B. Tech. 1ST YEAR

Ceramic Technology

(Applicable from the academic session 2024-2025)

Government College of Engineering & Ceramic Technology
(An Autonomous Institution under MAKUT)
73, A.C Banerjee Lane
Kolkata-700010

1st Semester B. Tech Ceramic Technology							
Sl. No.	Type of course	Course Code	Course Title	Hours per week			Credits
				Lecture	Tutorial	Practical	
Theory							
1	Basic Science course	BS(CT) 101	Mathematics – I	3	0	0	3
2	Basic Science course	BS(CT) 102	Chemistry	3	0	0	3
3	Basic Science course	ES(CT) 101	Programming for Problem solving	3	0	0	3
4	Engineering Science Course	ES(CT) 102	Electronics	3	0	0	3
Sessional/Practical							
1	Basic Science course	BSL(CT) 103	Chemistry Lab	0	0	3	1.5
2	Engineering Science Course	ESL(CT) 103	Programming for Problem solving Lab	0	0	2	1
3	Engineering Science Course	ESL(CT) 104	Engineering Graphics& Design	1	0	2	2
4	Engineering Science Course	ESL(CT) 105	Electronics Lab	0	0	2	1
5	Humanities & Social Sciences including Management	HSL(CT) 102	Design & Thinking Lab	0	0	2	1
				Total credits			**18.5**

Course Code: BS(CT)101	**Year: 1ST YEAR (CT)**
Course Title: MATHEMATICS I	**Semester: 1ST SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. To learn evaluation techniques of evolute, involute and can use concept of improper integrals.
2. To explain the meaning of Mean value theorem, Rolle's theorem and can recognize when to apply L'Hospital rule.
3. To Understand the definitions of limits and convergence in the context of sequences and series of real numbers.
4. To understand multivariate calculus, Divergence and curl which is used in many fields of natural and social science and engineering.
5. To identify a critical point as a local maximum, local minimum or a saddle point for a function of two variable
6. To learn the concept of eigen values, eigen vectors, diagonalisation of matrices for understanding engineering problems.

Pre-Requisite - Class 12th standard knowledge of Mathematics

Module 1 **8 hours**

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.

Module 2 **6 hours**

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.

Module 3 **11 hours**

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

Module 4 **9 hours**

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

Module 5 **8 hours**

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

Course outcomes

After completion of the course, a student would 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 relate the domain of applications of mean value theorems to engineering problems.

CO 3 apply the tools of power series and Fourier series to analyze engineering problems and the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
CO 4 apply the knowledge for solving the real-life problems by using several variables and extremum points.
CO 5 analyze different types of matrices, their eigen values, eigen vectors, rank and also their orthogonal transformations which are essential 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.

Course Code: BS(CT)102	**Year: 1ST YEAR (CT)**
Course Title: CHEMISTRY	**Semester: 1ST SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. The objective of the course is to provide an exposure to the atomic bonding, atomic and crystal structure, crystalline defects and various properties of chemistry.
2. This course also provides an understanding of practical problem-solving techniques for the chapters covered in the course.

Pre-Requisite: Class 12th standard knowledge of Chemistry

This course also provides an understanding of practical problem-solving techniques for the chapters covered in the course

Module 1 **6 hours**

Chemical bonding in molecules

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

Module 2 **4 hours**

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 characterization techniques. Diffraction and scattering. d-d transitions; selection rules for electronic spectral transitions; spectrochemical series of ligands; charge transfer spectra (elementary idea).

Module 3 **4 hours**

Periodic properties

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

Module 4 **6 hours**

Chemical Thermodynamics

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.
2nd 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 AA and AG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity and equilibrium reaction

Module 5 **3 hours**

Surface and Colloid Chemistry

Adsorption, absorption and sorption, Physical and Chemisorption, Langmuir and Freundlich 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 electro-kinetic phenomena, Zeta potential.

Module 6 **3 hours**

Solid state Chemistry

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

Module 7 **6 hours**

Stereochemistry

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

Module 8 **6 hours**

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

Course outcomes

After completion of the course, a student would be able to:

CO 1 describe various types of bonding and connectivity in a molecular system.
CO 2 use various tools to analyze different linkages present in a molecular system to determine exact structure of a molecule.
CO 3 estimate the energy change of a chemical reaction using thermodynamic parameters.
CO 4 apply knowledge of surface phenomena and colloidal properties of solids in assessing particulate behaviour.
CO 5 identify different imperfections in solids based on understanding of the ideal crystal structures.
CO 6 Identify three-dimensional structures of different isomeric molecules and their participation in different chemical reactions like addition, substitution, elimination reaction etc.

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. R. P. Sarkar, Inorganic Chemistry (Vol-1 & II)
5. J.D .Lee, Concise Inorganic Chemistry(5th Edition) Chapman & Hall
6. I. L. Finar,(Vol-I) Organic Chemistry, Addison Wesley Longman, Inc.
7. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.

8. Organic Chemistry,G Mark Loudon, 4th Edition, Oxford Publishers.
9. Basic Stereochemistry of Organic Molecules, Subrata Sengupta, Book syndicate Pvt. Ltd.

