Name of the course	**Physics-I**
Course Code: BS-PH101/ BS-PH201	Semester: 1st/2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 1 hr/week	Assignment & Quiz: 10 Marks
Practical: 3 hrs/week	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Course Objective:

1.	To understand the basic concepts of engineering mechanics
2.	To understand the concept of optics and its applications
3.	To understand theoretical concept of electricity and magnetism and solve related problem
4.	Qualitative understanding of concepts of quantum physics and statistical mechanics

Prerequisite:

1.	Higher Secondary Physics
2.	Higher Secondary Mathematics

Unit	**Content**	**Hrs**	**Marks**
1	**Mechanics**: Problems including constraints and friction. Basic ideas of vector calculus and partial differential equations. Potential energy function F = -grad V, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.	**7**	
2	**Optics:** Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for maximum, & intensity and qualitative discussion of fringes); diffraction grating (resolution formula only), characteristics of diffraction grating and its applications. Polarisation: Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity. Lasers: Principles and working of laser: population inversion, pumping, various modes, threshold population inversion with examples.	**5**	

3	**Electromagnetism and Dielectric Magnetic Properties of Materials:** Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid, Clausius- Mossotti equation (expression only), applications of dielectrics. Magnetisation, permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.	**8**	
4	**Quantum Mechanics:** Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.	**16**	
5	**Statistical Mechanics:** Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose -Einstein statistics.	**8**	

Text books:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. Classical mechanics, Narayan Rana, Pramod Joag , McGraw Hill Education
6. Introduction to Classical Mechanics, R Takwale , P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola , Cengage India
8. An Introduction to Mechanics (SIE), David Kleppner , Robert Kolenkow, McGraw Hill Education
9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill
10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.

Reference books:

1. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
3. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
4. Modern Quantum Mechanics, J. J. Sakurai, Cambridge University Press
5. Optics , Hecht , Pearson Education
6. Optics, Ghatak, McGraw Hill Education India Private Limited
7. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
8. Statistical Mechanics , Pathria , Elsevier

9. Statistical Physics, L.D.Landau , E.M. Lifshitz, Butterworth-Heinemann

Course outcomes:

After completion of this course, the Students will be familiar with

1. Basic concepts of mechanics
2. Bragg's Law and introduction to the principles of lasers, types of lasers and applications.
3. Various terms related to properties of materials such as, permeability, polarization,etc.
4. Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials.
5. Simple quantum mechanics calculations.

Special Remarks:

The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**Chemistry-I**
Course Code: BS-CH101/ BS-CH201	Semester: 1st / 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 1 hr/week	Assignment & Quiz: 10 Marks
Practical: 3 hrs/week	Attendance: 05 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:	
1.	Understand atomic and molecular structure, including orbitals and bonding theories.
2.	Learn principles and applications of key spectroscopic techniques.
3.	Study intermolecular forces and real gas behavior.
4.	Apply thermodynamics to chemical equilibria and electrochemistry.
5.	Analyze periodic properties and atomic trends.
6.	Explore stereochemistry and basic organic reaction mechanisms, including drug synthesis.
Pre-Requisite:	
1.	High School Mathematics, Chemistry, Physics

Unit	Content	Hrs	Marks
1	**Atomic and molecular structure (10 lectures):** Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.	10	
2	**Spectroscopic techniques and applications (8 lectures):** Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.	8	
3	**Intermolecular forces and potential energy surfaces (4 lectures):** Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.	4	
4	**Use of free energy in chemical equilibria (8 lectures):** First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.	8	

	Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.		
5	**Periodic properties (4 lectures):** Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries	4	
6	**Stereochemistry (4 lectures):** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.	4	
7	**Organic reactions and synthesis of a drug molecule (4 lectures):** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.	4	

Text Books:

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. University chemistry, by B. H. Mahan
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
5. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
6. Physical Chemistry, by P. W. Atkins
7. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers
8. Physical Chemistry, P. C. Rakshit, Sarat Book House
9. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Course Outcomes

