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)

Semester-I

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.

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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+1	End Semester Exam: 70 Marks

Course Objective:	
1.	To understand the basic concepts of engineering mechanics
2.	To understand the concept of optics
3.	To apply theoretical concept of electricity and magnetism for problem solving
4.	To solve problems of quantum physics and statistical mechanics
Prerequisite:	
1.	Higher Secondary Chemistry

Unit	Content	Hrs	Marks
1	**Atomic and molecular structure:** Schrodinger equation. Particle in a box solutions and their applications for simple samples. Molecular orbitals of diatomic molecules (e.g.H_2). 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:** 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 characterisation techniques. Diffraction and scattering.	**8**	
3	**Intermolecular forces and potential energy surfaces:** 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:** First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. 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.	**8**	
5	**Periodic properties:** Effective nuclear charge, penetration of orbitals,	**4**	

	variations of s, p, d and f orbital energies of atoms in 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.		
6	**Stereochemistry:** Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configuration and conformational analysis. Isomerism in transitional metal compounds.	**4**	
7	**Organic reactions and synthesis of a drug molecule**: 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

Reference books:

1. Physical Chemistry, by P. W. Atkins.
2. Spectroscopy of Organic Compounds, by P. S. Kalsi, New Age International Pvt Ltd Publishers.
3. Physical Chemistry, P. C. Rakshit, Sarat Book House.
4. 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:

After completion of this course, the learners will be able to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. 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.

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Name of the course	**Mathematics – I A**
Course Code: BS-M101	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
	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Course Objective:

1.	To understand the basic concepts of Integration and Differentiation
2.	To understand the concept of Matrices
3.	To apply theoretical concept of Vector Space
4.	To solve problems of Calculus, matrices and vector

Prerequisite:

1.	High School Mathematics

Unit	Content	Hrs	Marks
1	**Calculus (Integration):** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**8**	
2	**Calculus (Differentiation)**: Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.	**6**	
3	**Matrices:** Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination	**7**	
4	**Vector Spaces:** Vector Space, linear dependence of vectors, Basis, Dimension; Linear transformations (maps), Range and Kernel of a linear map, Rank and Nullity, Inverse of a linear transformation, Rank-Nullity theorem, composition of linear maps, Matrix associated with a linear map.	**9**	
5	**Vector Spaces (Continued):** Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigen bases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.	**10**	

Text books:

1. Reena Garg, Engineering Mathematics-I, 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.

Reference books:

1. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.
3. S.K. Mapa, Higher Algebra: Abstract and Linear, Sarat Book House Pvt.Ltd.
4. Hoffman and Kunze: Linear algebra, PHI.

Course outcomes:

After completion of this course, the learners will be able to:

1. Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
2. Understand the domain of applications of mean value theorems to engineering problems. Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
3. Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
4. Learn and apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems

Special Remarks:

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

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Name of the course	**Mathematics –I B**
Course Code: BS-M102	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
	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Objective:	
1.	To understand the basic concepts of engineering mathematics
2.	To understand the concept of Integration ,Differentiation Matrix
3.	To apply mathematical concept for problem solving

Prerequisite:	
1.	HS Physics
2.	HS Mathematics

Unit	Content	Hrs	Marks
1	**Calculus (Integration):** Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	**8**	
2	**Calculus (Differentiation):** Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.	**6**	
3	**Sequence and Series**: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.	**11**	
4	**Multivariate Calculus:** Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence	**9**	
5	**Matrices:** Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.	**8**	

Text books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. Michael Greenberg, Advanced Engineering Mathematics, Pearson.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference books:

1. Reena Garg, Engineering Mathematics-I, Khanna Publishers.
2. Kanti B. Dutta, Mathematical Methods of Science and Engineering, Cenage Learning.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi.

Course outcomes:

After completing the course the student will be able to

1. Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
2. Understand the domain of applications of mean value theorems to engineering problems.
3. Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
4. Apply the knowledge for addressing the real life problems which comprises several variables or attributes and identify extremum points of different surfaces of higher dimensions.

