# 1st Year Curriculum for B.Tech courses in Engineering & Technology

*(Applicable from the academic session 2018-2019)*

(Department of Information Technology)

&

(Department of Computer Science & Engineering)


*Government College of Engineering & Ceramic Technology*

*73, A.C Banerjee Lane*

*Kolkata-700010*

**Definition of Credit:**

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

**MOOCs for B. Tech Honours:**

The additional 20 credits (for obtaining B. Tech with Honours) are to be gained through MOOCs. The complete description of the MOOCs relevant for the first year course are given in *Annexure-I*. The courses for subsequent years of study will be posted subsequently.

The total of 20 credits that is required to be attained for B.TechHonours degree are distributed over four years in the following way: **For first year : 8 credits**
**For second year : 4 credits**
**For third year : 4 credits**
**For fourth year : 4 credits**

| **1st Semester for CSE/IT** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mandatory Induction Program- 3 weeks duration** | | | | | | | |
| Sl. No. | Type of course | Course Code | Course Title | Hours per week | | | Credits |
| | | | | Lecture | Tutoria l | Practical | |
| **Theory** | | | | | | | |
| 1 | Basic Science course | BS(CS/IT) 101 | Mathematics - I | 3 | 0 | 0 | 3 |
| 2 | Basic Science course | BS(CS/IT) 102 | Physics | 3 | 1 | 0 | 4 |
| 3 | Engineering Science Course | ES(CS/IT) 101 | Basic Electrical Engineering | 3 | 1 | 0 | 4 |
| **Sessional** | | | | | | | |
| 1 | Basic Science course | BSL(CS/IT) 103 | Physics Laboratory | 0 | 0 | 3 | 1.5 |
| 2 | Engineering Science Course | ESL(CS/IT) 102 | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 3 | Engineering Science Course | ESL(CS/IT) 103 | Engineering Graphics & Design | 1 | 0 | 4 | 3 |
| **Practical** | | | | | | | |
| 1 | | CLA(CS/IT)1 | Comprehensive Laboratory Assessment | - | - | - | 1 |
| | | | | **Total credits** | | | **17.5** |
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| **Course Code: BS(CS/IT)101** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: MATHEMATICS I** | **Semester: 1ST SEMESTER** |
| **Lecture per week: 3 hours**<br>**Tutorial per week:** | **Credit: 3** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

| Module No. | Description of Topic | Lectures Hours |
|---|---|---|
| 1 | ***Calculus (Integration):***<br>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):***<br>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:***<br>Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Linear systems ofequations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination. | 7 |
| 4 | ***Vector Spaces:***<br>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):***<br>Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Eigenbases.<br>Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization. | 10 |

**Course Outcomes:**

The students will be able to:

CO 1: apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.

CO 2: understand the domain of applications of mean value theorems to engineering problems.

CO 3: learn different types of matrices, concept of rank, methods of matrix inversion and their applications.

CO 4: understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.

CO 5: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

**Learning Resources:**


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

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| **Course Code: BS(CS/IT) 102** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: PHYSICS** | **Semester: 1ST SEMESTER** |
| **Lecture per week: 3 hours**<br>**Tutorial per week: 1 hour** | **Credit: 4** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

**Module 1: Quantum Mechanics(14)**

Introduction to quantum physics, Black body radiation, Photoelectric Effect and Compton Effect and their explanation using the photon concept. De Broglie hypothesis, wave-particle Duality.Born's interpretation of the wave function, verification of matter waves, Uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic Oscillator, hydrogen atom.

**Module 2: Statistical Mechanics (8)**

Statistical description of a system of particles, Phase space, Microstates and macrostates, Boltzmann's formula for the entropy, Boltzmann distribution function (derivation not reqd.) Classical ideal gas, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

**Module 3: Electronic materials (10)**

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

**Module 4: Semiconductors (10)**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction ( Ohmic and Schottky ), Semiconductor materials of interest for optoelectronic devices.