The course will enable the student to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. Rationalise bulk properties and processes using thermodynamic considerations.
2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
4. List major chemical reactions that are used in the synthesis of molecules.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**Mathematics – II A**
Course Code: BS-M201	Semester: 2nd (CS & IT)
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 1 hr/week	Assignment & Quiz: 10 Marks
Practical: 0 hrs/week	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Objective:	
1.	To introduce the fundamental principles of probability theory, including conditional probability, independence, and distributions of discrete random variables.
2.	To understand the concepts of continuous probability distributions, including properties and applications of Normal, Exponential, and Gamma distributions.
3.	To explore bivariate distributions and learn to compute joint, marginal, and conditional distributions along with Bayes' rule applications.
4.	To develop knowledge of basic statistical measures, including central tendency, moments, skewness, kurtosis, and key probability distributions.
5.	To equip students with skills in applied statistics, such as curve fitting using the least squares method and conducting hypothesis tests for large samples.
6.	To enable the application of inferential statistics for small samples, including t-tests, F-tests, and chi-square tests for goodness of fit and independence.
Pre-Requisite:	
1.	Basic Mathematics, Fundamentals of Probability, Introductory Statistics

Unit	Content	Hrs	Marks
1	**Basic Probability:** Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the Multinomial distribution, Poisson approximation to the Binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.	11	
2	**Continuous Probability Distributions:** Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities.	4	
3	**Bivariate Distributions:** Bivariate distributions and their properties, distribution of sums and quotients, Conditional densities, Bayes' rule.	5	
4	**Basic Statistics:** Measures of Central tendency, Moments, Skewness and Kurtosis, Probability	8	

	distributions: Binomial, Poisson and Normal and evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.		
5	**Applied Statistics:** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	8	
6	**Small samples:** Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	4	

Text Books:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. S. Ross, A First Course in Probability, Pearson Education India
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
5. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

Course Outcomes:

The students will be able to:

1. Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment
2. Understand the basic ideas of statistics with different characterization of a univariate and bivariate data set.
3. Apply statistical tools for analyzing data samples and drawing inference on a given data set.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**Mathematics – II A**
Course Code: BS-M202	Semester: 2nd (All stream except CSE&IT)
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 1 hr/week	Assignment & Quiz: 10 Marks
Practical: 0 hrs/week	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Pre-Requisite:	
1.	High School Mathematics and BS-M102

Unit	Content	Hrs	Marks
1	**Multivariate Calculus (Integration):** Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	11	
2	**First order ordinary differential equations:** Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	5	
3	**Ordinary differential equations of higher orders:** Second order linear differential equations with constant coefficients, Use of D- operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	9	
4	**Complex Variable – Differentiation** Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties	6	
5	**Complex Variable – Integration** Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus	9	

	theorem(without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour		

Text Books:

1. Reena Garg, Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
6. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
7. E. L. Ince, Ordinary Differential Equations, Dover Publications.
8. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-GrawHill.

Course Outcomes:

The students will be able to:

1. Learn the methods for evaluating multiple integrals and their applications to different physical problems.
2. Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences.
3. Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
4. Apply different types of transformations between two 2- dimensional planes for analysis of physical or engineering problems.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech Electrical and Computer Engineering
(Applicable from the academic session 2025-2026)

Name of the course	**Programming for Problem Solving**
Course Code: ES-CS201	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0 hr/week	Assignment & Quiz: 10 Marks
Practical: 4 hrs/week	Attendance: 05 Marks
Credit Points: 3+0	End Semester Exam: 70 Marks

Objective:	
1.	To familiarize students with the basic components of a computer system and introduce the concept of algorithms, flowcharts, and pseudocode for problem-solving.
2.	To develop an understanding of programming fundamentals, including variables, data types, arithmetic expressions, and the compilation process.
3.	To teach students how to implement conditional branching and iterative loops to control program flow.
4.	To introduce the concept of arrays and strings, and apply them in basic algorithmic solutions like searching and sorting.
5.	To explain the use of functions and recursion for modular programming and problem-solving using real-world examples.
6.	To provide an understanding of structures, pointers, and file handling, enabling the creation and manipulation of complex data types and memory-efficient programs.