Special Remarks:

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Name of the course	**Basic Electrical Engineering**
Course Code: ES-EE101	Semester: 1st
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: 2 hrs/week	Attendance: 05 Marks
Credit Points: 3+1	End Semester Exam: 70 Marks

Objective:	
1.	To understand the structure and properties of different type of electrical circuits
2.	To understand electrical machines, transformer, power converter and electrical installation
3.	To apply circuit analysis techniques to simplify electrical networks.
4.	To solve problems of electrical circuits.
Prerequisite:	
1.	H. S Physics
2.	H. S Mathematics

Unit	Content	Hrs	Marks
1	**DC Circuits**: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and NortonTheorems.Time-domain analysis of first-order RL and RC circuits.	**8**	
2	**AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	**8**	
3	**Transformers**: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.	**6**	
4	**Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motors. Construction and working of synchronous generators.	**8**	
5	**Power Converters:** DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal	**6**	

	modulation.		
6	**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary Calculations For energy consumption, power factor improvement and battery backup.	**6**	

Text books:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Book Publishing Co. (P) Ltd., Delhi.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGrawHill, 2010.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference books:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

Course Outcome:

After completion of this course, the learners will be able to

1. To understand and analyze basic electric and magnetic circuits
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low voltage electrical installations

Special Remarks:

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

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Name of the Course:	**Environmental Sciences**
Course Code: MC-ECS101	Semester: 1st
Duration:6 months	Maximum Marks:100
Teaching Scheme	**Examination Scheme**
Theory: 3hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
	Attendance: 5 marks
Practical: NIL	Practical: End Semester Exam :70 Marks
Credit Points:	0

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.
Pre-Requisite:	
1.	Basic knowledge of Environmental science

Unit	Content	Hrs	Marks
1.	Basic ideas of environment, basic concepts, man, society & environment, their interrelationship (1L). Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. (2L) Materials balance: Steady state conservation system, steady state system with nonconservative pollutants, step function. (1L) Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering. (2L)	6	
2.	Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem-components types and function. (1L) Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web. (2L) Biogeochemical Cycle- definition, significance, flow chart of different cycles	6	

	with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. (1L) Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.(2L)		
3.	Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. (1L) Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. (1L) Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget. (1L) Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). (2L) Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. (2L) Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. (2L) Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other greenhouse gases, effect of ozone modification. (1L) Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference). (1L)	11	
4.	Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. (2L) River/Lake/ground water pollution: River: DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH. (2L) Lake: Eutrophication [Definition, source and effect]. (1L) Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) (1L) Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment	9	

	system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. (2L) Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic (1L)		
5.	Lithosphere; Internal structure of earth, rock and soil (1L) Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).(2L)	3	
6.	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighbourhood noise] (1L) Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, $L10$ (18hr Index) ,*n Ld*.Noise pollution control. (1L)	3	
7.	Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. (2L)	2	

Text books/ reference books:

1. M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House (AICTE Recommended Textbook – 2018).
2. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt.Ltd.,1991.
3. De, A. K., "Environmental Chemistry", New Age International

Course Outcomes:

On completion of the course students will be able to:

1. To understand the natural environment and its relationships with human activities.
2. To apply the fundamental knowledge of science and engineering to assess environmental and health risk.
3. To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
4. Acquire skills for scientific problem-solving related to air, water, noise& land pollution

Special Remarks:

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

MC-ECS102: NSS/NCC or Sports and Yoga [No syllabus]

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-I Laboratory**	Category: Basic Science course
Course Code: **BS-CH191/ BS-CH291**	Semester: First/ Second
Duration:6 months	Maximum Marks:100
L-T-P: 0-0-3	Credit Points:1.5
Pre-Requisite	

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:

After completion of this course, the learners will be able to

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: **Basic Electrical Engineering Laboratory**	Category: Engineering Science Courses
Course Code: **ES-EE191**	Semester: 1st
Duration:6 months	Maximum Marks:100
L-T-P: 0-0-2	Credit Points:1
Pre-Requisite	