**References:**

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
6. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
7. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptaon NPTEL

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| **Course Code: ES(CS/IT)101** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: Basic Electrical Engineering** | **Semester: 1ST SEMESTER** |
| **Lecture per week: 3 hours**<br>**Tutorial per week: 1 hour** | **Credit: 4** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

*Detailed contents:*

**Module 1: DC Circuits (8 hours)**
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 Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**Module 2: AC Circuits (8 hours)**
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 R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**Module 3: Transformers (6 hours)**
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase ransformer connections.

**Module 4: Electrical Machines (8 hours)**
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 motor. Construction
and working of synchronous generators.

**Module 5: Power Converters (6 hours)**
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

**Module 6: Electrical Installations (6 hours)**
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.

**Course Outcomes**

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

**Learning Recourses:**

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

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| **Course Code: BSL(CS/IT) 103** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: Physics Laboratory** | **Semester: 1ST SEMESTER** |
| **Practical per week: 3 hours** | **Credit: 1.5** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

1. Determination of an unknown resistance using Carey Foster Bridge.
2. Determination of wavelength of light by Newton's ring method.
3. Determination of energy band gap by four-probe method.
4. Determination of specific charge (e/m) of electron by Thomson's method.
5. Determination of Planck's constant using photocell.
6. Verification of Stefan's law of blackbody radiation.
7. Determination of dielectric constant of a given dielectric material.
8. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
9. Determination of Rydberg constant by studying Hydrogen/Helium spectrum.
10. Determination of Numerical aperture and energy loss related to Optical Fibre experiment.
11. Parameter extraction from I-V characteristics of p-n junction diode/ solar cells.
12. To design a temperature controller circuit using a thermistor and study its performance characteristics.

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| **Course Code: ESL(CS/IT) 102** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: Basic Electrical Engineering Lab** | **Semester: 1ST SEMESTER** |
| **Practical per week: 2 hours** | **Credit: 1** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

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.

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| **Course Code: ESL(CS/IT) 103** | **Year: 1ST YEAR CSE/IT** |
| **Course Title: Engineering Graphics& Design** | **Semester:1stSEMESTER** |
| **Lecture per week: 1 Hours**<br>**Practical per week: 4 Hours** | **Credit:3** |
| **Prerequisites: 10+2 KNOWLEDGE** | |

| Module No. | Description of Topic | Lectures Hours |
|---|---|---|
| 1 | ***Introduction to Engineering Drawing***<br>Principles of Engineering Graphics and their significance, usage of Drawing instruments; lines, lettering, dimensioning; Conic sections including the Rectangular Hyperbola (General method only);Cycloid, Epicycloid, Hypocycloid and Involute; Scales – concept of R.F, Plain, Diagonal and Vernier Scales. | 2L+3P |
| 2 | ***Orthographic Projections***<br>Principles of Orthographic Projections, Conventions; Projections of Points and lines inclinedto both reference planes; Projections of planes like circle, rhombus, polygons; Auxiliary Planes. | 1L+2P |
| 3 | ***Projections of Regular Solids***<br>Projections of Regular Solids like cone, pyramids, prisms etc. | 1L+2P |
| 4 | ***Sections and Sectional Views of Right Angular Solids***<br>Section of solids like Prism, Cylinder, Pyramid, Cone – Auxiliary Views;<br>Development of surfaces of RightRegular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic viewsof geometrical solids. | 1L+2P |
| 5 | ***Isometric Projections***<br>Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions;Isometric Views of lines, Planes, Simple and compound Solids; Conversion of IsometricViews to Orthographic Views and Vice-versa, Conventions. | 1L+2P |
| 6 | ***Overview of Computer Graphics***<br>Listing the computer technologies that impact on graphical communication, Demonstratingknowledge 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), TheCommand Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. | 1L+2P |
| 7 | ***Customisation& CAD Drawing***<br>Consisting of set up of the drawing page and the printer, including scale settings, Setting upof units and drawing limits; ISO and ANSI standards for coordinate dimensioning andtolerancing; 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. | 1L+2P |
| 8 | ***Annotations, layering & other functions***<br>Applying dimensions to objects, applying annotations to drawings; Setting up and use ofLayers, layers to create drawings, Create, edit and use customized layers; Changing linelengths through modifying existing | 1L+2P |

