B.Tech. 1st Year Course Structure : 2025-2026 – Even Semester									
Semester 2 (Group – A)									
Sl. No.	**Type of Course**	**Subject code**	**Subject name**	**L**	**T**	**P**	**S**	**Total Contact Hours**	**Credit Points**
THEORY									
1	Basic Science Course	BSCCH202	Chemistry	3	1	0	0	4	4
2	Basic Science Course	BSCM203B	Mathematics and Basic Statistics	3	1	0	0	4	4
3	Humanities and social sciences including	HSMC101	English in Practice & Theory	2	0	2	0	4	3
4	Engineering Science Course	ESCEC201	Basic Electronics Engineering	3	1	0	0	4	4
5	Engineering Science Course	ESME202B	Engineering Mechanics - Essentials	1	1	0	0	2	2
6	Engineering Science Course	ESCCS202	Programming for Problem Solving using C	2	1	0	0	3	3
7	Humanities and social sciences including Management	ESP201A	Essential Studies for Professionals - I	1	0	0	0	1	0.5
PRACTICAL									
8	Basic Science Course	BSCCH292	Chemistry Laboratory	0	0	3	0	3	1.5
9	Engineering Science Course	ESCEC291	Basic Electronics Engineering Laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCME293	Workshop/ Manufacturing Practices	1	0	4	0	5	3
11	Engineering Science Course	ESCCS292	Programming for Problem Solving Laboratory using C	0	0	4	0	4	2
SESSIONAL									
13	Humanities and social sciences including Management	SDP281A	Skill Development for Professionals - I	0	0	0	1	1	0.5
14	Humanities and social sciences including Management	IKS281	Indian Knowledge System for Engineers	0	0	0	4	4	2
Mandatory Industry and Value Added Courses (IVC)									
15	Mandatory Industry and Value Added Courses (IVC)	IVC281B	Design Thinking and Innovation - Creativity and IPR	0	0	0	1	1	0
16	Mandatory Industry and Value Added Courses (IVC)	IVC282B	Finance and Venture Design	0	0	0	1	1	0
17	Mandatory Co-curricular Courses	MCC281B	Co - Curricular Subjects B	0	0	0	1	1	0
Total Credit Points of Semester				**16**	**5**	**15**	**8**	**44**	**30.5**
Co-curricular Subjects: 1. Foreign Language, 2. Physical Education									

University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus for B.Tech Admission Batch 2025

Subject Name: Mathematics and Basic Statistics **Credit: 4** **Lecture Hours: 48**

Subject Code: BSCM203B

Pre-requisite: High School Mathematics

Relevant Links:

Study Material Coursera NPTEL NPTEL NPTEL NPTEL Linkedin Learning Infosys Springboard

COURSE OBJECTIVES:

1. **To give an exposure of basic concepts related to matrices, ordinary differential equations, vector space as well as basic statistics to the students enrolled in the first year of B.Tech. program.**
2. **To lay the foundation of various applications of mathematics in their further course of study.**
3. **To solve and analyze various situations of interest in engineering.**
4. **To imbibe the idea of mathematical modelling with application to real life problems.**

COURSE OUTCOMES:

CO 1: Identify different types of matrices and relate the concept of rank for solving linear system of equations and apply the concept of eigenvalues, eigenvectors, and diagonalization of matrices.

CO 2: Appraise the idea of vector space and inner product spaces and orthogonalization for understanding physical and engineering problems.

CO 3: Appraise different techniques to solve first and second order ordinary differential equations with its formulation to address the modeling of systems and problems of engineering sciences.

CO 4: Explain the concept of Basic Statistics with their properties and applications in physical and engineering environment.

Module number	Topic	Sub-topics	Mapping with Textbooks	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Matrices**	Linear Systems of Equations, Rank of a Matrix. Eigenvalues and Eigenvectors; Eigenvalues of some special matrices; Cayley-Hamilton Theorem; Similarity Matrix, Diagonalization of matrices.	**T1: Chapter 2** Secs. 2.7, 2.9, 2.10, 2.13 – 2.16	***International Academia:*** Syllabus | Engineering Math: Differential Equations and Linear Algebra | Mechanical Engineering | MIT OpenCourseWare Part III: Linear Algebra | Calculus Revisited: Complex Variables, Differential Equations, and Linear Algebra | Supplemental Resources | MIT OpenCourseWare Linear Algebra, Calculus, &	10	1. Write a function that takes a matrix, a row number and a column number. Beginning with the row number passed to the function, scroll down the column passed to the function and return the row number that contains the

				Applications I Stanford Online ***AICTE prescribed syllabus:*** Untitled_1-min.pdf (aicte-india.org) ***Industry Mapping & Simulation:*** MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/ ***Generative AI:*** Microsoft Math Solver https://math.microsoft.com/en		largest absolute value in the column. 2. Using MATLAB, find the determinant and rank of a matrix. 3. Compute eigenvalues and eigenvectors of a matrix $A \in \mathbf{R}^{n\times n}$. 4. Solve a linear system of equations.

2	**Vector Space**	Vector Space, Vector Subspace, Linear Independence and 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; Inner Product Spaces, Gram-Schmidt Orthogonalization.	**T2: Chapter 15, 25 & 27** l	***International Academia:*** Linear Algebra, Calculus, & Applications I Stanford Online Part III: Linear Algebra | Calculus Revisited: Complex Variables, Differential Equations, and Linear Algebra | Supplemental Resources | MIT OpenCourseWare Syllabus | Engineering Math: Differential Equations and Linear Algebra | Mechanical Engineering | MIT OpenCourseWare ***AICTE prescribed syllabus:*** Untitled_1-min.pdf (aicte-india.org) ***Industry Mapping:*** MATLAB	14	1. Write a program of check the independence of any three vectors in $\mathbf{R^3}$. 2. Find the inner product of any two vectors of $\mathbf{R}^3$. 3. Using Gram-Schmidt Orthogonalization , find the orthonormal vectors for any three vectors in $\mathbf{R^3}$.

3	**Ordinary Differential Equations**	First order first degree equations: Exact equations, Rules for finding Integrating Factors, Linear and Bernoulli's equations. Equations of first order but not of first degree: Equations solvable for p, Equations solvable for x, Equations solvable for y and Clairaut's type. Second Order Linear Differential Equations with constant coefficients, D-operator Method, Method of Variation of Parameters; Cauchy-Euler Equation; Power Series Solutions, Frobenius method.	**T1: Chapter 11** Secs. All **Chapter 11** Secs. All **Chapter 16** Secs. 16.1 – 16.4	**International Academia:** Syllabus | Engineering Math: Differential Equations and Linear Algebra | Mechanical Engineering | MIT OpenCourseWare Part III: Linear Algebra | Calculus Revisited: Complex Variables, Differential Equations, and Linear Algebra | Supplemental Resources | MIT OpenCourseWare ***AICTE prescribed syllabus:*** Untitled_1-min.pdf (aicte-india.org) ***Industry Mapping:*** MATLAB	14	1. Solve any initial valued ordinary differential equation. 2. Solve any boundary valued ordinary differential equation

4	**Basic Statistics**	Measures of Central Tendency- Mean, Median & Mode; Measures of Dispersion – Variance and Standard Deviation; Moments, Skewness, Kurtosis; Correlation & Regression, Rank Correlation.	**T1: Chapter 25**	***International Academia:*** **Theory of Probability Course I Stanford Online** Statistical Methods in Engineering & Physical Sciences I Stanford Online) ***AICTE prescribed syllabus:*** Untitled_1-min.pdf (aicte-india.org) ***Industry Mapping:*** MATLAB	10	1. Plot Scatter diagram, Histogram, Frequency Polygon, Ogive (two types) for any given data. 2. Find mean, median, mode for ungrouped data. 3. Find the correlation and rank correlation between two variables. 4. Find the regression line between two variables.

Text Book:

T1: B. S. Grewal, "Higher Engineering Mathematics", 44th Edition (2021), Khanna Publishers.

T2: B. K. Pal & K. Das, "Engineering Mathematics" - Vol. 1, 10th Edition (2021), U. N. Dhur & Sons.

Reference Books:

1. **Biswadip Basu Mallik & Krishanu Deyasi,** "Engineering Mathematics" – Vol. 1A, 2B, 1st Edition (2020), Cengage Learning.
2. **Erwin Kreyszig,** "Advanced Engineering Mathematics", 10th Edition (2017), John Wiley & Sons.
3. **R. K. Jain and S. R. K. Iyengar,** "Advanced Engineering Mathematics", 5th Edition (2016), Narosa Publication House.

4. **B. V. Ramana,** "Higher Engineering Mathematics", 11th Reprint (2017), Tata McGraw Hill.

5. **Amos Gilat,** "Matlab: An Introduction with Applications", 6th Edition (2016), John Wiley & Sons.

6. **Rudra Pratap,** "Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers", 7th Edition (2019), Oxford University Press.

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Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus and Lesson Plan for B.Tech Admission Batch 2025

Subject Name: Chemistry **Credit: 4** **Lecture Hours: 48**

Subject Code: BSCCH202

Maximum: 100 marks (Internal: 30 marks; External: 70 marks)

Pre-requisite: Basic knowledge of Chemistry in Class- XI and XII level

Relevant Links:

A. **STUDY MATERIAL**

B. **Coursera**

C. **NPTEL**

D. **IEM Learning**

COURSE OBJECTIVES:

1. To acquaint the students with the basic phenomenon/concepts of chemistry, the student faces during course of their study in the Industry and Engineering field.