Course Code: ES(CT)101	**Year: 1ST YEAR (CT)**
Course Title: Programming for Problem solving	**Semester: 1ST SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. To understand the various steps in Program development and basic concepts in C Programming Language.
2. To learn how to write modular and readable C Programs in C to solve problems.

Pre-Requisite

1. Basic fundamental knowledge of Mathematics.
2. Knowledge of arithmetic and logical reasoning

Module 1. Introduction to Computing 4 hours

Computer Systems-Hardware and Software, Different components, Computer Languages, Algorithm, Flowchart, Representation of Algorithm and Flowchart with examples. 4

Module 2. Introduction to C 4 hours

History of C, Features of C, Structure of C Program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators.

Module 3. Statements 4 hours

Selection statements (Decision Making)- if and switch statements with examples, Repetition statements (loops)- while, for, do-while statements with examples, Unconditional statements- break, continue, goto statements with examples.

Module 4. Arrays 4 hours

Declaration and Initialization, One dimensional Arrays, Two dimensional Arrays, Searching, Basic Sorting Algorithms.

Module 5. Strings 4 hours

Declaration and Initialization, String Input / Output functions, String manipulation functions.

Module 6. Function 8 hours

Designing Structured Programs, Types of Functions-User defined functions, Standard functions, Categories of functions, Parameter Passing techniques, Storage classes, Dynamic Memory Allocation, Recursion.

Module 7. Pointers 5 hours

Introduction, Definition and Declaration of pointers, address operator, Pointer variables, Pointers with Arrays

Module 8. Structures and Unions 5 hours

Introduction, Declaration and Initialization, Array of Structures, Unions

Course outcomes

After completion of the course, a student would be able to:

CO 1 explain different components of computers
CO 2 formulate simple algorithms for arithmetic and logical problems
CO 3 translate the algorithms to programs (in C language).
CO 4 test and execute the programs
CO 5 implement branching, iteration and recursion
CO 6 use arrays, pointers and structures to formulate algorithms and programmes

Learning Resources:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. Programming with C by T Jeyapoovan, Vikas Publishing House Pvt Ltd

Course Code: ES(CT)102	**Year: 1ST YEAR (CT)**
Course Title: Electronics	**Semester: 1ST SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. To study the characteristics of semiconductor devices
2. To study applications of semiconductor devices
3. To study digital logic gates.

Pre-Requisite

1. Class 12th standard knowledge of Physics

Module 1. Introduction 2hours

Introduction to Semiconductors : intrinsic and extrinsic Semiconductors:, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors.

Module 2. Introduction to Diodes: 4hours

Formation of P-N junction, V-I characteristics of P-N junction diode, Zener diode and its reverse characteristics, Simple diode circuits, half wave & full wave rectifiers.

Module 3. Introduction to Transistors : 6 hours

Formation of PNP / NPN junctions, , CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, early effect. Transistors as switch, Introduction to JFET and MOSFET

Module 4. Introduction to Operational Amplifier 6 hours

Basic information of operational amplifier, ideal characteristics, Basic OPAMP applications using ideal model: inverting amplifier, non-inverting amplifier, summing amplifier, comparator circuit using operational amplifier.

Module 5. Digital Electronics using logic Gates: 8 hours

Number system, Boolean algebra & logic gates: Binary numbers & Boolean algebra , Logic gates, Truth Tables and function minimization using algebraic method, Karnaugh map, Universal logic gate

Module 6. Digital circuits: 8 hours

Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer, Flip-flops.

Course Outcome:

After completion of this course the students will be able to -

CO1 - Explain the operation of different semiconductor devices like diode, transistor and FET

CO2 - Analyze different electronic circuits using diode, transistor, FETs and Operational amplifier.

CO3 - Compare electrical properties of conductor, semiconductor and Insulator

CO4 - Compare different number systems.

CO5 - Design digital electronic circuits.

Learning Resources:

1. D chattopadhyay & P.C.Rakshit. Electronics (Fundamentals and Applications), New Age International Publishers
2. Malvino, Electronic Principle, McGraw Hill.
3. Millman & Halkias, Integrated Electronics, McGraw Hill
4. Morries Mano, Digital Logic Design, PHI

Course Code: BSL(CT) 103	**Year: 1ST YEAR (CT)**
Course Title: Chemistry Lab	**Semester: 1st SEMESTER**
Lecture per week: 3 hours	**Credit: 1.5**
Prerequisites: 10+2 KNOWLEDGE	

Objective
1. To develop laboratory practice and safety.
2. To develop laboratory skills and instrumentation.
3. To deepen the understanding of concepts.
4. To provide scientific skills and chemical knowledge.

Pre-Requisite -Class 12th standard knowledge in Practical Chemistry

Module	Content	Hours
1	Qualitative analysis of an inorganic sample salt.	6
2	Estimation of Fe(II) present in a solution permanganometrically	3
3	Estimation of Fe(II) present in a solution dichromatometrically.	3
4	Determination of hardness of water in ppm unit complexometrically.	6 (any two from Module 4-9)
5	Determination of surface tension of a given liquid.	
6	Determination of viscosity of a given liquid.	
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.	