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| | lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views ofcomposite right regular geometric solids and project the true shape of the sectioned surface;Drawing annotation, Computer-aided design (CAD) software modeling of parts andassemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editingand two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualizationexercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multiviews of dwelling. | |
| 9 | ***Demonstration of a simple team design project*** Geometry and topology of engineered components: creation of engineering models and theirpresentation in standard 2D blueprint form and as 3D wire frame and shaded solids; meshedtopologies for engineering analysis and tool-path generation for component manufacture;geometric dimensioning and tolerancing; Use of solid-modeling software for creatingassociative 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 tobuilding drawing practice; Drawing sectional elevation showing foundation to ceiling;Introduction to Building Information Modelling (BIM). | 1L+3P |

**Course Outcomes:**

After completing the course the student will be able to

CO 1: Learn importance of engineering drawing and its place in society
CO 2: Learn engineering graphics standards
CO 3: Read drawing and can understand different views
CO 4: Perform solid modelling
CO 5: Handle computer aided geometric design software
CO 6: Create working drawings
CO 7: Communicate other engineering personnel via engineering graphics language.

**Learning Resources:**


1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, CharotarPublishing House
2. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, ScitechPublishers
5. (Corresponding set of) CAD Software Theory and User Manuals


Following is the list of drawing instruments that required for making engineering drawings on paper with perfection.

1. Drawing Board

2. T-Scale

3. Set-squares (45°–45° & 60°–90°)

4. Protractor

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.

| 2nd semester for CSE/IT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sl. No. | Type of course | Course Code | Course Title | Hours per week | | | Credits |
| | | | | Lecture | Tutorial | Practical | |
| **Theory** | | | | | | | |
| 1 | Basic Science course | BS(CS/IT) 204 | Chemistry | 3 | 0 | 0 | 3 |
| 2 | Basic Science course | BS(CS/IT) 205 | Mathematics-II | 3 | 1 | 0 | 4 |
| 3 | Engineering Science Course | ES(CS/IT) 204 | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 4 | Humanities & Social Sciences including Management | HS(CT/IT/ CS) 201 | English | 2 | 0 | 0 | 2 |
| **Sessional** | | | | | | | |
| 1 | Basic Science course | BSL(CS/IT) 206 | Chemistry Laboratory | 0 | 0 | 3 | 1.5 |
| 2 | Engineering Science Course | ESL(CS/IT) 205 | Programming for Problem SolvingLaboratory | 0 | 0 | 4 | 2 |
| 3 | Engineering Science Course | ESL(CS/IT) 206 | Workshop /Manufacturing Practices | 1 | 0 | 4 | 3 |
| 4 | Humanities & Social Sciences including Management | HSL(CT/IT/ CS) 202 | Language Lab | 0 | 0 | 2 | 1 |
| **Practical** | | | | | | | |
| 1 | | CLA(CS/IT) 2 | Comprehensive Laboratory Assessment | - | - | - | 1 |
| | | | | | | **Total credits** | **20.5** |

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| **Course Code: BS(CS/IT) 204** | **Year: 1ST YEAR (CSE/IT)** |
| **Course Title: Chemistry** | **Semester: 2ndSEMESTER** |
| **Lecture per week: 3 hours**<br>**Tutorial per week:** | **Credit: 3** |
| **Prerequisites: 10+2 KNOWLEDGE** | |

## Unit-1: Chemical bonding in molecules(6 L)

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules,

Chemistry of coordination compounds reactivity and stability: Determination of configuration of cis- and trans- isomers by chemical methods. Labile and inert complexes, substitution reaction on square planer complexes, trans effect (example and applications). Structure and bonding: VB description and its limitations.