2. The student with the knowledge of the basic chemistry will understand and explain scientifically the various chemistry related

problems in the industry/engineering field.
3. The student will be able to understand the new developments and breakthroughs efficiently in engineering and technology.

4. The introduction of the latest (R&D oriented) topics will make the engineering student upgraded with the new technologies

COURSE OUTCOMES:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the (10+2) levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. The course will enable the student to:

CO1: Analyze nano- structures, intermolecular forces and microscopic properties in terms of orbital concept of hydrogen atoms and bands of solid extending to Crystal field of transition metal ions using quantum mechanical approach.

CO2: Rationalize bulk properties using thermodynamic considerations and equilibrium conditions predicting the interactions in different systems.

CO3: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels and its subsequent applications.

CO4: Able to apply stereo chemical approach for structure prediction and drug design in fundamental organic reactions.

Detailed Syllabus:

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment	Books

1	**Atomic and molecular structure**	Schrödinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.	***International Academia:*** MIT- https://ocw.mit.edu/courses/5-111sc-principles-of-chemical-science-fall-2014/pages/unit-i-the-atom/ https://ocw.mit.edu/courses/5-111sc-principles-of-chemical-science-fall-2014/pages/unit-ii-chemical-bonding-structure/lecture-13/ Stanford University- https://explorecourses.stanford.edu/search?view=catalog&filter-coursestatus-Active=on&page=0&catalog=&academicYear=&q=crystal+field+theory&collapse= ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf ***Industry Mapping:*** A Python Program for Solving Schrödinger's Equation in	7	1. Estimation of Hardness of water sample by Complexometric titration. 2. Synthesis of Nanoparticles	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 1

			Undergraduate Physical Chemistry | Journal of Chemical Education (acs.org) https://in.mathworks.com/matlabcentral/fileexchange/125425-matlab-support-package-for-quantum-computing			
2	**Spectroscopic techniques and applications**	Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.	***International Academia:*** ***https://ocw.mit.edu/courses/5-80-small-molecule-spectroscopy-and-dynamics-fall-2008/*** ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf ***Industry Mapping:*** HORIBA Scientific's Lab Spec 6 Spectroscopy Suite provides an intuitive, powerful software platform for imaging	6	1. Estimation of metal ions using UV-vis spectroscopy. 2. Studies on the synthesis of Nanoparticles using UV-vis spectroscopy.	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 2

			and spectroscopy by Raman, photoluminescence (PL), cathodoluminescence (CL) and AFM-Raman. ***https://www.horiba.com/int/scientific/products/detail/action/show/Product/labspec-6-spectroscopy-suite-software-1843/***			
3	**Intermolecular forces and potential energy surfaces**	Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.	***International Academia:*** *MIT*- Unit III: Thermodynamics & Chemical Equilibrium | Principles of Chemical Science | Chemistry | MIT Open Course Ware *Stanford University*- Stanford University Explore Courses ***AICTE Syllabus*:** Final_ECE.pdf (aicte-india.org) ***Industry Mapping:*** The equations of state for gases are essential in various engineering applications, including the design and ***operation of chemical processes, HVAC systems,*** and the	3	1. Determination of surface tension of liquids using Stalagmometer Instrument 2. Determination of viscosity of liquids using Ostwald Viscometer.	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 3

			petroleum industry.			
4	**Use of free energy in chemical equilibria**	Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.	***International Academia:*** *MIT-* ***https://ocw.mit.edu/courses/5-60-thermodynamics-kinetics-spring-2008/resources/lecture-13-gibbs-free-energy/*** ***https://ocw.mit.edu/courses/5-111sc-principles-of-chemical-science-fall-2014/pages/unit-iii-thermodynamics-chemical-equilibrium/lecture-16/*** ***https://ocw.mit.edu/courses/5-60-thermodynamics-kinetics-spring-2008/pages/lecture-notes/*** ***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf	9	1. Acid base titration (Colorimetric) 2. Acid base titration (Conductometric) 3. Acid base titration (pH metric) 4. Potentiometric Titration 5. Determination of the partition coefficient of a substance between two immiscible liquids (Heterogeneous Equilibrium). 6. Determination of hardness of water sample 7. Determination of alkalinity of water sample	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition, chapter 5, 6, 7, 18

			Industry Mapping: Energy, entropy and free energy concepts come from thermodynamics and are applicable to all fields of science and engineering. Instruments Used in Industries: **Potentiometer, Conductivity meter, pH-meter** Gibbs Energy Minimization Software for Geochemical Modeling: https://www.bing.com/ck/a?!&&p=c92d076e6c36cf3aJmltdHM9MTcwMTEyOTYwMCZpZ3VpZD0xNjY1NGQ4Yy03NDMzLTYyMDAtMDE0Yi01YzcwNzU5ZTYzNWUmaW5zaWQ9NTIxMQ&ptn=3&ver=2&hsh=3&fclid=16654d8c-7433-6200-014b-5c70759e635e&psq=gibbs+free+energy+software&u=a1aHR0cDovL2dlbXMud2ViLnBzaS5jaC8&ntb=1 Materials analysis applying thermodynamic (MAAT)			

			software: A friendly and free tool to analyze the formation of solid solutions, amorphous phases and intermetallic compounds - ScienceDirect https://github.com/MathWorks-Teaching-Resources/Thermodynamics			
5	**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	***AICTE-prescribed syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf ***International Standards***: https://ocw.mit.edu/courses/5-111sc-principles-of-chemical-science-fall-2014/pages/unit-ii-chemical-bonding-structure/lecture-9/ ***Industry Mapping:*** Stanford AI recreates chemistry's periodic table of elements https://news.stanford.edu/press-releases/2018/06/25/ai-recreates-chemistrys-periodic-table-elements/	3	**Periodic table and Graph** *Part-1*: study the structure of the Periodic Table of Elements and use it to find information about elements. *Part-2*: create a graph on excel or on the graph paper out of the given data sets. https://www.coursehero.com/file/179637355/Lab-3-Periodic-Table-	Chemistry- I, Second Edition, Gourkrishna Das mohapatra, chapter- 5

					Graph-2pdf	
6	**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	**International Standards** :(https://ocw.mit.edu/courses/5-12-organic-chemistry-i-spring-2003/resources/5_12_outline_1st_half/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf) **Industry Mapping:** Chem Draw software	3		Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition, chapter 27
7	**Organic reactions and synthesis of a drug molecule**	Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.	***International Academia:*** https://ocw.mit.edu/courses/5-12-organic-chemistry-i-spring-2003/resources/5_12_outline_1st_half/ https://explorecourses.stanford.edu/m_search?page=0&q=CHEM&filter-coursestatus-Active=on&filter-catalognumber-	7	Determination of the rate constant of an organic reaction Thin layer chromatography https://vlab.amrita.edu/?sub=3&brch=63&sim=154&cnt=2	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition, chapter 26

			CHEM=on https://catalog.mit.edu/subjects/5/ ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf) **Industry Mapping:** Chem Draw software, Chem3D software Drug Design and Lead Molecule Discovery using Structure Based Virtual Screening and Molecular Docking. Introduction to Generative Chemistry- Application of Generative AI in Chemistry. ***Industry Tool:*** Screening of drug molecules using Popular Industrial Software using			

			AutoDock, AutoDock Vina, Open Babel, Biovia Discovery Studio			

Text Books:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition
2. Chemistry- I, Second Edition, Gourkrishna Das mohapatra

Reference Books:

1. Physical Chemistry, P.C. Rakshit, Sarat Book distributors, Calcutta, 7th Edition

2. Physical Chemistry, G.W. Castellan, Narosa Publishing House, 3rd Edition

3. Fundamentals of Molecular Spectroscopy by C. N. Banwell & E.M. McCash, McGraw Hill Education India Publishers, 5th Edition

4. A Guide Book to Mechanism in Organic Chemistry by Peter Sykes, Pearson Publishers, 6th Edition

5. Inorganic Chemistry, Part- I & II, R.L Dutta, The New Book Stall Publishing House

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University of Engineering and Management
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University of Engineering & Management, Jaipur

2nd Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: English in Practice & Theory **Credit: 2** **Lecture Hours: 24**

Subject Code: HSMC201

Pre-requisite: Basic English Proficiency, Listening and Speaking Skills, Reading and Writing Skills, Academic and Social Contexts, and Familiarity with Corporate Ethics.

Relevant Links:

STUDY MATERIAL **Coursera** **NPTEL** **IEM Learning**

COURSE OBJECTIVES:

1. Demonstrate the ability to apply grammar, syntax, and vocabulary fundamentals in written and spoken communication.
2. Communicate effectively in both academic and social contexts by adapting language skills to different situations.

3. Apply language skills in professional settings, showcasing readiness for the industry, and demonstrate an understanding of corporate ethics in communication and decision-making.
4. Demonstrate basic proficiency in English by reading, listening, comprehending, writing, and speaking effectively in various contexts.