After completion of the course, a student would be able to
CO 1 analyze qualitative parameters (basic and acid radicals) of inorganic salts.handle stalagmometer and Ostwald's viscometer to determine surface tension and viscosity of liquid.
CO 2 estimate quantities of Fe (II) permanganetometrically and dichromatometrically.
CO 3 estimate hardness of water complexometrically.
CO 4 handle stalagmometer and Ostwald's viscometer to determine surface tension and viscosity of liquid.
CO 5 develop perception about safety standards to be maintained inside the laboratory.
CO 6 develop skill to work in a team.

Learning Resources:

1. Practical Chemistry, Prof Sachin Dutta, Bharati Book Stall
2. Practical Chemistry , R Mukhopadhyay & P Chatterjee, Books and Allied (p) Ltd.
3. Practical Chemistry, Pandey, Bajpai, Giri, S Chand Publication
4. Vogel's Qualitative Inorganic Analysis, G Svehla, B Shivasankar (7th Edition), Pearson
5. Vogel's Quantitative Chemical Analysis, J Mendham, R C Denney, J D Barnes, M Thomas, B Shivasankar (6th Edition), Pearson

Course Code: ESL(CT) 103	**Year: 1ST YEAR (CT)**
Course Title: Programming for Problem solving Lab	**Semester: 1st SEMESTER**
Lecture per week: 3 hours	**Credit: 1**

Prerequisites

1. Knowledge of Mathematics.
2. Knowledge of arithmetic and logical operations.
3. Knowledge of reasoning.

Objective:

1. To understand the various steps in Program development.
2. To understand the basic concepts in C Programming Language.
3. To learn how to write modular and readable C Programs
4. To learn to write programs (using structured programming approach) in C to solve problems.

Module 1 **2 Hours**
Familiarization with programming environment

Module 2 **3 Hours**
Simple computational problems using arithmetic expressions

Module 3 **3 Hours**
Problems related to Branching and logical expressions

Module 4 **3 Hours**
Iterative problems using loops e.g., sum of series

Module 5 **3 Hours**
1D Array manipulation, searching, sorting related problems

Module 6 **3 Hours**
Problems related to 2D arrays and Strings manipulation

Module 7 **8 Hours**
Problems related to Functions, call by value, call by reference and dynamic memory allocation

Module 8 **3 Hours**
Problems regarding Recursion

Module 9 **6 Hours**
Pointers related problems

Module 10 **2 Hours**
Problems on structures and Unions

Course outcomes
After completion of the course, a student would be able to:

CO 1 formulate algorithms for simple problems and translate given algorithms to a working and correct program
CO 2 identify and correct logical errors and syntax errors encountered at run time.
CO 3 write iterative as well as recursive programs.
CO 4 represent data in arrays, strings and structures and manipulate them through a program
CO 5 declare pointers of different types and use them in defining self-referential structures.
CO 6 work effectively in a team.

Learning Resources:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Programming with C by T Jeyapoovan, Vikas Publishing House Pvt Ltd
3. Programming in C by J.B. Dixit, Laxmi Publications Pvt Ltd

Course Code: ESL(CT) 104	**Year: 1ST YEAR CSE/IT**
Course Title: ENGINEERING GRAPHICS & DESIGN	**Semester: 1stSEMESTER**
Lecture per week: 1 Hours Practical per week: 2 Hours	**Credit:2**
Prerequisites: 10+2 KNOWLEDGE	

Module	Content	Hours	Remarks.
1	**Introduction to Engineering Drawing and AutoCAD** Principles of Engineering Graphics and their significance; Drawing instruments and their uses; Different types of lines and their uses; Dimensioning; Drawing standards and codes; Scales: concept of R.F, plain and diagonal scales. Demonstrating knowledge of the theory of CAD software; Drawing area; Command line; Status bar, Select and erase objects; Setting up of the drawing page and the printer, including scale settings; Setting up of units and drawing limits; Orthographic constraints, Snap to objects manually and automatically; Various ways of drawing circles.	3L+6P	Manual drawing sheet + AutoCAD sheet
2	**Geometrical Constructions and Curves used in Engineering Practice** Construction of polygons, conic sections including the rectangular hyperbola, cycloid and involute.	2L+4P	Manual drawing sheet
3	**Orthographic Projections of Points, Lines, Planes** Principles of orthographic projections, conventions; Projections of points; Projections of lines inclined to both reference planes; Projections of planes like circle, polygons etc.	2L+4P	Manual drawing sheet
4	**Projections of Regular Solids** Projections of regular solids like cone, pyramids, prisms etc.	1L+2P	AutoCAD sheet
5	**Sections of Right Regular Solids and Development of Surfaces** Section of solids like cylinder, prism, pyramid, cone etc. Development of surfaces of right regular solids: cylinder, prism, pyramid and cone.	2L+4P	Manual drawing sheet
6	**Isometric Projections** Principles of isometric projection, isometric scale, isometric views, conventions; Isometric views of planes, simple and compound solids; Conversion of isometric views to orthographic views and vice-versa.	2L+4P	Manual drawing sheet + AutoCAD sheet