Pre-Requisite:	
1.	Basic Mathematics, Fundamentals of Computers, Analytical Thinking

Unit	Content	Hrs	Marks
1	**Introduction to Programming (4 lectures):** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - (1 lecture). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. (1 lecture) From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- (2 lectures)	4	
2	**Arithmetic expressions and precedence (2 lectures)**	2	
3	**Conditional Branching and Loops (6 lectures):** Writing and evaluation of conditionals and consequent branching (3 lectures) Iteration and loops (3 lectures)	6	
4	**Arrays (6 lectures):** Arrays (1-D, 2-D), Character arrays and Strings	6	
5	**Basic Algorithms (6 lectures):**	6	

	Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)		
6	**Function (5 lectures):** Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference	5	
7	**Recursion (4 -5 lectures):** Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	4-5	
8	**Structure (4 lectures):** Structures, Defining structures and Array of Structures	4	
9	**Pointers (2 lectures):** Idea of pointers, Defining pointers, Use of Pointers in self- referential structures, notion of linked list (no implementation)	2	
10	**File handling** (only if time is available, otherwise should be done as part of the lab)		

Text Books:

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. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Outcomes

The student will learn

1. To formulate simple algorithms for arithmetic and logical problems. To translate the algorithms to programs (in C language).
2. To test and execute the programs and correct syntax and logical errors. To implement conditional branching, iteration and recursion.
3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
4. To use arrays, pointers and structures to formulate algorithms and programs.
5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
6. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**English**
Course Code: HM-HU201	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 2 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0 hr/week	Assignment & Quiz: 10 Marks
Practical: 3 hrs/week	Attendance: 05 Marks
Credit Points: 2+0	End Semester Exam: 70 Marks

Objective:	
1.	To develop vocabulary through understanding word formation processes such as compounding, clipping, blending, and root derivations.
2.	To strengthen grammar fundamentals and sentence construction, including transformation, active/passive voice, and direct/indirect speech.
3.	To enhance writing skills by focusing on paragraph structure, logical flow, coherence, and cohesion.
4.	To identify and correct common writing errors related to grammar, punctuation, redundancy, and usage.
5.	To train students in different writing styles like describing, defining, classifying, and argumentative writing.
6.	To provide hands-on practice in academic and professional writing formats such as comprehension, précis writing, essays, letters, emails, and CVs.

Pre-Requisite:	
1.	Basic English Grammar, Fundamental Writing Skills, Reading Comprehension

Unit	**Content**	**Hrs**	**Marks**
1	**Vocabulary Building:** The concept of Word Formation: Compounding, Backformation, Clipping, Blending. Root words from foreign languages and their use in English Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations: Acronyms		
2	**Basic Writing Skills:** Sentence Structures & Types: Simple, Compound, Complex Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration Importance of proper punctuation Creating coherence: Arranging paragraphs & Sentences in logical order Creating Cohesion: Organizing principles of paragraphs in documents Techniques for writing precisely		

3	**Identifying Common Errors in Writing:** Subject-verb agreement Noun-pronoun agreement Misplaced modifiers Articles Prepositions Redundancies Clichés		
4	**Nature and Style of sensible Writing:** Describing Defining Classifying Providing examples or evidence Writing introduction and conclusion		
5	**Writing Practices:** Comprehension Précis Writing Essay Writing Business Letter, Cover Letter & CV; E-mail		

Some examples of English words with foreign roots

Greek Root/Affix	Examples	Latin Root	Examples
Anti	Antisocial, antiseptic	Aud	Audible
Auto	Automatic, autograph	Bene	Beneficial
Anthropos	Anthropology, philanthropy	Brev	abbreviate, brief
Bio	Biography	circum	Circulate
Chronos	Time	Contra	Contradict
Di	Dilemma	Cred	Credible
Bio	Biology	Dict	Diction
Biblio	Bibliography	Femina	Feminine
Chron	Chronology	Inter	Internet, interval
Cracy	Contradiction	Magna	Magnificient
Geo	Geology	Mal	Malnutrition
Hyper	Hyperactive	Multi	multinational
Mania	Kleptomania	Nova	Novel
Mega	Megaserial	Multi	Multiple, multiplex
Eu	Eulogy, euphoria	Non	Nonstop
Geo	Geology	Pre	Previous, predicate
Graph	autograph, photograph	Re	Redo, rewind
Hetero	Heterogeneous	Scrib	Scripture
Hyper	Hyperactive	Spect	Spectator
Hypo	hypodermic, hypoglycemia	Trans	Transport
Macro	Macrocosm	Uni	Unity
Mega	megalomania	Omni	Omnipotent