COURSE OUTCOMES:

CO1. Achieve competence in grammar, syntax, and vocabulary fundamentals.
CO2. Effectively communicate in academic and social contexts.
CO3. Develop readiness for the industry and understand corporate ethics.
CO4. Acquire basic proficiency in English encompassing reading, listening, comprehension, writing, and speaking skills.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Textbook Mapping	Corresponding Lab Assignment
1.	**Vocabulary Building**	1.1 The concept of vocabulary and word formation (Ch-1.1, page 3) 1.2 Root Words from foreign languages (Ch- 1.2, page 2) 1.3 Acquaintance with Prefixes and Suffixes (Ch-1.3, page 11) 1.4 Synonyms, antonyms, and Standard abbreviations (Ch-1.4, page 15)	***International Academia:*** https://ocw.mit.edu/courses/21g-232- advanced-speaking- and-critical-listening- skills-els-spring- 2007/ https://ocw.mit.edu/courses/24-901-language-and-its-structure-i-phonology-fall-2010/ ***AICTE Prescribed Syllabus:***	**3**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House	Activities on vocabulary building and Lexigraphy games. Exercises involve creating and using industry-specific vocabulary and understanding jargon.

			https://www.aicte-india.org/sites/default/files/ Untitled_1-min.pdf ***Industry Mapping:*** Business writing and corporate documents.			
2.	**Basic Writing Skills**	2.1 Sentence Structures (Ch-2.1, page 54) 2.2 Use of phrases (Ch-2.2, page 66) 2.3 Importance of proper punctuation (Ch- 2.3, page 62) 2.4 Creating coherence (Ch-2.4, page 65) 2.5 Organizing principles of paragraphs in documents (Ch-2.5, page 68) 2.6 Techniques for writing precisely (Ch-2.6, page71)	***International Academia*** https://ocw.mit.edu/courses/21w-011- writing-and-rhetoric- rhetoric-and- contemporary-issues- fall-2015/ ***AICTE Prescribed Syllabus:*** https://www.aicte-india.org/sites/default/files/ Untitled_1-min.pdf ***Industry Mapping:*** Formal business Correspondence, project, and business writing.	**4**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House	Presentation activities and interactive activities with punctuation.
3.	**Identifying Common Errors in Writing**	3.1-Subject – Verb agreement (Ch-3.1, page- 85) 3.2- Noun-Pronoun Agreement (Ch-3.2, page 89)	***International Academia:*** https://ocw.mit.edu/courses/24-900-introduction-to-linguistics-spring-	**4**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House	Presentation skills on grammar and related topics on modifiers and redundancies.

		3.3- Misplaced modifiers (Ch- 3.3, page 93) 3.4- Articles and Prepositions (Ch- 3.4, 97) 3.5-Redundancies and Clichés (Ch- 3.5, page 102)	2022/ ***AICTE Prescribe d Syllabus:*** https://www.aicte-india.org/sites/default/files/ Untitled_1-min.pdf ***Industry Mapping:*** Formal business Correspondence.			
4.	**Nature and Style of Sensible Writing**	4.1- Describing, Defining and Classifying (Ch- 4.1, page- 123) 4.2- Providing examples or evidence (Ch-4.2, page- 125) 4.3- Writing introduction and conclusion (Ch- 4.3, page- 129)	***International Academia*:** https://ocw.mit.edu/courses/21w-794-graduate-technical-writing-workshop-january-iap-2019/ ***AICTE Prescribe d Syllabus:*** https://www.aicte-india.org/sites/default/files/ Untitled_1-min.pdf ***Industry Mapping:*** Email writing and writing	**3**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House	Creative writing skills on descriptive essays, expository writing, persuasive writing, and Narrative writing.

			other relevant corporate documents.			
5.	**Writing Practices**	5.1- Comprehension (Ch-5.1, page- 142) 5.2- Precis Writing (Ch-5.2, page- 149) 5.3- Essay Writing (Ch-5.5, page- 152) 5.4 Business Correspondence (Letter Writing, Business Letter, Cover Letter, Memos, Email) (Ch- 5.5, page- 156) 5.5- CV Writing (Ch-5.5, page- 166)	***International Academia:*** https://ocw.mit.edu/courses/21g-225-advanced-workshop-in-writing-for-science-and-engineering- els-spring- 2016/ ***AICTE Prescribed Syllabus:*** https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf ***Industry Mapping*:** Project writing and documentation	**5**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House	Activities on reading comprehension and creative writing skills and assignments on concise writing.
6.	**Listening and Speaking Practices**	6.1- Listening Comprehension (Ch- 6.1, page-182) 6.2- Pronunciation,	***International Academia:*** https://ocw.mit.edu/courses/21g-223- listening-speaking-and-	**5**	Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan	Interactive Practice sessions in language lab.

		intonation, Stress, and rhythm (Ch-6.2, page- 182) 6.3- Common everyday situation: Conversations and dialogues (Ch- 6.3, page- 184) 6.4-Communication at Workplace (Ch- 6.4, page- 188) 6.5- Interviews & Group Discussions (Ch- 6.5, page- 188) 6.6- Formal Presentations (Ch- 6.6, page- 188)	pronunciation-fall-2004/ https://ocw.mit.edu/courses/21g-232-advanced-speaking- and-critical-listening- skills-els-spring-2007/ https://online.stanford.edu/courses/gsb- x0011-sharpen-your-communication-skills ***AICTE Prescribed Syllabus:*** https://www.aicte-india.org/sites/default/files/ Untitled_1-min.pdf ***Industry Mapping:*** Campus Interviews and recruitment drives.		Publishing House	

Tools Used:

Generative AI: Chatgpt, Gemini, Meta AI

Image generator: Dall-E, Nvidia, Canva

Plagiarism checker: GptZero, Ithenticate

ATS Resume Checker

TEXTBOOKS:

1. Das Biswas, Samapika & Riya Barui. *Mastering the Art of English*.2024. Publisher(s): Aryan Publishing House.
2. Raman, Meenakshi. *Technical Communication Principles*. Oxford University Press.
3. Prasad, P. *Universal English in the Twenty-First Century*. Katson Books, Published by S.K. Kataria and Sons. AICTE Approved.

REFERENCE BOOKS:

1. Rizvi, M. Ashraf. *Effective Technical Communication*. Publishers: McGraw Hill, Education.
2. Kumar, Sanjay & Pushp Lata. *Communication Skills*. Oxford University Press.
3. Chauhan, Gajendra Singh, Smita Kashiramka, and L. Thimmesha. *Functional English*. Published by Cengage Learning India Private Limited.

Syllabus for B.Tech Admission Batch 2025

Subject Name: Basic Electronics Engineering Credit: 3 Lecture Hours: 36

Subject Code: ESCEC201

Study Material Coursera NPTEL Linkedin Learning

COURSE OBJECTIVES:

1. **To introduce basic concept of Electronics**
2. **To study semiconductor, its band-structure, p-type and n-type semiconductor**
3. **To introduce the concept of P-N junction diode, Zener diode.**
4. **To learn the concept of BJT, FET and OPAMP.**
5. **To illustrate the basic concept of logic gates**

Course Outcomes:

CO1: To conceptualize the fundamentals of semiconductor physics including the band structures.

CO2: To be able to understand the basics of p-n junction diode and Zener diode and their applications.

CO3: To be able to understand the concept of Transistors working principles, characteristics and their applications.

CO4: To study the basics of digital electronics including basic gates, universal gates and truth tables.

Module number	Topic	Sub-topics	Textbook Name and chapter	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1.	**Semicon-ductor Physics**	Classification of Metal, insulator and semiconductor, Introduction to active and passive components, intrinsic and extrinsic semiconductor, n-type and p-type semiconductors and their Band structure, carrier concentration, scattering and drift of electrons and holes, drift current, diffusion mechanism, generation and recombination and injection of carriers, **density of state function and dimensional problem quantization**	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky **Chapter**-1	***International Academia:*** (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2009) (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)	6	1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimetres etc. 2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.