Course outcomes	
After completion of the course, a student would be able to:	
CO 1	**apply** basics of Engineering Graphics standards for interpreting Engineering Drawing
CO 2	**create** Engineering Graphics of real life objects or machine components
CO 3	**explain** plan and elevation of different solid objects
CO 4	**develop** solid model with Computer Aided Design (CAD) software
CO 5	**construct** working drawings for sections of solids and development of surface

Learning Resources:	
1.	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2.	AutoCAD Software User Manuals

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

Sl. No.	Name of the instrument	Sl. No.	Name of the instrument
1	Drawing Board	8	Compass (Small and Large)
2	T-Scale	9	Divider (Small and Large)
3	Set-squares (45°–45° & 60°–90°)	10	French Curves
4	Protractor	11	Sharpener
5	Scales (Plain, Diagonal)	12	Eraser
6	Drawing paper (A1 Size)	13	Drawing pins & clips
7	Drawing pencil (H, HB, B)	14	Duster or handkerchief etc.

Course Code: ESL(CT) 105	**Year: 1ST YEAR CSE/IT**
Course Title: ELECTRONICS LAB	**Semester: lstSEMESTER**
Practical per week: 2 Hours	**Credit:1**
Prerequisites: 10+2 KNOWLEDGE	

Module	Content	Hrs
Module 1.	**2 HOURS**	
Familiarization with Electronic devices such as Diodes, Transistors, FET etc.		
Module 2.	**2 HOURS**	
Familiarization with equipment like Multimeter, Trainer kit, CRO, Signal generator etc.		
Module 3.	**2 HOURS**	
Study on V-I characteristics of Junction Diode.		
Module 4.	**2 HOURS**	
Study on transistor characteristics operating in common emitter mode		
Module 5.	**2 HOURS**	
Study of inverting and non-inverting operational amplifier (OP-AMP) configurations.		
Module 6.	**2 HOURS**	
Study of AND,OR,NOT, NAND, NOR & XOR gates and verification of truth tables.		
Module 7.	**2 HOURS**	
Implementation AND,OR NOT and XOR gate using universal logic gates		
Module 8.	**2 HOURS**	
Implementation of Full adder circuit		

Course Outcome:

After completion of this course the students will be able to

CO1 Identify different electronic components and equipment needed to conduct a particular experiment.

CO2 Determine static and dynamic resistance of a p-n junction diode from the I-V characteristics.

CO3 Identify active, cut off and saturation region of operation of a transistor from their characteristics.

CO4 Measure output of OPAMP circuit operating in inverting and non-inverting mode.

CO6 Measure the output of logic gate ICs for different combinations of inputs.

CO7 Design combinational logic circuits.

Learning Resources

1. Laboratory Manuals

Course Code: HSL(CT) 105	**Year: 1ST YEAR CSE/IT**
Course Title: DESIGN & THINKING LAB	**Semester: lstSEMESTER**
Practical per week: 2 Hours	**Credit:1**
Prerequisites: 10+2 KNOWLEDGE	

Pre-requisites: Nil Total hours 40

Introduction

This course is intended for students from any discipline who require an understanding of design thinking for brand, product, and service development. Students will learn a series of design thinking concepts, methods and techniques that are used to bring about innovation in business and in the social sector.

Pedagogical approach

The course will be a mix of lecture, case discussions, participative and immersive learning. It will be a predominantly student driven learning to acquire the requisite skills. Relevant case discussions drive the principles of arriving at an optimum solution through innovative approaches. A comprehensive group project will be a major outcome of the course.

Course objectives

*To expose the student with state of the art perspectives, ideas, concepts, and solutions related to the design and execution of projects using design thinking principles

*To prepare the mindset and discipline of systemic inspiration driven by a desire to identify new sources of ideas, and new models especially outside their regular working atmosphere

*To propose a concrete, feasible, viable and relevant innovation project/challenge.

Module 1 **13 hours**

What is Different About Design thinking? Design Thinking Skills Principles of Design Thinking, The Basis for Design Thinking, The Design Thinking Team, Design Thinking Workshops and Meetings - Exercises and case based discussions

Module 2 **13 hours**

Listening and Empathizing Techniques - observation - structured open ended approach - .

Design Thinking Frameworks, Ideation tools - brainstorming, innovation heuristics, behaviour models, overcoming cognitive fixedness - Exercises and case based discussions

Module 3 **14 hours**

Use of Diagrams and Maps in Design Thinking - Empathy map. Affinity diagram, mind map, journey map, combining ideas into complex innovation concepts.

Story telling - improvisation, scenario planning, development of scenarios, evaluation tools, frog design and prototyping - - Exercises and case-based discussions

Assess developer and user perspectives for bias - apply frameworks to strengthen communication - sustain a culture of innovation.

References:

Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Ad vantage", Harvard Business Press , 2009.

Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand - Improve- Apply", Springer, 2011

Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013

Jeanne Liedtka , Andrew King, Kevin Bennett, “Book - Solving Problems with Design Thinking - Ten Stories of What Works” (Columbia Business School Publishing), 2013

Maurfcio Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, “Design thinking: Business Innovation” MJV Press, 2011

Burgelman, Christensen, and Wheelwright, “Strategic Management of Technology and Innovation”5th Edition, McGraw Hill Publications, 2017

2nd Semester B. Tech Ceramic Technology							
Sl. No.	Type of course	Course Code	Course Title	Hours per week			Credits
				Lecture	Tutorial	Practical	
Theory							
1	Basic Science course	BS(CT) 204	Mathematics-II	3	0	0	3
2	Basic Science course	BS(CT) 205	Physics	3	0	0	3
3	Engineering Science Course	ES(CT) 206	Basic Electrical Engineering	3	0	0	3
4.	Engineering Science Course	ES(CT) 207	Basic Mechanical Engineering	3	0	0	3
5.	Humanities & Social Sciences including Management	HS(CT) 202	English	2	0	0	2
Sessional/Practical							
1	Basic Science course	BSL(CT) 206	Physics Lab	0	0	2	1
2	Engineering Science Course	ESL(CT) 208	Basic Electrical Engineering Lab	0	0	2	1
3	Engineering Science Course	ESL(CT) 209	Workshop /Manufacturing Practices	1	0	2	2
4.	Humanities & Social Sciences including Management	HSL(CT) 203	English Communication Lab	0	0	2	1
5.	NSS						1
				Total credits			**20**

Course Code: BS(CT)204	**Year: 1ST YEAR (CT)**
Course Title: MATHEMATICS II	**Semester: 2ND SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:
1. To learn integral of a function of more than one variable
2. To create mathematical models using first order differential equation.
3. To learn analytical technique for finding solution of higher order differential equation.
4. To study complex power series, classification of singularities, calculus of residues and its applications in the evaluation of integrals, and other concepts and properties.
5. To study the techniques of complex variables and functions together with their derivatives, Contour integration and transformations.

Pre-Requisite
1. Class 12th standard knowledge of Mathematics

Module 1. **11 HOURS**

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.

Module 1. **5 HOURS**

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.

Module 3. **9 HOURS**

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

Module 4. **6 HOURS**

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.

Module 5. **9 HOURS**

Complex Variable - Integration

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum- Modulus 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.

Course outcomes

After completion of the course, a student would be able to:

CO 1 apply the concept of multiple integrals for solving different physical problems.

CO 2 apply 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.

CO 3 apply different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.

CO 4 apply different types of transformations between 2- dimensional planes for analysis of physical or engineering problems.
CO 5 apply complex integration technique to find residue of any complex function.

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. E. L. Ince, Ordinary Differential Equations, Dover Publications.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-Graw Hill.

Course Code: BS(CT)205	**Year: 1ST YEAR (CT)**
Course Title: PHYSICS	**Semester: 2ND SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. The objective of the course is to provide an exposure to the conservative force field, motion under conservative force, moment of inertia, development and various laws of electromagnetism, familiarizing the students with different wave phenomena of light like interference, diffraction, polarization and the evolution of quantum mechanics.
2. This course also provides an understanding of practical problem-solving techniques for the chapters covered in the course.

Pre-Requisite

1. Class 11th and 12th standard knowledge of Physics and Mathematics.

Module I: Mechanics **12 Lectures**

Use of vectors in particle mechanics, Unit vectors in spherical and cylindrical polar coordinates, Conservative vector fields and their potential functions - gravitational and electrostatic examples, Gradient, Divergence and Curl. Gauss' Divergence Theorem and Stokes Theorem.

Simple Harmonic Motion (SHM), Differential Equation of SHM, Damped vibration, Critical Damping, Forced Vibration, Resonance, Amplitude and Velocity Resonance, Sharpness of Resonance and Quality Factor, Lissajous Figure.

Module 2: Electricity and Magnetism **8Lectures**

Overview of Coulomb"s law, Gauss's law, dielectric polarization, Displacement vector, permeability and dielectric constant, polar and non-polar dielectrics, applications of dielectrics. Electric current and the continuity equation. Overview of Biot-Savart law and Ampere's Circuital law. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism, magnetic domains and hysteresis, Electromagnetic Induction – Faraday's Law and Lenz's Law, Displacement Current and Maxwell's Equations.

Module 3: Wave Optics **8Lectures**

Interference of light waves, Young's experiment, Interference in thin film, Newton's rings. Diffraction of light waves, Fraunhoffer diffraction due to single slit, and plane diffraction grating, X-Ray Diffraction and Bragg's Law, Polarization of light waves, Polarization by reflection, Brewster's law.

Module 4: Modern Physics and Quantum Mechanics **10 Lectures**

Black body radiation, Photoelectric Effect, Compton effect, De Broglie Waves, Particle diffraction and Davisson-Germer experiment, Uncertainty principle and applications, Schrödinger equation, energy levels and wave functions, Particle in a box (1- D), Potential Barrier and tunneling, Formation of Energy Bands in a solid, Valence Band and Conduction Band, Concept of Metals, Insulators and Semiconductors.