Laboratory Experiments:

Choose 10 experiments from the following:

1.	First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting down list of experiments to be performed, and instruction for writing the laboratory reports by the students. Group formation. Students are to be informed about the modalities of evaluation.
2.	Introduction and uses of following instruments : (a) Voltmeter (b) Ammeter (c) Multimeter (d) Oscilloscope Demonstration of real life resistors, capacitors with color code, inductors and autotransformer.
3.	Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine.
4.	Calibration of ammeter and Wattmeter.
5.	Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage.
6.	Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.
7.	Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.
8.	(a) Open circuit and short circuit test of a single-phase transformer (b) Load test of the transformer and determination of efficiency and regulation
9.	Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side.
10.	Measurement of power in a three phase unbalanced circuit by two wattmeter method.
11.	Determination of Torque –Speed characteristics of separately excited DC motor.
12.	Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.
13.	Determination of operating characteristics of Synchronous generator.

14.	Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor.
15.	Demonstration of components of LT switchgear.

Course Outcomes:

On completion of the course students will be able to

1. Understand common electrical components and their series parallel connection.
2. Analyze the steady state and transient state behavior of electrical circuit.
3. Apply the common electrical measuring instruments for measurements of the current, voltage, power etc.
4. Analyze the basic characteristics of transformers, different electrical machines and power converters.

Special Remarks:

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

Name of the Course: **Engineering Graphics & Design**	Category: Engineering Science Courses
Course Code: **ES-ME191/ ES-ME 291**	Semester: First/ Second
Duration:6 months	Maximum Marks:100
L-T-P: 1-0-4	Credit Points:3
Pre-Requisite	

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 Views and Vice-versa, Conventions;	1	4
8	SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS	1	4

	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)		
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-	2	8

	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).		

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

The student will learn:

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling

Special Remarks:

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

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 paper with perfection.

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

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: **Workshop/ Manufacturing Practices**	Category: Engineering Science Courses
Course Code: **ES-ME192/ ES-ME 292**	Semester: First/Second
Duration:6 months	Maximum Marks:100
L-T-P : 1-0-4	Credit Points:3
Pre requisite:	

Laboratory Experiments:

1.	**Lectures & videos:** Detailed contents: 1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods 2. CNC machining, Additive manufacturing 3. Fitting operations & power tools 4. Electrical &Electronics 5. Carpentry 6. Plastic moulding, glass cutting 7. Metal casting. 8. Welding (arc welding & gas welding), brazing
2.	**Workshop Practice:** **Machine shop (8 hours)** *Typical jobs that may be made in this practice module:* To make a pin from a mild steel rod in a lathe. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.
3.	**Fitting shop (8 hours)** *Typical jobs that may be made in this practice module:* To make a Gauge from MS plate. **Carpentry (8 hours)** *Typical jobs that may be made in this practice module:* To make wooden joints and/or a pattern or like.
4.	**Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs))** *Typical jobs that may be made in this practice module:* ARC WELDING (4 hours): To join two thick (approx 6mm) MS plates by manual metal

	arc welding. GAS WELDING (4 hours): To join two thin mild steel plates or sheets by gas welding.
5.	**Casting (8 hours)** *Typical jobs that may be made in this practice module:* One/ two green sand moulds to prepare, and a casting be demonstrated.
6.	**Smithy (4 hours)** *Typical jobs that may be made in this practice module:* A simple job of making a square rod from a round bar or like.
7.	**Plastic moulding & Glass cutting (4 hours)** *Typical jobs that may be made in this practice module:* For plastic moulding, making at least one simple plastic component should be made. For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.
8.	**Electrical & Electronics (8 hours)** Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable. Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point. Simple wiring exercise to be executed to understand the basic electrical circuit. Simple soldering exercises to be executed to understand the basic process of soldering. Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

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.

Course Outcomes:

On completion of the course students will be able to

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

Special Remarks:

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