Elementary Crystal Field Theory: Splitting of $d^n$ configurations in octahedral, square planar and tetrahedral fields, crystal field stabilization energy in weak and strong fields; pairing energy. JahnTeller distortion.

## Unit-2: Spectroscopic techniques and applications (5 L)

Principles of spectroscopy and selection rules.Electronic spectroscopy.Fluorescence and its applications in medicine.Vibrational and rotational spectroscopy of diatomicmolecules.Applications.Nuclear magnetic resonance and magnetic resonance imaging,surface characterisation techniques.Diffraction and scattering.d-d transitions; selection rules for electronic spectral transitions; spectrochemical series of ligands; charge transfer spectra (elementary idea).

## Unit-3: Periodic properties (3 L)

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.

## Unit-4: Chemical Thermodynamics (6 L)

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form. Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas.

Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.

Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV): Definition and General expression of Cp - CV. Expression of Cp - CV for ideal gas. Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas,

Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process. Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's law.

2 nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. Evaluation of entropy: characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases.

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of $\Delta A$ and $\Delta G$ for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity and equilibrium reaction.

## Unit-5:Surface and Colloid Chemistry(3L)

Adsorption, absorption and sorption, Physical and Chemisorption, Langmuir and Freaudlich isotherm, Multilayer adsorption, BET isotherm and its application to surface area measurement, Sols (reversible and irreversible), emulsion and emulsifier, micelle, gels, application of colloids, qualitative idea of electrokinetic phenomena, Zeta potential

## Unit-6: Solid state Chemistry (3L)

Introduction to stoichiometric defects (Schottky&Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor.

## Unit-7:Stereochemistry(5L)

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

## Unit-8: Organic reactions and synthesis of a drug molecule (5L)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**Learning Resources:**


1. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2. S. Glasston, Text Book of Physical Chemistry, Macmillan India Limited.
3. S. Pahari, Physical Chemistry, New Central Book Agency.
4. S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition),
6. R. P. Sarkar, Inorganic Chemistry (Vol-1 & II)
7. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
8. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
9. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.

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| **Course Code: BS(CS/IT) 205** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: MATHEMATICS –II** | **Semester: 2ND SEMESTER** |
| **Lecture per week: 3 hours**<br>**Tutorial per week: 1 hours** | **Credit: 4** |
| **Pre- Requisites: Knowledge on BS(CS/IT) 101** | |

| Module No. | Description of Topic | Lectures Hours |
|---|---|---|
| 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:**<br>Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities. | 4 |
| 3 | **Bivariate Distributions:**<br>Bivariate distributions and their properties, distribution of sums and quotients, Conditionaldensities, Bayes' rule. | 5 |
| 4 | ***Basic Statistics:***<br>Measures of Central tendency, Moments, Skewness and Kurtosis, Probability distributions:Binomial, Poisson and Normal and evaluation of statistical parameters for these threedistributions, Correlation and regression – Rank correlation. | 8 |
| 5 | ***Applied Statistics:***<br>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:***<br>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 |

**Course Outcomes:**

The students will be able to:

CO1: 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.

CO2: understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.

CO3: apply statistical tools for analysing data samples and drawing inference on a given data set.

**Learning Resources:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
2. S. Ross, A First Course in Probability, Pearson Education India
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.

4. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
6. N.G. Das, Statistical Methods (Combined Volume), Tata-McGraw Hill.

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| **Course Code: ES(CS/IT) 204** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: Programming for Problem Solving** | **Semester: 2ND SEMESTER** |
| **Lecture per week: 3 hours** | **Credit: 3** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

**Detailed contents**

***Unit 1***Computer Fundamentals **(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)**

***Unit 2:***Arithmetic expressions and precedence **(2 lectures)**

**Unit 2:**Conditional Branching and Loops **(6 lectures)**

Writing and evaluation of conditionals and consequent branching **(3 lectures)**

Iteration and loops **(3 lectures)**

***Unit 3***Arrays **(6 lectures)**

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

***Unit 4***Basic Algorithms **(6 lectures)**

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

***Unit 5***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

***Unit 6***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.

***Unit 7***Structure **(4 lectures)**

Structures, Defining structures and Array of Structures

***Unit 8***Pointers **(2 lectures)**

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

***Unit 9***File handling (only if time is available, otherwise should be done as part of the lab)

**Course Outcomes**

The student will learn

☐To formulate simple algorithms for arithmetic and logical problems.