Course outcomes

After completion of the course, a student would be able to:

CO 1: Develop the basic concepts of Vector Analysis and Apply them for an understanding of Electromagnetism.

CO 2: Explain the basics of Simple Harmonic Motion and its differential equation and apply it for an understanding of Damped vibration and Resonance.

CO 3: Explain basics of electromagnetism including Biot-Savart law, Ampere's circuital law and the laws of electromagnetism.

CO 4: Apply the concepts of wave theory of light to for an understanding of interference, diffraction and polarization and apply them to study the basics of X-Ray diffraction.

CO 5: Recall the Old Quantum Theory and apply it for an understanding of the Uncertainty Principle of Quantum Mechanics.

CO 6: Analyze the Schrodinger Theory of Quantum Mechanics and apply it to different problems and for an understanding of the basic concepts of Semiconductor Physics.

References:

1. Speigel – Vector Analysis
2. Griffiths – Electromagnetic Theory
3. Fewkes and Yarwood – Classical Electricity and Magnetism
4. Jenkins and White – Optics
5. Ryder – Perspectives of Modern Physics
6. Eiseberg and Resnick – Modern Physics and Quantum Mechanics

Course Code: ES(CT)206	**Year: 1ST YEAR (CT)**
Course Title: BASIC ELECTRICAL ENGINEERING	**Semester: 2ND SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Pre- Requisites: 10+2 KNOWLEDGE

Module	Content	Hr
1	**DC Circuits** Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with DC excitation, Super position Theorem, Thevenin's and Norton's Theorems. Time-domain analysis of first-order RL and RC circuits.	**8**
2	**AC Circuits** Representation of sinusoidal waveforms, peak, average 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, Q factor, Selectivity Three phase system, voltage and current relations in star and delta connections, three phase power calculations.	**8**
3	**Transformers** Basic construction, equivalent circuit, phasor diagram, loss and efficiency, regulation. Auto-transformer and applications.	**5**
4	**Electrical Machines** Induction Motor: 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 Special Motors: Introduction to BLDC Motor, Stepper motor, Permanent Magnet DC (PMDC) Motor, Servo motor, Synchronous motor (Qualitative analysis only)	**10**
5	**Electrical Installations** General layout of power system network: Generation, Transmission and Distribution Components of Low Tension Switchgear: Switch Fuse Unit (SFU), MCB, RCCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption.	**5**

Course Outcomes (COs)

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

CO1 **explain** the overall electrical power system, its different parameters, components, protective elements and power converters

CO2 **solve** problems of DC and AC circuits using different methods and network theorems

CO3 **analyze** the operation of electric machines and transformer and circuits using equivalent circuits, phasor diagrams etc.

CO4 **derive** different characteristics and expressions of electric machines and transformer

CO5 **evaluate** performance of electrical machines and transformer

Text Book and Reference Book

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, McGraw Hill
2. A. Chakrabarti, S. Nath, C. K. Chanda, “Basic Electrical Engineering”, McGraw Hill
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press
5. E. Hughes, “Electrical and Electronics Technology”, Pearson
6. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India
7. P. V. Prasad, S. Sivanagaraju, K. R. Varmah, C. Abraham, “Basic Electrical Engineering”, Cengage Learning India Pvt. Ltd

Course Code: ES(CT)207	**Year: 1ST YEAR (CT)**
Course Title: BASIC MECHANICAL ENGINEERING	**Semester: 2ND SEMESTER**
Lecture per week: 3 hours	**Credit: 3**

Objective:

1. The objective of this course is to provide a good foundation for taking up advanced courses of the subsequent semesters. A working knowledge of statics with emphasis on force equilibrium and free body diagrams and vibration of body are provided. This course provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions. This course also provides the basic understanding of different machine elements like cam-follower, power screw, belt drives, gear drives, flywheel and bearings.

Pre-Requisite

1. Class 12th standard physics knowledge
2. Class 12th standard knowledge in differential and integral calculus

Module	Content	Hours
1	**Introduction to statics and vibrations** Moment, Varignon's theorem, Couple, Equivalent couples, Force couple systems. Equilibrium of forces in two dimensions: Concept of free body diagram, Equilibrium conditions. Vibrations of one degree of freedom systems, Free vibrations of an un-damped, under-damped, critically damped and over-damped system; Critical speed of shafts.	8
2.	**Strength of materials** Concept of stress; Normal stress and shear stress; Tension and compression within the elastic limit: Hooke's law, Stress-strain diagram for ductile and brittle material, working stress, factor of safety, stress and strain in composite bar, Thermal stress. Theories of elastic failure. Torsion of circular shafts, angle of twist, torque and power developed in hollow and circular shafts. Shear Force and Bending Moment: Relation between shear force and bending moment, Sign convention, Shear force and bending moment diagrams for simply supported beam and cantilever subjected to point loads & uniformly distributed load. Area moment of inertia, Bending stress and flexural of rigidity.	12
3	**Theory of machine elements** **Cams and followers:** Classification of cams and followers, Different follower motions and their displacement diagrams like uniform velocity, SHM. Drawing of profile of radial cam with knife-edge follower without offset with reciprocating motion (graphical method only). **Power screws:** Forms of threads, Terminology of power screw, Torque	12

	requirement while lifting and lowering load, self-locking screw. **Belt drives:** Characteristics of belt drives, action of belts on pulleys, velocity ratio, slip. **Gear drives:** Classification of gears, Gear terminology, simple gear train and compound gear train. **Flywheel:** Coefficient of fluctuation of speed, maximum fluctuation of energy and torque. **Bearing:** Static and dynamic load carrying capacity, Stribeck's equation, Equivalent bearing load, Load-life relationship.	