Micro	microcosm	Semi	Semicircle
Mono	Monarch	Sub	Subway
Pan	Panorama	somnus	Insomnia,
Pathos	Pathetic	Super	Superman
Phobia	Hydrophobia	Sym	Sympathy
Pod (Gk), ped (Latin)	Pseudopodia	scribe	Describe, scribble(write illegibly), inscribe
Poly	polyglot	Trans	Transform
Tele	Telephone	Un	Unnecessary
Theo	Theology, theist	Uni	Universal

Text Books:

1. Kulbushan Kumar, R S Salaria, Effective Communication Skills, Khanna Publishing House, Delhi.
2. Practical English Usage, Michael Swan. OUP. 1995.
3. Remedial English Grammar, F.T. Wood. Macmillan. 2007.
4. On Writing Well, William Zinsser. Harper Resource Book. 2001.
5. Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7. Exercises in Spoken English. Parts I–III. CIEFL, Hyderabad. Oxford University Press.
8. Universal English, Prof. Prasad. Kataria Publications, 2019.
9. Communication Skills for Professionals, Nira Konar. Prentice Hall of India, 2nd edition, New Delhi, 2011.
10. Gajendra Singh Chauhan, Smita Kashiramka and L. Thimmesha. Functional English. Cengage, 2019.

Course Outcome:

1. Understand and apply various methods of word formation, including the use of root words, prefixes, suffixes, synonyms, and antonyms.
2. Construct grammatically correct sentences using appropriate sentence structures, phrases, and clauses with proper punctuation.
3. Identify and correct common errors in writing such as subject-verb agreement, misplaced modifiers, and improper use of articles and prepositions.
4. Organize paragraphs and sentences logically and cohesively to create coherent written documents.
5. Demonstrate effective writing styles for different purposes by describing, defining, classifying, and supporting ideas with examples.
6. Practice and produce various forms of writing including comprehension, précis, essays, business letters, cover letters, CVs, and professional emails.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**Constitution of India**
Course Code: MC-ECS201	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 2 hrs/week	Mid Semester Exam: 15 Marks
Tutorial: 0 hr/week	Assignment & Quiz: 10 Marks
Practical: 0 hrs/week	Attendance: 05 Marks
Credit Points: 0	End Semester Exam: 70 Marks

Objective:	
1.	To understand the origin, sources, and features of the Indian Constitution, including fundamental rights, duties, and directive principles.
2.	To study the structure and functioning of the Union Government, including the roles of the President, Prime Minister, Parliament, and Central Secretariat.
3.	To examine the structure and administration of State Government, including the roles of the Governor, Chief Minister, and State Secretariat.
4.	To explore the organization and significance of local administration, including municipalities, Panchayati Raj Institutions, and district-level functionaries.
5.	To understand the election process in India, including the role and functioning of the Election Commission at both central and state levels.
6.	To analyze the institutional mechanisms for the welfare of SC/ST/OBC and women in the Indian democratic framework.
Pre-Requisite:	
1.	Indian History, Civics / Social Studies, Basics of Political Science

Unit	Content	Hrs	Marks
1	**Introduction:** Constitution meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	3	
2	**Union Government and its Administration:** Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha	6	
3.	**State Government and its Administration Governor:** Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions	6	
4.	**Local Administration District's Administration head:** Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila	8	

	Panchayat: Position and role, Block level: Organizational Hierarchy (Different 4. departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy		
5.	**Election Commission Election Commission:** Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women	7	

Text books:

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D. Basu
4. 'Indian Administration' by Avasti and Avasti

Course Outcome:

1. Understand the meaning, sources, and evolution of the Indian Constitution along with its key features like citizenship, preamble, fundamental rights and duties, and directive principles.
2. Analyze the federal structure of India and the relationship between the Centre and States, including the roles and powers of the President, Prime Minister, and Parliament.
3. Explain the structure and functioning of the State Government, focusing on the roles of the Governor, Chief Minister, Council of Ministers, and State Secretariat.
4. Describe the framework of local administration and Panchayati Raj institutions, highlighting the responsibilities of elected and appointed officials at various levels.
5. Evaluate the functions and responsibilities of the Election Commission, Chief Election Commissioner, and State Election Commissions in the democratic process.
6. Recognize the significance of various statutory institutions and bodies established for the welfare of SC/ST/OBC and women in India.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the Course: **Physics-I Laboratory**	Category: Basic Science course
Course Code: **BS-PH191/ BS-PH291**	Semester: First/ Second
Duration:6 months	Maximum Marks:100
L-T-P: 0-0-3	Credit Points:1.5

Pre-Requisite	
1.	Basic Knowledge of Physics
Course Objective: Students will	
1.	be able to understand the natural environment and its relationships with human activities.
2.	be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
3.	be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
4.	be able to solve scientific problem-solving related to air, water, noise & land pollution.

Laboratory Experiments:
Choose 10 experiments including at least one from Optics, Electricity and Magnetism and Quantum Mechanics and at least a total of six from these three groups.

• **Experiments in Optics**
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
• **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. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell.
6. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance.
7. Determination of unknown resistance using Carey Foster's bridge.

8. Study of Transient Response in LR, RC and LCR circuits using expeyes.
9. Generating sound from electrical energy using expeyes.
• **Experiments in Quantum Physics**
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.
• **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 Poiseulle's capillary flow method.

Course Outcomes:

On completion of the course students will be able to

1. understand and apply the principles of geometrical and physical optics to determine properties such as dispersive power, wavelength, and interference patterns using various optical devices.
2. perform experiments related to electricity and magnetism to analyze electrical characteristics, material properties, and electromagnetic phenomena, including Hall effect, dielectric constants, and thermoelectric power.
3. demonstrate the ability to conduct and interpret quantum physics experiments, such as measuring Planck's constant, the Stefan-Boltzmann constant, and the Rydberg constant, as well as understanding semiconductor band gaps.
4. develop proficiency in experimental methods and tools like Carey Foster's bridge, ballistic galvanometers, and expeyes to study transient responses and material resistance.
5. analyze mechanical properties of materials, such as elasticity, rigidity, viscosity, and moment of inertia, using static and dynamic methods to solve real-world engineering problems.
6. effectively record, analyze, and interpret experimental data, and communicate scientific findings with clarity, while demonstrating safe and ethical laboratory practices.

Special Remarks:

The above mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective

Name of the course	**Chemistry Laboratory**
Course Code: BS-CH191/ BS-CH291	Semester: 1st / 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: Nil	Continuous Internal Assessment:40
Tutorial: Nil	External Assessment: 60
Practical: 3 hrs/week	
Credit Points: 1.5	

	Laboratory Experiments:
Choose 10 experiments from the following:	
1	Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
2	pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
3	Determination of dissolved oxygen present in a given water sample.
4	To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution)
5	Determination of surface tension and viscosity
6	Thin layer chromatography
7	Ion exchange column for removal of hardness of water
8	Determination of the rate constant of a reaction
9	Determination of cell constant and conductance of solutions
10	Potentiometry - determination of redox potentials and emfs
11	Saponification/acid value of an oil
12	Chemical analysis of a salt
13	Determination of the partition coefficient of a substance between two immiscible liquids
14	Adsorption of acetic acid by charcoal
15	Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

Course Outcomes

1. Perform conductometric and pH-metric titrations to determine the strength of acid-base solutions accurately.
2. Analyze water quality parameters such as dissolved oxygen, chloride content, and hardness using standard analytical techniques.
3. Evaluate physicochemical properties like surface tension, viscosity, and isoelectric point using appropriate experimental methods.
4. Apply chromatographic and adsorption techniques for separation and analysis of chemical substances.
5. Determine rate constants and partition coefficients to study reaction kinetics and distribution of solutes in immiscible liquids.