☐To translate the algorithms to programs (in C language).

☐To test and execute the programs and correct syntax and logical errors.

**Suggested Text Books**

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

**Suggested Reference Books**

**(i)** Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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| **Course Code: HS(CT/IT/CS) 201** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: English** | **Semester: 2ND SEMESTER** |
| **Theory per week: 2 hours** | **Credit: 2** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

1. **Vocubulary building and new words concept**:
   - 1.1 Concept of Word formation
   - 1.2 Collection of five new words everyday (from Oxford Dictionary & English Newspapers)
   - 1.3 Synonyms & Antonyms
   - 1.4 Masculine & Feminine
   - 1.5 Singular & Plural
2. **Basic Writing Skill – Written English**
   - 2.1 Sentence construction
   - 2.2 Use of Phrases, idioms and clauses in sentences
   - 2.3 Importance of proper punctuation
   - 2.4 Techniques for writing precisely
   - 2.5 Paragraph writing
3. **Avoiding mistakes & errors in English**
   - 3.1 Subject – Verb agreement
   - 3.2 Noun – Pronoun agreement
   - 3.3 Misplaced Modifiers
   - 3.4 Articles
   - 3.5 Prepositions
4. **Practice of Writing English – Form**
   - 4.1 Precis writing
   - 4.2 Essay writing
   - 4.3 Letter writing
   - 4.4 Comprehension
   - 4.5 English Translation – Bengali to English & vice versa

5. **Communication Skill – incorporation presentation skill & negotiation skill**
   - 5.1: Listening comprehension
   - 5.2 Spoken English
   - 5.3 Comprehension, intonation, accent, stress and rhythm
   - 5.4 Conversation and dialogues
   - 5.5 Manoeuvering sentences – replacing words
   - 5.6 Interview – personal interview / Group Discussion
   - 5.7 Public speaking

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| **Course Code: BSL(CS/IT) 206** | **Year: 1ST YEAR (CSE/IT)** |
| **Course Title: Chemistry Laboratory** | **Semester: 2ndSEMESTER** |
| **Practical per week: 3 hours** | **Credit: 1.5** |
| **Prerequisites: 10+2 KNOWLEDGE** | |

1. Determination of surface tension of a given liquid.
2. Determination of viscosity of a given liquid.
3. Qualitative analysis of an inorganic sample salt.
4. Estimation of Fe(II) present in a solution permanganometrically
5. Estimation of Fe(II) present in a solution dichromatometrically.
6. Determination of hardness of water in ppm unit complexometrically.
7. Determination of rate constant of a reaction.
8. Determination of cell constant and conductance of a solution.
9. Potentiometry: determination of redox potential and emf

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| **Course Code: ESL(CS/IT) 205** | **Year: 1ST YEAR (CSE & IT)** |
| **Course Title: Programming for Problem Solving Laboratory** | **Semester: 2ND SEMESTER** |
| **Practical per week: 4 hours** | **Credit: 2** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

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

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

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

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

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

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

Laboratory Outcomes

 To formulate the algorithms for simple problems

 To translate given algorithms to a working and correct program

 To be able to correct syntax errors as reported by the compilers

 To be able to identify and correct logical errors encountered at run time

 To be able to write iterative as well as recursive programs

 To be able to represent data in arrays, strings and structures and manipulate them through a program

 To be able to declare pointers of different types and use them in defining self-referential structures.

 To be able to create, read and write to and from simple text files.