Course outcomes	
After completion of the course, a student would be able to:	
CO 1	**deduct** the state of static bodies subjected to different force, moment and couple under equilibrium condition for two dimensional systems only.
CO 2	**determine** critical speed of shaft and results for a single degree of freedom system under free vibrations.
CO 3	**determine** the state of mechanical systems subjected to simple stress, strain and thermal stress.
CO 4	**evaluate** torsional forces, shear force and bending moment of beams to illustrate the state of deformable bodies.
CO 5	**interpret** design related numerical problems on power screw, belt drives, flywheel and bearing.
CO 6	**design** gear drives and cam-follower systems.

Learning Resources:	
1.	Engineering mechanics- Timoshenko and Young
2.	Engineering mechanics- Mariam and Kraige
3.	Strength of materials- Timoshenko and Young
4.	Theory of machines- S S Rattan
5.	Design of machine elements- V B Bhandari

Course Code: HS(CT)202	**Year: 1ST YEAR (CT)**
Course Title: ENGLISH	**Semester: 2ND SEMESTER**
Lecture per week: 2 hours	**Credit: 2**

Objective:

1. To develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing.
2. To revise and reinforce structure already learnt
3. To enable the learner to communicate effectively and appropriately in real life situations.

Pre-Requisite

1. Basic English Grammar knowledge of class 12th standard

Module	Content	Hours
1	Vocabulary building and new words concept: • Concept of Word formation • Collection of five new words everyday (from Oxford Dictionary & English Newspapers) • Synonyms & Antonyms • Masculine & Feminine • Singular & Plural	4
2	Basic Writing Skill - Written English • Sentence construction • Use of Phrases, idioms and clauses in sentences • Importance of proper punctuation • Techniques for writing precisely • Paragraph writing	4
3	Avoiding mistakes & errors in English • Subject - Verb agreement • Noun - Pronoun agreement • Misplaced Modifiers • Articles • Prepositions	4
4	Practice of Writing English - Form • Precis writing • Essay writing • Letter writing • Comprehension • English Translation - Mother tongue to English & vice versa	6
5	Communication Skill - incorporation of presentation skill & negotiation skill • Listening comprehension • Spoken English • Comprehension, intonation, accent, stress and rhythm • Conversation and dialogues • Manoeuvring sentences - replacing words • Interview - personal interview / Group Discussion • Public speaking	6

Course outcomes
After completion of the course, a student would be able to:

CO 1 develop a minimum repository of English words to use for making meaningful sentences.
CO 2 write correct sentences using phrases, idioms, clauses with proper punctuation marks.
CO 3 identify the common mistakes and grammatical errors in sentence construction.
CO 4 write letters, essays, precis etc. in proper format.
CO 5 able to speak English with correct pronunciation.
CO 6 communicate effectively in public forum and in professional field

Learning Resources:

1. Technical Education: Raman and Sharma
2. Effective Technical Communication: Ashraf Rizvi
3. Effective Communication and Soft Skills: Nitin Bhatnagar & Mamta Bhatnagar

Course Code: BSL(CT)206	**Year: 1ST YEAR (CT)**
Course Title: PHYSICS LAB	**Semester: 2ND SEMESTER**
PRACTICAL per week: 2 hours	**Credit: 1**

- Preliminary Experiments

1. To determine the Young's Modulus of the material of a beam, by the method of flexures.
2. To determine the resistance per unit length of the bridge wire and hence to determine the unknown resistance of a coil using Carey Foster's Bridge.
3. Study of Charging and Discharging of a Capacitor in a R-C Circuit.
4. To verify the Stokes Law and hence to determine the coefficient of viscosity of a highly viscous liquid.
5. Determination of the Moment of inertia of a body about an axis passing through its CG and perpendicular to its length.
6. Determination of Modulus of rigidity of the material of a wire by dynamical method.

- Experiments directly connected with the Syllabus

1. To determine the Planck's constant by measuring the Stopping Potential for different wavelengths of incident light incident using a vacuum photo tube.
2. To verify the Bohr's theory of atomic orbitals by Franck-Hertz experiment.
3. To verify the Stefan's law of black body radiation using diode EZ-81.
4. To determine the Band gap of a semiconductor sample, by measuring its resistivity at different temperatures by Four-Point Probe method.
5. To determine the Radius of curvature of a Plano-convex lens, using Newton's Rings.
6. To determine the Dielectric Constant of an insulator using an Amplifier, Oscillator , CRO.
7. To measure the variation in the magnetic field along the axis of a Helmholtz coil.