				Industry Mapping: TCAD Software		
2.	**P-n Junction diode and Zener diode**	Diodes: Semiconductor p-n junction formation, forward and reverse bias, V-I characteristics of p-n junction diode, **Current equation**, **Derivation for Forward and Reverse current, piece-wise linear diode characteristics,** Diode as a switch, Application of diode in Clipper and Clamper Circuits, Zener Diodes, V-I characteristics of Zener Diodes, application of junction diode as a rectifier, Half-Wave and Full-Wave Rectifier Circuits, **SCR Operation & Characteristics.**	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky **Chapter**-2	***International Academia:*** (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2009) (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) ***Industry Mapping:*** TCAD Software	6	1. Circuit designing using p-n junction diodes. **i.** Study the I-V characteristics of a p-n junction diode **ii.** Design and implement clipper circuits using a diode and observe their effect on the output waveform. **iii.** Design and implement clamper circuits using a diode and observe their effect on the output waveform. 2. Study of I-V characteristics of Zener diodes. 3. Design and implement voltage over-protection circuit using a Zener diode 4. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
3.	**Bipolar Junction Transistors**	Bipolar Junction Transistor (BJT): Type, Operation, Physical mechanism, current gain, minority current distribution; Punch-	Electronic Devices and Circuits Theory by Robert L.	***International Academia:*** (https://ocw.mit.edu/courses/6-012-microelectronic-	6	1. Study of Characteristic curves for CB, CE mode configuration and find the

		through and avalanche effect**,** V-I Characteristics, region of operation, input & output characteristics for CB. CE & CC mode, current amplification factors α for CB mode and β for CE mode, BJT as amplifier and switch, small signal analysis**, small signal analysis using h-parameter, gain and impedance calculation**	Boylestad, Louis Nashelsky **Chapter**-3	devices-and-circuits-fall-2009) (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) ***Industry Mapping:*** TCAD Software, SPICE Software		respective hybrid parameters.
4.	**Field effect transistors**	Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier, CMOS technology, Advanced CMOS devices (Example: FinFETs, MOSFETs with high mobility channels, and silicon nanowire transistors), IGBT	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky **Chapter**-6	***International Academia:*** (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2009) (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Cur	6	1. Study of I-V characteristics of Field Effect Transistors and show the characteristics in LTSpice.

				riculum/Final_ECE.pdf) ***Industry Mapping:*** TCAD Software, SPICE Software		
5.	**OPAMP**	Ideal Op-AMP, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), Inverting Configuration, Noninverting configuration, DC imperfections, difference amplifiers, circuits based on Op-amps: Integrators, differentiators, filters, logarithmic amplifiers, Schmitt trigger, **frequency dependent negative resistance and solution of differential equations**	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky **Chapter - 10**,11	***International Academia:*** (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2009) (https://ocw.mit.edu/courses/6-012-microelectronic-devices-and-circuits-fall-2005/) ***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) ***Industry Mapping:*** TCAD Software, SPICE Software	6	1. Design and simulate Inverting and Non-inverting amplifiers using Op-amp and draw waveforms in LTSpice 2. Design and simulate Adder and Subtractor circuits using Op-amp and draw waveforms in LTSpice 3. Design and simulate Differentiator and Integrator circuits using Op-amp and draw waveforms in LTSpice 4. Determination of input-offset voltage, Offset null of Op-amps, etc.
6.	**Digital Logic gates**	Components of TTL circuits, Boolean Algebra and Logic Gates, Basic Logic AND, OR, NOT Gates and Universal gates, XOR and XNOR gate, their symbols and Truth tables,	Digital Logic Design 4th Edition by M . Morris Mana and Michael D. Ciletti Chapters 1,2,4	***International Academia:*** (https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html)	6	1. Study of Logic Gates and realization of Boolean functions using Logic Gates.

		De Morgan's Theorems, Combinational Circuit (adders/subtractors, magnitude comparator, multiplexer, demultiplexers, encoders, decoders).		***AICTE-prescribed syllabus:*** (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) ***Industry Mapping:*** Hardware Chipsets Software- TinkerCad, EDA Playground		2. Show NAND and NOR gates are universal gates. 3. Write a VHDL code to describe the functionality of various gates. Compile and simulate the code to obtain the timing waveform.

Text Books:

1. Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky (Chapters 1,2,3,6,10,11)
2. Digital Logic Design 4th Edition by M . Morris Mano and Michael D. Ciletti (Chapters 1,2,4)

Reference Books:

1. Streetman, Solid State Electronic Devices, Pearson Education India
2. Donald Neamen, Semiconductor Physics and Devices, McGraw-Hill Higher Education
3. Simon M. Sze, Yiming Li, Kwok K. Ng, Physics of Semiconductor Devices, John Wiley & Sons
4. **Millman, Grabel, Microelectronics, McGraw Hill**
5. **Sedra, Smith, Microelectronic Circuits, Oxford University Press.**

University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

2nd Semester Syllabus for B.Tech in ECE Batch 2025-2029

Subject Name: Engineering Mechanics-Essentials **Credit:2** **Lecture Hours: 24**

Subject Code: ESCME202B

Pre-requisite: High School Mathematics

Relevant Links:

Study Material Coursera NPTEL

COURSE OBJECTIVES:

1. To build foundational understanding of equilibrium of forces and moments in mechanical systems.
2. To enable students to determine the center of gravity and moment of inertia for regular and composite bodies.
3. To develop a conceptual understanding of dynamic equilibrium and the motion of rigid bodies using Newtonian and D'Alembert frameworks.
4. To analyze particle and rigid body motion, and understand the relationship between work, energy, and power for mechanical systems.

COURSE OUTCOMES:

CO 1: Apply principles of force and moment equilibrium to assess the static behavior of mechanical systems.

CO 2: Determine the center of gravity and moment of inertia for regular and composite bodies using standard analytical techniques.

CO 3: Analyze dynamic equilibrium and rigid body motion by employing Newtonian and D'Alembert formulations.

CO 4: Apply work-energy and power relations to interpret and solve particle and rigid body motion problems in mechanical systems.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	**Force & Equilibrium Systems**	Basic concepts, ; Rigid Body equilibrium (2-D & 3-D); System of Forces, Coplanar - Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Concept of Free body diagrams, Equations of Equilibrium of Coplanar Systems, Lami's Theorem.	***International Academia:*** ***https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/*** ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf*** ***Industry Mapping:*** *MATLAB*	4	Solving force equilibrium problems in MATLAB and validating with analytical solutions.	B.B. Ghosh, S. Chakrabarti, S. Ghosh "Engineering Mechanics", Part I - Chapter 1, 3
2	**Centre of Gravity & Moment of Inertia**	Centre of Gravity and its implications; Centroid of simple figures from first principle, centroid of composite sections; Area moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard	***International Academia:*** ***https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/*** ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf***	5	Solving numerical problems on CG & MI in MATLAB and validating with analytical solutions	

		sections and composite sections; Concept of Mass moment inertia.	***Industry Mapping:*** *MATLAB*			
3	**Brief Introduction to Dynamic Equilibrium**	.Application of Newton's laws and D' Alembert's principles to solve motion problems	***International Academia:*** ***https://ocw.mit.edu/courses/2-003sc-engineering-dynamics-fall-2011/*** ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf*** ***Industry Mapping:*** *MATLAB, Tensorflow ,* *PyTorch*	5	Create a ML model to predict a particle's final velocity given varying forces and masses	B.B. Ghosh, S. Chakrabarti, S. Ghosh "Engineering Mechanics" - Part II – Chapter 3
4	**Dynamics of Rigid Bodies**	Translation and rotation of rigid bodies; instantaneous center of rotation and velocity analysis. Force, torque, and moment of inertia; plane motion types - translation, rotation, and general motion. Application of D'Alembert's principle for dynamic equilibrium; equations of motion for translation, rotation, and	***International Academia:*** ***https://ocw.mit.edu/courses/2-003sc-engineering-dynamics-fall-2011/*** ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf*** ***Industry Mapping:*** ***ANSYS Mechanical***	6	Model a rigid body in Open Modelica with specified rotation and translation parameters. Observe the effect of applied torques and forces on its motion, and plot angular velocity and acceleration over time.	S.S. Bhavikatti "Engineering Mechanics – Vector and Classical Approach" - Chapter 8

		combined motion.				
5	**Work, Energy & Power**	Work-energy principle for particles, Kinetic energy, potential energy, and conservation of energy	***International Academia:*** ***https://ocw.mit.edu/courses/2-003sc-engineering-dynamics-fall-2011/*** ***AICTE-prescribed syllabus:*** ***https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf*** ***Industry Mapping:*** *MATLAB, Blender*	4	Use Mujoco or PyBullet to simulate a particle's trajectory under different initial velocities and accelerations. Analyze how changes in parameters affect the path	B.B. Ghosh, S. Chakrabarti, S. Ghosh "Engineering Mechanics" - Part II – Chapter 4

TEXT BOOKS:

1. B.B. Ghosh, S. Chakrabarti, S. Ghosh, "Engineering Mechanics", Vikas Publishing House ((Part I - Chapters 1, 3, 5, 6, Part II – Chapters 4)
2. S.S. Bhavikatti "Engineering Mechanics – Vector and Classical Approach" New Age International Publishers (Chapter 8)

REFERENCE BOOKS:

1. A. Chanda & D. Nag," Engineering Mechanics", Wiley India, 2017.
2. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Statics", Wiley.
3. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley.
4. Timoshenko, Young, Rao, Pati, "Engineering Mechanics," McGraw Hill

Subject Name: Programming for Problem Solving **Credit: 3** **Lecture Hours: 36**

Subject Code: ESCCS202

Lecture Notes | Coursera | NPTEL | LinkedIn Learning | Infosys Springboard

Course Objectives:

Upon successful completion of this course, students will be able to:

- Understand core programming principles and the C programming language.
- Develop C programs to solve computational problems.
- Utilize C libraries for common programming tasks.
- Employ effective programming practices.
- Gain a foundation for further computer science studies.
- Appreciate C programming's industry relevance.