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| **Course Code: ESL(CS/IT) 206** | **Year: 1ST YEAR CSE/IT** |
| **Course Title: Workshop/ Manufacturing Practices** | **Semester:1stSEMESTER** |
| **Lecture per week: 1 Hours**<br>**Practical per week: 4 Hours** | **Credit:3** |
| **Prerequisites: 10+2 KNOWLEDGE** | |

| Module No. | Description of Topic | Lectures Hours |
|---|---|---|
| 1 | Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods | 3L |
| 2 | CNC machining, Additive manufacturing | 1L |
| 3 | Fitting operations & power tools | 1L+3P |
| 4 | Electrical &Electronics | 1L+2P |
| 5 | Carpentry | 1L+3P |
| 6 | Plastic moulding, glass cutting | 1L+2P |
| 7 | Metal casting | 1L+2P |
| 8 | Welding (arc welding & gas welding), brazing | 1L+3P |
| 9 | Machine shop | 3P |
| 10 | Smithy | 2P |

**Course Outcomes:**

After completing the course the student will be able to

CO 1: Learn about different manufacturing processes which are commonly employed in industry to fabricate components using different materials.
CO 2: Fabricatecomponents with their own hands.

CO 3: Get practical knowledge of the dimensional accuracies and dimensionaltolerances possible with different manufacturing processes.
CO 4: Assemble different components and they will be able to produce small devices oftheir interest

**Learning Resources:**


1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., "Elements ofWorkshop Technology", Vol. I 2008 and Vol. II 2010, Media promotersandpublishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4thedition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" PearsonEducation, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice HallIndia, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

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| **Course Code: HSL(CT/IT/CS) 202** | **Year: 1ST YEAR (CT)** |
| **Course Title: Language Laboratory** | **Semester: 2ND SEMESTER** |
| **Practical per week: 2 hours** | **Credit: 1** |
| **Pre- Requisites: 10+2 KNOWLEDGE** | |

1. **LISTENING :**Listening to pre-recorded short episodes, conversations, passages, stories, news bulletin, speeches by famous personalities – Listening for general and specific information etc.

2. **READING :** Reading aloud – by students individually – reading rhymes – proverbs – passages on various topics of interest – Newspaper reading – Reading humorous passages – Anecdotes – Stories – tricky sounds (conditioners) – Reading manuals – Reading individual sentences with articulation, pronunciation, Tones, Punctuation, pauses etc…- Reading the titles of popular books, movies and poems.

3. **SPEAKING:** Self-introduction – introducing one self, one's family – one's friends and relatives, one's country etc.
Welcome Address, Vote of thanks.
Extempore speeches.
Short speech on simple topics on simpler themes for about one minute.
Role play – Group Discussion – Debate – Seminars – Machine Descriptions (depending upon branches) – Compering – Interviewing others by Asking Questions – Interview Techniques – Conversational Practice – Telephonic Conversation – Telephonic Interviews – How to establish conversation / dialogues – Entry Attempts/Admissions.

4. **WRITING:**
Writing Resume, preparing Curriculum Vitae.Converting newspaper headlines into sentences.
Formation of Sentences – Using the table of Sentence-making and producing multiple sentences.
Framing Questions for the responses given. Tips for better performance in interviews.
Describing Objects.Describing Situations

5. **PROFESSIONAL ETHICS & ORGANISATIONAL BEHAVIOUR:**
Different kinds of Ethics – Ethics in different fields – Engineering Ethics – Senses of Engineering Ethics – Moral Values – Integrity & Loyalty – Work Ethics – Respect for others and authority – Empathy – Caring and Sharing – Honesty – Courage and Commitment – Valuing Time – Co-operation & Teamwork – Safety and Risk – Right Action – Professional ideals and virtues – Individual's Ambition – Conflict Resolution – Self-Confidence – Customs and Manners – General Behaviour – Etiquettes to be followed – Professional Responsibility – Accountability – Leadership Quality – Effective Communication skills.

6. **PROJECT REPORT WRITING (Outline):**Significant features of Project Report Writing – Organization – Presentation – Use of Impersonal Passives – Acknowledgements.