A student has to complete at least 8 experiments in a single semester.

Course Code: ESL(CT)208	**Year: 1ST YEAR (CT)**
Course Title: BASIC ELECTRICAL ENGINEERING LAB	**Semester: 2ND SEMESTER**
PRACTICAL per week: 2 hours	**Credit: 1**

Introduction to basic safety precautions and mentioning of the Do's and Don'ts during handling of electrical instruments and machines. 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.

List of Experiments

1) Introduction and uses of following instruments: (a) Voltmeter (b) Ammeter (c) Multimeter (d) Energy meter (e) Oscilloscope. Demonstration of real life resistors, capacitors with color code, inductors and autotransformer.

2 Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine.

3 Calibration of ammeter and Wattmeter.

4 Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage.

5 Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.

6 Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.

7 (a) Open circuit and short circuit test of a single-phase transformer (b) Load test of the transformer and determination of efficiency and regulation

8 Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side.

9 Measurement of power in a three phase unbalanced circuit by two wattmeter method.

10 Determination of Torque –Speed characteristics of separately excited DC motor.

11 Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.

12 Demonstration of components of LT switchgear.

13 Verification of Thevenin's Theorem

14 Verification of Norton's Theorem

15 Verification of Superposition Theorem

16 Starting, reversing and speed control of DC shunt motor

Course Code: ESL(CT) 209	**Year: 1ST YEAR (CT)**
Course Title: WORKSHOP/ MANUFACTURING PRACTICES	**Semester: 2ND SEMESTER**
Theory 1 hr, practical 2 hrs	**Credit: 2**
Pre- Requisites: 10+2 KNOWLEDGE	

Module	Content	Hours
1	Introduction to different manufacturing methods like casting, forming, machining, joining. Visit to mechanical workshop and awareness on the safety rules to be followed in mechanical workshop.	1L+2P
2	Introduction to fitting operations; Study of different fitting tools: Bench vice, Hammer, Files, Punch, Callipers etc.; Making a job using bench working methods; Power tools.	2L+4P
3	Introduction to carpentry: Seasoning of wood; Familiarisation with different carpentry tools: rule, try square, marking gauge, hand saw, chisel, jack plane, trying plane, claw hammer, mallet, rasp file etc; Making of a wood joint	2L+4P
4	Glass cutting and making of a glass based product e.g. kaleidoscope.	1L+2P
5	Casting: Introduction to riser, core, shrinkages. Making of a die cast component.	1L+2P
6	Introduction to welding, brazing and soldering. Join metallic pieces using electric arc welding; Hands on practice on soldering/ brazing.	1L+2P
7	Introduction to machine shop: Lathe, Grinding machine, Drilling machine, Shaping machine. Preparation of a work piece through turning, knurling, taper turning operations in lathe. Flatten one surface of a metallic block using Shaping machine and polishing the same surface using grinding machine.	2L+4P
8	Introduction to smithy; Drawing, upsetting; Smithy tools: Anvil, swage block, hearth, hammer, tongs; Resize a component using smithy operations.	1L+2P
9	Introduction to advanced manufacturing methods. Making of a product/ part using polymer based 3D printing.	1L+2P

Course outcomes

After completion of the course, a student would be able to

- **CO 1** **explain** different manufacturing processes which are commonly employed in industry to fabricate components using different materials including advanced manufacturing methods.
- **CO 2** **construct** a defined job in different sections of mechanical workshop e.g., carpentry, fitting , welding, machine shop, casting shop floor, forging shop etc.
- **CO 3** **develop** different components to produce small devices using welding, brazing, soldering, glass cutting etc.
- **CO 4** **bulid** products using additive manufacturing process.

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",4thedition, 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 McGraw Hill House,2017.

Course Code: ESL(CT)208	**Year: 1ST YEAR (CT)**
Course Title: ENGLISH COMMUNICATION LAB	**Semester: 2ND SEMESTER**
PRACTICAL per week: 2 hours	**Credit: 1**

Module	Content	Hours
1	LISTENING Listening to pre-recorded short episodes, conversations, passages, stories, news bulletin, speeches by famous personalities - Listening for general and specific information etc.	4
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.	4
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.	6
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; Project report writing (outline): significant features of Project report writing - Organization - Presentation - Use of Impersonal Passives - Acknowledgements.	6
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 - Cooperation & 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.	4

Course outcomes

After completion of the course, a student would be able to:

CO 1 Develop listening skill with proper comprehension.

CO 2 Read aloud fluently various topics with proper pronunciation and articulation and necessary pauses.

CO 3 Able to speak English fluently with correct pronunciation during Group Discussions, Seminar presentations, Telephonic conversations etc.

CO 4 Write Resume, prepare Curriculum Vitae and Convert newspaper headlines into sentences etc.

CO 5 Develop self-confidence and leadership quality through effective communication skills.

CO 6 Develop skill to write project reports in impersonal passive voice.