Course Outcomes:

CO1: Impart the fundamental concepts of problem-solving approaches and algorithmic thinking

CO2: Provide comprehensive knowledge of the C programming language, including character sets, expressions, and operators

CO3: Demonstrate control over program flow and logic using input/output operations, control structures, and program organization

CO4: Enable students to solve real-world challenges by applying advanced concepts such as functions, arrays, pointers, data structures and file handling in building end-to-end applications

Module	Topic	Sub-topics	Mapping with Industryand International Academia	Lecture Hours	Corresponding Lab Assignment
1	**Introduction to C**	**Introduction:** • The Von-Neuman Architecture, • Hardware and Software, • Phases of a program execution, • Compiler vs Interpreter, • Phases of a C Program Compilation • Execution of a C Program **Structure of C Program:** • The first C Program: Hello World • Preprocessor Directives • Header Files • The MAIN function • Keywords &Identifiers • Statements • Punctuations and Various Brackets	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping** – Understanding File systems, command line interfaces and programming practices **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	4	• Write a C program that prints "Hello, World!" and your name on separate lines. Add comments explaining each part. • Write a simple C program and conceptually explain the preprocessor, compiler, assembler, and linker phases. Compile and execute it. Introduce an error and observe the compiler message. • List five C keywords with their purposes. Provide five valid and five invalid identifiers with explanations. Write a short program using at least three keywords and three valid identifiers.
2	**Data Representation, I/O and Operators**	**Datatypes** – • Binary Representation, Allocation Size, Range. • Console I/O - printf() & scanf() • Formatted Strings • Format Specifiers • Escape Sequences. **Operators -** • Operands and Expressions • Unary, Binary, Ternary Operators • Arithmetic, Logical,	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping** – Understanding the concept of memory representation of data **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	4	• Write a C program to print the size and range of int, char, float, double, short int, long int, and long double using sizeof(). Experiment with out-of-range values. • Write a program to get user input for name and age and print it back using printf() with appropriate format specifiers. Format the output neatly. Explore different format specifiers. • Write a program that takes two integers and performs addition, subtraction, multiplication, integer division, and modulus, printing the results. • Write a program demonstrating prefix and postfix increment and decrement operators, explaining their difference.

		Assignment, Relational, Bitwise, Increment, Decrement, Conditional Operators • Operator Precedence			• Write a program using logical operators (&&, ||, !) to evaluate a simple condition based on user input. • Write a program using bitwise operators (&, |, ^, ~, <<, >>) on two integers and print the binary results (helper function might be needed). • Write a program with an expression involving multiple operators of different precedence levels. Predict and verify the output.
3	**Control Flow**	**Conditions**: • If, Else, Else if • Nested Conditions • Switch-case • Goto. **Iterations:** • While loop, • Do-while loop, • For loop, • Break and continue, • Nested loops	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping** Learning to build Flowcharts **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	6	• Write a program to check if an input integer is positive, negative, or zero. • Write a program to find the largest of three input integers using nested if-else. • Write a program that takes a character and uses switch-case to identify it as a vowel or consonant (case-insensitive), including a default case. • (Optional) Demonstrate a simple use of goto and explain why it should be used cautiously. • Write a program using a while loop to print the first n natural numbers (n is user input). • Write a program using a do-while loop to repeatedly ask for a positive number until one is entered. • Write a program using a for loop to calculate the sum of even numbers from 1 to 100. • Write a program with a nested loop to print a simple pattern of asterisks. • Write a program with a for loop from 1 to 10. Use break to exit when the number is 5, printing preceding numbers. • Write a program with a for loop from 1 to 10. Use continue to skip even numbers and print only odd numbers.
4	**Arrays and Strings**	**Arrays:** • Declaration and Initialization, • Indexing • Memory Layout • Multidimensional Arrays	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping:** Exploring the foundations of structured data	5	• Declare and initialize an integer array of size 5. Print all elements with their indices. • Write a program to find the sum and average of elements in an integer array. • Write a program to find the largest and smallest element in an integer array. • Declare and initialize a 2x3 integer matrix. Print

		Strings: • Character arrays vs strings • Declaring and initializing strings, • String Input and Output • String library functions	representation and manipulation. **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita		all elements in row-major order. • Write a program to add two 2x2 matrices and print the resulting matrix. • Declare a character array and initialize it with a string literal. Print the string by iterating until the null terminator. • Declare a string using a string literal directly and print it using printf() with %s. • Write a program to get a string input from the user and print it back using scanf() (be aware of buffer overflow) and printf(). • Repeat the above using fgets() for safer string input. • Write a program that takes two strings and uses strlen(), strcpy(), strcat(), and strcmp() from <string.h> to demonstrate their functionalities. •
5	**Function and Recursion**	• Declaration, Definition, & Calling • Formal vs Actual parameters • Return type • Recursion • Scope: local vs global variables • Storage classes: auto, static, extern, register	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping:** Understanding the foundation of procedural programming, code reusability **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	4	• Write a function add (int a, int b) that returns the sum. Call it from main with sample values and print the result. • Write a function is Even(int num) that returns 1 if even, 0 otherwise. Call it from main and print a message based on the return value. • Write a function square (int x). In main, pass a variable to square (call by value) and show the original variable remains unchanged. Explain formal vs. actual parameters. • Write a recursive function factorial (int n). Call it from main and print the result. • Write an iterative function factorial_iterative (int n). Compare it with the recursive version. • Write a program demonstrating local and global variables with the same name, showing which is accessed within a function. • Write a program using a static local variable in a function to show its value persists across calls.
6	**Pointers**	• Concept of memory address, • Declaring and using pointers, • & and * operators.	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping:**	6	• Declare an integer and a pointer to an integer. Assign the integer's address to the pointer. Print the integer's value directly and indirectly, and print the address and pointer value.

		• Call by value vs Call by Reference, • Pointers and arrays, • Pointers with strings, • Pointers to pointers, • Dynamic memory allocation • Command-line arguments.	Explore direct memory manipulation capabilities of C. **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita		• Demonstrate the use of & (address-of) and * (dereference) operators. • Write swap_value(int a, int b) that doesn't swap original values in main (call by value). Explain why. • Write swap_reference(int *a, int *b) that swaps original values using pointers (call by reference). • Declare an integer array and a pointer to its first element. Iterate using pointer arithmetic and print each element. Show the array name acts as a pointer. • Declare a string literal and assign its address to a character pointer. Iterate and print each character until the null terminator. • Declare an integer, a pointer to an integer, and a pointer to a pointer. Demonstrate accessing the original value using the double pointer. • Write a program to get the size of an integer array from the user and use malloc() to allocate memory. Read values, print them, and then free() the memory. • Repeat the dynamic allocation using calloc() and observe the initialization difference. • Write a program to dynamically resize an array using realloc() after initial allocation. • Write a program that takes two command-line arguments (numbers) and prints their sum.
7	**Structures & Unions**	**Structures**: • Defining and declaring structures, • Accessing members • User-defined data types - typedef • Passing structures to functions, • Arrays of structures, • Nested structures **Unions**: • Syntax & memory layout of	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping:** Learning to construct user-defined datatypes. **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	4	• Define a Student structure (name, roll_no, marks). Declare and initialize a Student variable. Print its information using the dot operator. • Use typedef to create an alias for the Student structure. Declare and initialize a variable of the new type. • Write a function displayStudent(struct Student s) to print student info (pass by value). Call it from main. • Write a function updateMarks(struct Student *s, float new_marks) to update marks (pass by reference). Call it from main. • Declare an array of three Student structures,

		unions • Struct vs. union • Enum definition and use in switch-case • Enum vs #define constants			initialize them, and print the information of all students. • Define an Address structure (street, city, zipcode). Modify Student to include an Address member. Declare, initialize, and print a Student with address details. • Define a Data union (int or float). Declare a variable, assign an int and print, then assign a float and print. Observe the output. • Write a short explanation comparing and contrasting structures and unions. • Define an enum DayOfWeek. Write a program that takes an integer input and uses a switch-case with the enum to print the day name. • Explain the advantages of using enums over #define constants for related integer constants.
8	**File Handling**	• The file pointer • Opening & closing a file • Reading and Writing Files • Formatted: fprintf and fscanf • Character: fputc and fgetc • String: fputs and fgets • File Modes • ftell,fseek,rewind,feof	**MIT OCW** – LINK **AICTE** – LINK **Industry Mapping** Learning to build advanced project with database integration **Platforms & IDEs:** GitHub, VSCode, GCC **Competitive Coding:** HackerRank, Leetcode, Codevita	3	• Write a program to open "my_file.txt" in write mode, write a few lines, and close it. Then, open it in read mode and print each line until EOF. • Create a Product structure (name, price). Write a program to write info for three products into a file using fprintf(). Write another program to read this data back using fscanf() and print it. • Write a program to open a file in write mode and use fputc() to write a string character by character. Write another program to read it back using fgetc() until EOF. • Write a program to open a file in write mode and use fputs() to write a few strings (one per line). Write another program to read them back using fgets() until NULL. • Experiment with different file modes ("r", "w", "a", "r+", "w+", "a+") with small programs to understand their behavior. • Write a program to open a file, write data, use ftell() to get the position, fseek() to go to the beginning and read, and rewind() to go to the beginning and read again. • Write a program that reads a file character by character using fgetc() and uses feof() to detect the

					end and stop reading.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Reema Thareja, Computer Fundamentals and programming in C, Oxford University Press
3. Yashavant Kanetkar, Let Us C, BPB Publications,13th Edition

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Alternate Courses:

NPTEL – Introduction to programming in C, Satyadev Nandakumar, IIT Kanpur - https://nptel.ac.in/courses/106104128

