new students

Engineering education has evolved globally in a continuous manner to address the twin needs of industry and society. It is now an accepted fact that the institutions imparting technical education should aspire to create manpower who will possess strong technical knowledge and skill, have leadership qualities and be a team player, capable of coming up with innovative solutions and be alive to societal and community concerns. The aim of the Induction Programme is to acclimatize the students to the environment of their engineering institution, give them a flavour of the exciting new world of education that they are entering, provide them with mentoring schemes, and make them aware of their neighbourhood, society and people. This will allow them to evolve as well rounded individuals.

The following schedule is laid down by the Institute to implement the three week long Induction Programme:

| | | | |
|---------------------|----------------------|----------------|--|
| Week 1 | 1 st Half | Day 1 | Overall introduction of the new students to the Institution, its different Departments & Faculty Members |
| | 2 nd Half | Day 1 | (a) Assignment of faculty mentors to the new students (b) Assessment and allotment for mentoring by senior students preferably from the second year |
| | 2 hrs | Day 2, 3, 4, 5 | Lectures by eminent personalities on different areas such as (a) Introduction to Engineering (b) Various topics of science and technology (c) Innovation and entrepreneurship (d) Creative and performing arts (e) Social issues |
| | 2 hrs. | Day 2, 3, 4, 5 | Participation in Games, Yoga, Meditation etc. |
| | 2 hrs | Day 2, 3, 4, 5 | Visit to the different Departments of the Institute |
| Week 2 (AllDays) | 2hrs | | Scheduled class lectures as per time table. |
| | 2hrs | | Students to be conducted through proficiency modules to be prepared by respective Colleges for ascertaining English skills & Computer knowledge of the students and to prepare a report on the same |

| | | | |
|--------|------|-------|--|
| | 2hrs | | Participation in Games, Sports, Yoga, Creative arts etc. |
| Week 3 | 2hrs | | Scheduled class lectures as per time table |
| | | Day 1 | Visits to neighbourhood locations |
| | | Day 2 | Visits to natural spots in adjoining areas to understand the effect of nature on society |
| | | Day 3 | Visits to Science Museum / laboratories |
| | | Day 4 | Visits to NGOs |
| | | Day 5 | |