6. Utilize electrochemical techniques such as potentiometry and conductometry for redox analysis and evaluation of electrolytic properties.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective

Name of the course	**Programming for Problem Solving**
Course Code: ES-CS291	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: Nil	Continuous Internal Assessment:40
Tutorial: Nil	External Assessment: 60
Practical: 4 hrs/week	
Credit Points: 2	

	Laboratory Experiments:
1	Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment
2	Tutorial 2: Variable types and type conversions: Lab 2: Simple computational problems using arithmetic expressions
3	Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures
4	Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series
5	Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation
6	Tutorial 6: 2D arrays and Strings Lab 6: Matrix problems, String operations
7	Tutorial 7: Functions, call by value: Lab 7: Simple functions
8-9	Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Programming for solving Numerical methods problems
10	Tutorial 10: Recursion, structure of recursive calls Lab 10: Recursive functions
11	Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures
12	Tutorial 12: File handling: Lab 12: File operations

Course Outcomes

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs

6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech Electrical and Computer Engineering
(Applicable from the academic session 2025-2026)

Name of the course	**Engineering Graphics & Design**
Course Code: ES-ME191/ ES-ME 291	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: 1 hrs/week	Continuous Internal Assessment:40
Tutorial: Nil	External Assessment: 60
Practical: 4 hrs/week	
Credit Points: 3	

Sl. No.	Content	Lecture (L)	Practical (P)
1	INTRODUCTION TO ENGINEERING DRAWING Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.	1	4
2	LETTERING, DIMENSIONING, SCALES Plain scale, Diagonal scale and Vernier Scales.	1	4
3	GEOMETRICAL CONSTRUCTION AND CURVES Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.	1	4
4	PROJECTION OF POINTS, LINES, SURFACES Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.	1	4
5	PROJECTION OF REGULAR SOLIDS Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).	1	4
6	COMBINATION OF REGULAR SOLIDS, FLOOR PLANS Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.	1	4
7	ISOMETRIC PROJECTIONS Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic	1	4

	Views and Vice-versa, Conventions;		
8	SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)	1	4
9	OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.	1	4
10	ANNOTATIONS, LAYERING & OTHER FUNCTIONS applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer- aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.	2	8

11	DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).	2	8

Text Books:

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 Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals

Course Outcomes

1. The student will learn:
2. Introduction to engineering design and its place in society
3. Exposure to the visual aspects of engineering design
4. Exposure to engineering graphics standards
5. Exposure to solid modelling

General Instructions

1. In every topic some problems are to be done in the class and some are to be given to students as home assignment.
2. The problems for class work are to be prepared on drawing sheet of A1 size in the class/ using AutoCAD software.
3. The problems for home assignments are to be prepared on drawing copy/ using AutoCAD software.
4. Print out of every assignment is to be taken for CAD Drawings on Drawing sheets (A4 Sheets).
5. A title block must be prepared in each sheet/ assignment.

Following is the list of drawing instruments that required for making engineering drawings on

1. Paper with perfection.
2. Drawing Board
3. Mini drafter/ Set-squares (45°–45° & 60°–90°), T-square
4. Protractor (180°, 360°)
5. Scales (Plain, Diagonal)
6. Compass (Small and Large)
7. Divider (Small and Large)
8. French Curves
9. Drawing paper (A1 Size)
10. Drawing pencil (H, HB, B)
11. Sharpener
12. Eraser
13. Drawing pins & clips
14. Duster or handkerchief etc.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.

Name of the course	**Language Laboratory**
Course Code: HM-HU291	Semester: 2nd
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination Scheme**
Theory: Nil	Continuous Internal Assessment:40
Tutorial: Nil	External Assessment: 60
Practical: 3 hrs/week	
Credit Points: 1.5	
Laboratory Experiments:	
1) Honing 'Listening Skill' and its sub skills through Language Lab Audio device. 3P	
2) Honing 'Speaking Skill' and its sub skills. 2P	
3) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/ Voice modulation/ Stress/ Intonation/ Pitch &Accent) of connected speech. 2P	
4) Honing 'Conversation Skill' using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode). 2P	
5) Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success. 2P	
6) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD. 4P	
7) Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/Non-Technical Passages Learning Global / Contextual / Inferential Comprehension. 2P	
8) Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions. 2P	

Course Outcomes

1. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Special Remarks:

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.