COURSERA – Introductory C Programming Specialization- Andrew D. Hilton- https://www.coursera.org/specializations/c-programming

Lesson Plan:

Week	Module	Topics
1	Module 1: Introduction to C	• History, structure of C programs • Compilation phases: Preprocessor, Compiler, Linker • main(), header files, keywords, identifiers
2	Module 2: Data Representation, I/O and Operators	• Data types, memory representation • printf(), scanf(), format specifiers • Arithmetic, Logical, Relational, Bitwise, Assignment operators
3	Module 3: Control Flow – Conditions	• if, else, else if, nested conditions • switch-case, goto (with caution)
4	Module 3: Control Flow – Loops	• while, do-while, for loops • break, continue, nested loops • Pattern printing and number-based logic
5	Module 4: Arrays	• Declaration, initialization, traversal • Sum, average, max/min in array • Introduction to 2D arrays and matrix operations
6	Module 4: Strings	• Character arrays and string literals • Input/output using scanf, gets, fgets • String library functions: strlen, strcpy, strcat, strcmp
7	Module 5: Functions	• Function declaration, definition, and calling • Return values, parameters (call by value) • Scope and storage classes
8	Module 5: Recursion	• Recursive vs iterative logic • Recursive programs: factorial, GCD, Fibonacci
9	Module 6: Pointers – Basics	• Address-of and dereference operators • Pointer arithmetic, arrays and pointers • Call by reference
10	Module 6: Pointers – Advanced	• Dynamic memory: malloc, calloc, realloc, free • Pointer to pointer • Command-line arguments
11	Module 7: Structures & Unions	• Structure declaration, array of structures • Passing structures to functions • Nested structures, typedef • Introduction to Unions and Enums
12	Module 8: File Handling	• File I/O operations: fopen, fclose, fscanf, fprintf, fgetc, fputc, fgets, fputs • File modes, ftell, fseek, rewind, feof

		• Command-line file handling programs

1st Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: Essential Studies for Professionals-I **Credit: 0.5** **Lecture Hours: 48**

Subject Code: ESP201A

Pre-requisite: Basic knowledge of English grammar, Indian history, Civics and Mathematics.

Relevant Links:

Study Material links:

1. https://egyankosh.ac.in/handle/123456789/57865
2. https://ncert.nic.in/textbook.php?keps2=1-10
3. https://books.google.com.na/books?id=XJL5Rk6aHYUC&printsec=copyright&hl=en&pli=1#v=onepage&q&f=false
4. https://egyankosh.ac.in/handle/123456789/57869
5. https://books.google.com.na/books?id=XJL5Rk6aHYUC&printsec=copyright&hl=en&pli=1#v=onepage&q&f=false
6. https://egyankosh.ac.in/handle/123456789/57872
7. https://ncert.nic.in/textbook.php?keps2=2-10
8. https://books.google.com.na/books?id=XJL5Rk6aHYUC&printsec=copyright&hl=en&pli=1#v=onepage&q&f=false
9. https://egyankosh.ac.in/handle/123456789/57885
10. https://books.google.com.na/books?id=XJL5Rk6aHYUC&printsec=copyright&hl=en&pli=1#v=onepage&q&f=false
11. https://egyankosh.ac.in/handle/123456789/53138
12. https://ncert.nic.in/textbook.php?fees1=4-14
13. https://egyankosh.ac.in/handle/123456789/53138
14. https://ncert.nic.in/textbook.php?lehs1=1-4
15. https://nios.ac.in/media/documents/SrSec315NEW/315_History_Eng/315_History_Eng_Lesson3.pdf
16. https://egyankosh.ac.in/handle/123456789/53138
17. https://nios.ac.in/media/documents/SrSec315NEW/315_History_Eng/315_History_Eng_Lesson4.pdf

COURSE OBJECTIVES:

1. To introduce the foundations of grammar, vocabulary, and writing in functional English.
2. To impart knowledge on interpreting data through pie charts.
3. To impart knowledge on the basic structure and key features of the Indian Constitution.
4. To impart knowledge on the early sources and civilizations of Indian history.

COURSE OUTCOMES:

CO 1: Demonstrate proficiency in basic grammar, vocabulary, comprehension, and formal writing.

CO 2: Interpret and analyze data presented in pie charts with accuracy.

CO 3: Explain the making, structure, and key principles of the Indian Constitution.

CO 4: Identify major sources and features of ancient Indian civilizations.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	**Objective English**	1. **Verbs**: Application, Subject-Verb Agreement, 2. **Non-Finites** (Infinitives, Gerunds and Participles) 3. **Application of Tense** 4. **Basic Application of Vocabulary** (Synonyms and Antonyms) 5. **Reading Comprehension** 6. **Official Letter/ Application Writing**	***International Exams*** ***1. GRE*** *(https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37)* ***National Exams:*** ***1. UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21* ***3. Combined Graduate Level conducted by SSC*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-*	12	1. **Textbook:** Objective General English, Author: R.S Agarwal, Publishing house: S. Chand	❖ Verbs and its Application: Practice set based on Spot the Error. ❖ Non-Finites (Infinitives, Gerunds and Participles): Practice set based on Spot the Error. ❖ Application of Tenses: Practice set based on Spot the Error, ❖ Filler (Single & Double) ❖ Reading Comprehension: Comprehend the

			Notification-Emp-News.pdf) ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2. Miscellaneous Services Recruitment Examination*** *(file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1*			passage ❖ Official Letter/Application Writing
2	**Data Interpretation**	**1. Pie Charts**	***International Exams*** ***1. GRE*** *(https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37)* ***National Exams:*** ***1. UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21* ***3. Combined Graduate Level conducted by SSC***	12	1. **Textbook:** An Advanced Approach to Data Interpretation for Competitive Examinations, Author: R.S. Aggarwal, Publisher: S. Chand	❖ Percentage, ratio & average based pie charts. ❖ Degree based pie charts. ❖ Single Pie chart. ❖ Double & Mixed Pie chart

			(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22 ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)* ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2. Miscellaneous Services Recruitment Examination*** *(file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1*			
3	**Constitution of India**	**1. Making of Constitution** **2. Preamble** **3. Fundamental Rights and DPSP** **4. Fundamental Duties**.	***National Exams:*** ***1.UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21* ***3. Combined Graduate Level***	12	**1. IGNOU Study material:** BPSC-102, (Unit 1, 3, 4, 6) **2. NCERT Textbook for class XI:** India Constitution at Work (Chapter 1, 2) **3. History & Civics for ICSE Class**	❖ Classroom Discussion on: "Proposing and defending Constitutional Amendments, fostering critical thinking about societal needs" ❖ Classroom Debate on "the principles outlined in the Preamble exploring their

			conducted by SSC *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)* ***State Level Exams:*** ***1.Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1* ***2. Miscellaneous Services Recruitment Examination*** *(https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) pg 1*		**IX Textboo**k : Sudeshna Sengupta (Chapter-1, 3)	relevance in contemporary society" ❖ Case Study: "Focus on real-life situations involving Fundamental Rights violations or protections" ❖ Assignment: "Analyze the historical background and evolution of Fundamental Duties, along with their relevance in today's societal context." **All the assignments are in line of GS Paper I of UPSC CSE Mains Examination
4	**History**	**1. Sources of Indian History** **2. The Harappan Civilization**	***National Exams:*** ***1.UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence***	12	**1. IGNOU study material -** BHIC-131- (Unit 1) (History of India from the Earliest Times upto 300	❖ Class discussion on "Advanced Urban Planning in the Indus Valley: Comparisons with Modern City

		3. Vedic Civilization	***Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf , pg 20-21)* ***3. Combined Graduate Level conducted by SSC*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf* ***State Level Exams:*** ***1.Civil Services Executive Exam (WBCS)*** ***(****https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2.*** **Miscellaneous Services Recruitment Examination** *(https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf)), pg 1*		C.E.), (Unit 5, 6, 8, 9) **2. NCERT textbook for Class VI:** *Exploring Society India and Beyond* **3. NCERT textbook for Class XII):** *Themes in Indian History-I* **4. NIOS History Module 1**	Planning." ❖ Assignment: Write a short note "Evolution of the Vedic Caste System: Origins, Functions, and Changes Over Time." ❖ Debate: "Status and Roles of Women in the Vedic Civilization: Progressive or Conservative?" ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.

TEXT BOOKS:

1. Textbook: Objective General English, Author: R.S Agarwal, Publishing house: S. Chand
2. IGNOU Study material: BPSC-102
3. NCERT Textbook for class XI: India Constitution at Work
4. History & Civics for ICSE Class IX Textbook : Sudeshna Sengupta
5. IGNOU study material - BHIC-131
6. NCERT textbook for Class VI: *Exploring Society India and Beyond*
7. NCERT textbook for Class XII): *Themes in Indian History-I*
8. NIOS History Module 1

REFERENCE BOOKS:

1. ESP – I Study Material

University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus for B.Tech. Admission Batch 2025

Course Name: Chemistry Laboratory	
Course Code: BSCCH292	
Course Code: BSCCH292	**Category:** Basic Science Courses
Course Title: Chemistry Laboratory	**Semester:** First/Second
L-T-P: 0-0-3	Credit: 1.5
Pre-Requisites: Basic knowledge of Chemistry in Class- XI and XII level. Basic concepts of qualitative and quantitative analysis. Basic knowledge of algebraic calculation and graph plot	

Course Outcomes

CO1: Apply knowledge in quantitative estimation, Electroplating, Electric Power generation and synthesis of Nanomaterials and Quantum dots.

CO2: Operate the instruments properly, record and interpret data.

CO3: Estimate rate constants of reactions from concentration of reactants/products as a function of time.

CO4: Work effectively in teams to accomplish the assigned responsibilities.

List of Experiments

Expt. No.	List of Regular Experiments
1	Determination of the alkalinity present in water (Acid – Base Titration)
2	Determination of the pH of sample solutions by digital pH meter: pH metric titration (using **MATLAB**)
3	Determination of cell constant and conductance of solutions: Conductometric titration (using **MATLAB**)
4	Determination of surface tension of liquids using Stalagmometer Instrument.
5	Determination of viscosity of liquids using Ostwald Viscometer.
6	Determination of the partition coefficient of a substance between two immiscible liquids
7	Determination of the rate constant of a reaction (using **MATLAB**)
8	Potentiometry - determination of redox potentials and emfs
9	Determination of the hardness of water.

Innovative Experiments

Sl No	Name of Experiment	Corresponding Equipments/Links
10	Synthesis and characterization of Nanoparticles	Magnetic Stirrer, UV-visible Spectrophotometer
11	Synthesis and characterization of Carbon Dots	Magnetic Stirrer, UV-visible Spectrophotometer
12	Electroplating	
13	Making Battery: The Generation of Electric Power/Energy from Chemical Energy	
14	Digital Twin of a Water Purification System using MATLAB	
15	Beer's Law Lab Study/Verification	Using UV-visible Spectrophotometer and also using PHET simulator (https://phet.colorado.edu/en/simulations/beers-law-lab)

List of Virtual experiments to be conducted in the laboratory		
Sl No	**Name of the experiment**	**Simulation software link**
16	Saponification/acid value of an oil	https://vlab.amrita.edu/index.php?sub=3&brch=63&sim=688&cnt=4
17	Determination of the Chemical Oxygen Demand.	https://ee2-nitk.vlabs.ac.in/exp/chemical-oxygen/simulation.html
18	Adsorption of acetic acid by charcoal	https://vlab.amrita.edu/?sub=3&brch=190&sim=606&cnt=1
19	Thin layer chromatography	https://vlab.amrita.edu/index.php?brch=63&cnt=1&sim=154&sub=3
20	Colligative properties using freezing point depression	https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=337&cnt=1
21	Rutherford Scattering Experiment	https://phet.colorado.edu/en/simulations/ruth erford-scattering
22	Fluorescence Spectroscopy	https://mfs-iiith.vlabs.ac.in/exp/fluorescence- instrumentation/simulation.html
23	Infrared Spectroscopy	https://ccnsb06-iiith.vlabs.ac.in/exp/solutions-infra-red- spectroscopy/simulation.html

University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur
Syllabus for B.Tech Admission Batch2025

Subject Name: Basic Electronics Engineering Laboratory Credit:2

Subject Code: ESCEC291 Semester: 2nd

Course Objectives:

1. To introduce basic concept of Electronics components
2. To study semiconductor, its band-structure, p-type and n-type semiconductor
3. To introduce the concept of P-N junction diode, Zener diode.
4. To learn the concept of BJT, FET and OPAMP.
5. To illustrate the basic concept of logic gates

Course Outcomes:

CO1: To conceptualize the fundamentals of semiconductor physics including the band structures.

CO2: To be able to understand the basics of p-n junction diode and Zener diode and their applications.

CO3: To be able to understand the concept of Transistors working principles, characteristics and their applications.

CO4: To study the basics of digital electronics including basic gates, universal gates and truth tables.

Module number	Topic	Name of the Experiments	Mapped With IIT
1.	Active and Passive Components	a. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Multimeters etc. b. Determination of Resistance of Carbon Resistors using Colour Code.	1. http://vlabs.iitkgp.ac.in/be/exp1/index.html 2. http://vlabs.iitkgp.ac.in/be/exp2/index.html
2.	PN Junction Diodes	Study of I-V Characteristics of PN Junction Diodes	http://vlabs.iitkgp.ac.in/be/exp5/index.html
3.	Clipper and Clamper Circuit	Familiarization with Clipper and Clamper Circuit	http://vlabs.iitkgp.ac.in/ssds/newexp1/index.html
4.	Zener Diode	a. Study of I-V Characteristics of Zener Diode b. Design a voltage regulator using zener diode	http://vlabs.iitkgp.ac.in/be/exp7/index.html
5.	Bridge rectifier	To construct bridge rectifier with and without filter to have rectified, filtered output dc voltage.	http://vlabs.iitkgp.ac.in/be/exp7/index.html
6.	Bipolar Junction Transister (BJT)	a. Input Characteristics of a NPN type Bipolar Junction Transister (BJT) b. Output Characteristics of a NPN type Bipolar Junction Transister (BJT)	http://vlabs.iitkgp.ac.in/be/exp11/index.html
7.	Oprational –Amplifier (OP-Amp)	Inverting, Non- Inverting Amplifier, Adder, Subtractor	http://vlabs.iitkgp.ac.in/be/exp17/index.html
8.	Logic Gates	a. Verification of truth table of Logic Gates b. Study the Boolean functions using Logic Gates c. Show NAND and NOR gates are universal gates.	http://vlabs.iitkgp.ac.in/dec/exp3/index.html

University of Engineering and Management
Institute of Engineering & Management, Salt Lake Campus
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University of Engineering & Management, Jaipur

Syllabus for B.Tech. Admission Batch 2025

Workshop/ManufacturingPractices(ESCME293)	
Department:	Basic Science and Humanities
Program:	B.Tech.;
Course Code:	ESCME293
TitleofCourse:	Workshop/Manufacturing Practices
Yearof Study:	
Semester:	FirstYear First
ContactHours:	L-T-P:1-0-4
Credits:	3
Typeofcourse:	Laboratory
Pre-requisitesCourses:	• Knowledgeindimensionsandunits. • Usageofgeometricalinstrumentsandanalytical ability.

CourseOutcome(CO):	**CO1:**Upon completion of this laboratory course,studentswillbeabletofabricatecomponents withtheirownhands. **CO2:** They will also get practical knowledge of the dimensional accuracies and dimensionaltolerancespossiblewithdifferentmanufacturingprocesses. **CO3:**By assembling different components,they will be able to produce small devices of their interest. **CO4:** Exposure to some of the advanced and latest manufacturing techniques being Employed in the industry.

List of Experiments & Assignments

Choose any 12experiments from the following list

Expt.No.	Experiment
1	**Fitting shop** : Typical jobs that may be made in this practice module: To prepare a simple type fitting job. Material cutting by Smart Cutting machine like Cricut Maker.
2	**Fitting shop**: Typical jobs that may be made in this practice module: To make a Gauge from MS plate.Machining by using Advance Laser Cut machine.
3	**Casting** : Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated. Introduced advance arc Furnace for improving Foundry experiments .
4	**Welding shop**: Typical jobs that may be made in this practice module: ARC WELDING (4 hours): To join two thick (approx 6mm) MS plates by manual metal arc welding.

5	**Welding shop**: Typical jobs that may be made in this practice module: To join two thin mild steel plates or sheets by gas welding. Welding by using Advance Robotic Arm welding .
6	**Smithy** :Typical jobs that may be made in this practice module: Prepare a simple type job by upsetting process.
7	**Smithy**: Typical jobs that may be made in this practice module: Prepare a simple type job by drawing down process.
8	**Carpentry:** Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.
9	**Machine shop**: Typical jobs that may be made in this practice module: To make a pin from a mild steel rod in a lathe. Advanced machining by using CNC Lathe and CNC Milling.
10	**Machine shop**: Typical jobs that may be made in this practice module: To make rectangular and V slot in a block of cast iron or mild steel in a shaping and / or milling machine.
11	**Plastic moulding & Glass cutting**: Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made.
12	**Plastic moulding & Glass cutting :** Typical jobs that may be made in this practice module: For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.
13	**Electrical & Electronics:** Familiarization with LT switch gear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.
14	**Electrical & Electronics**: Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.
15	**Electrical & Electronics**: Simple wiring exercise to be executed to understand the basic electrical circuit.
16	**Electrical & Electronics**: Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.
17	**Electrical & Electronics**: Simple soldering exercises to be executed to understand the basic process of soldering.

Course Code: ESCCS292	**Category: Engineering Science Course**
Course Name: Programming for Problem Solving Laboratory	**Semester- First/Second**
L-T-P: 0-0-4	**Credit-2**

Laboratory/Practical: List of Experiments:

Week	Ques	Problem Statements
1	1	Write a Program to display "Hello World".
	2	Write a Program to find the last digit of a number and delete the last digit.
	3	Write a Program to find the last digit of a number without using % modulus operator.
	4	Write a Program to delete the last two digits of any user given input number.
	5	Write a Program to double the last digit of any user given input number.
	6	Write a Program to exchange the last two digits of any user given input number.
	7	Read two numbers. Write a Program to find their product after exchanging last digits.
	8	Write a Program to insert 1 as a first digit after decimal.
	9	Write a Program to find out the summation of two variables.
	10	Write a Program to swap two numbers using and without using a third variable.
	11	Write a Program to change temperature from Fahrenheit to Celsius or vice-versa.
2	1	Write Program, which reads a, b and c as sides of a triangle and prints area. Hint: area = $\sqrt{s*(s-a)*(s-b)*(s-c)}$.
	2	Write Program, which reads x1, y1, x2 and y2 and finds distance between points (x1,y1) and (x2,y2).
	3	Write a Program, which reads a, b and c as sides of a Triangle and print whether angel A is 90° or not.

	4	Write a Program to check whether a number is even or odd.
	5	Write a Program to test whether any year is Leap year or not.
	6	Write a Program to accept the marks of a student and display the grade accordingly.
	7	Write a Program to reverse the digits of an integer.
	8	Write a Program to print the summation of digits of user given input number.
	9	Write a Program to check whether a given number is Palindrome or not.
	10	Write a Program to find all the Fibonacci numbers for a given range.
	11	Write a Program to find all prime numbers within a given range.
	12	Write a Program to calculate the Factorial of any integer.
3	1	Print the following pattern upto N Lines: **** **** **** **** for N = 4
	2	Print the following pattern upto N Lines: * ** *** **** for N = 4
	3	Print the following pattern upto N Lines: **** *** ** * for N = 4
	4	Print the following pattern upto N Lines:

		* * * * * * * * * * for N = 4
4	1	Print the following pattern upto N Lines: * *** ***** ******* for N = 4
	2	Print the following pattern upto N Lines: ******* ***** *** * for N = 4
	3	Write a Program to print given pattern: A BB CCC DDDD
	4	Write a Program to print given pattern: ABCDE CDEF EFG GH I
	5	Write a Program to print given pattern: A BC CDE DEFG

		EFGHI
5	1	Write a Program to print given pattern: A AC ACE ACEG ACEGI
	2	Write a Program to print given pattern: 1 12 123 1234 12345 for N=5
	3	Print the following pattern upto N Lines: 10001 01010 00100 01010 10001 for N = 5
	4	Print the following pattern upto N Lines: 1 121 12321 1234321 for N = 4
	5	Print the following pattern upto N Lines: 1 1 1 1 2 1 1 3 3 1 1 4 6 4 1

		for N=5
6	1	Write a Program to declare, read and display values in 1-D array.
	2	Write a Program to declare, read and display values in a 2-D array.
	3	Write a Program in C to copy the elements of one array into another array.
	4	Write a Program in C to count the frequency of each element of an array.
	5	Write a Program to perform different matrix operations like addition, multiplication with 3x3 matrices.
	6	Write a Program to find out the largest/smallest element in array.
	7	Write a Program in C to sort elements of array in ascending order.
	8	Write a Program in C to sort elements of the array in descending order.
7	1	Write a Program to reverse an array.
	2	Write a Program to split an array.
	3	Write a Program to merge two arrays.
	4	Write a Program to check an element is present or not in one 1D array.
	5	Write a Program to find the number of even and odd positions elements in 1D array.
	6	Write a Program to accept your name and print your name using string.
	7	Write a Program to reverse a string.
	8	Write a Program to check whether a string is palindrome or not.
	9	Write a Program to find the length of string.
	10	Write a Program to copy one string to another string.
8	1	Write a Program to concatenate two string.
	2	Write a Program to compare two string.
	3	Write a Program to find the vowels in the given string.
	4	Write a Program to perform linear search of 5 elements taken as user input.
	5	Write a Program to perform binary search of 5 elements taken as user input.
	6	Write a Program to perform bubble sort in C.
	7	Write a Program to perform insertion sort in C.
	8	Write a Program to perform merge sort in C.
	9	Write a Program to perform selection sort in C.
9	1	Write a Program to add three numbers using function.

	2	Write a Program to find X^Y using user defined function.
	3	Write a Program to find factorial of a given number using user defined functions as well as recursion function.
	4	Write a Program to find GCD (Greatest Common Divisor) and LCM (Least Common Multiple) of two numbers using recursion.
	5	Write a Program to display the Fibonacci series for a given range using function.
10	1	Write a Program to check whether any use given input number is Armstrong number or not using user defined function.
	2	Write a Program to check whether any use given input number is Peterson number or not using user defined function.
	3	Write a Program to create a structure called Student to store his/her name, and marks.
	4	Write a Program to implement an array of structures to store the data of multiple students.
11	1	Write a Program to print address of an integer variable.
	2	Write a Program to swap two numbers using pointers.
	3	Write a Program to add two numbers using pointers.
	4	Write a Program to read and display values in a 1-D array using pointers.
	5	Write a Program to find the factorial of a given number using function and pointers.
	6	Write a Program to print the Ackermann function with recursion.
12	1	Write a Program to read a text file and display the contents.
	2	Write a Program to read a text file containing subject and marks of a student and calculate his average marks.
	3	Write a Program to write into a file.
	4	Write a Program to copy the content of one file to another.

Course Outcomes:

CO1: Impart the fundamental concepts of problem-solving approaches and algorithmic thinking.
CO2: Provide comprehensive knowledge of the C programming language, including character sets, expressions, and operators.
CO3: Demonstrate control over program flow and logic using input/output operations, control structures, and program organization. **CO4:** Enable students to solve real-world challenges by applying advanced concepts such as functions, arrays, pointers, data structures, and file handling in building end-to-end applications.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. Reema Thareja, Computer Fundamentals and programming in C, Oxford University Press
3. Yashavant Kanetkar, Let Us C, BPB Publications

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Alternate Courses:

NPTEL – Introduction to programming in C, SatyadevNandakumar, IIT Kanpur - https://nptel.ac.in/courses/106104128
COURSERA – Introductory C Programming Specialization- Andrew D. Hilton- https://www.coursera.org/specializations/c-programming

University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

2nd Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: Language Laboratory

Category: Humanities and Social Sciences including Management	
Course Title: Language Laboratory	**Semester: Second**
L-T-P: 0-0-2	**Credit: 1**
Pre-Requisites: Language Acquisition model, Technological aids for language simulation, Hands-on Training, and Practice.	

Course Objectives:

1. To introduce students to the fundamental principles, ethics, and codes of conduct in business communication.
2. To develop students' non-verbal communication skills, including body language and speaking techniques, essential for professional environments.
3. To provide hands-on experience of real-world professional scenarios through simulated interviews and communication-based lab activities.
4. To foster critical thinking, teamwork, and leadership skills through collaborative exercises like group discussions, mock interviews, and telephonic conversations.

Course Outcomes:

CO1. The course will facilitate students to understand the codes and conducts of Business communication.

CO2. It will help students acquire proper body language and speaking nuances to become industry ready.

CO3. It will enable students to experience real-life interview situations through various simulation-based lab experiments.

CO4. It will help in students in brainstorming through various real-life situations. Enabling leadership qualities through mock-interview, telephonic conversations, and group communication among students.

List of Assignments:

S.L.	NAME OF ASSIGNMENTS	MAPPED INNOVATIVE PROJECTS	MAPPED LAB MANUAL ASSIGNMENTS	Mapped with AICTE	Mapped with IIT
1	**Icebreaker**	JAM (Just a Minute) & Impromptu Speech	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Introducing Oneself (5.1), Impromptu Speech Delivery (5.2)	JAM	Public Speaking
2	**Creative Studio**	Personal YouTube Channel, Personal Blog & Personal Podcast	Listening to Speeches and Evaluating them (1.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Storytelling (4.1), Discussion about Current Affairs, and Mock Job Placement Interviews (4.2), Introducing Oneself (5.1), Impromptu Speech Delivery (5.2), Acquiring Decision making and problem-solving ability, Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self Control, and influencing others (7.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes. (8.2)	Information Transfer, Public Speech - T.V. Programme analysis	Exercises based on Reading Comprehension (Extract from IELTS)
3	**Echoes of Me**	Publish a Book	Skimming and Scanning, Extensive reading, newspaper reading (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Dialogue writing on the day-to-day situation (3.3), Storytelling- Virtual Field Trip, Design and Debate through Tinker cad (4.1), Discussion about current affairs, and mock job/placement interviews (4.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self- control, and influencing others (7.1)	**NO DIRECT MATCH**	**NO DIRECT MATCH**

4	**Tech Talks**	Comparative Video & Create Reels	Reading non/technical passages, graphics, diagrams, etc. (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Dialogue writing on the day-to-day situation (3.3), Storytelling (4.1), Discussion about current affairs, and mock job/placement interviews (4.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1)	Reading Comprehension	Movie Review

5	**Stage Presence I**	Individual Technical Paper Presentation & Poster Presentation (with Plagiarism Report)	Reading non/technical passages, graphics, diagrams, etc. (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Dialogue writing on the day-to-day situation (3.3), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1)	Power Point Presentation, Poster/ PPT Presentation- (Topics from Industry)	**NO DIRECT MATCH**
6	**Stage Presence II**	Group Technical Paper Presentation & Poster Presentation (with Plagiarism Report)	Reading non/technical passages, graphics, diagrams, etc. (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Dialogue writing on the day-to-day situation (3.3), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1)	Power Point Presentation, Poster/ PPT Presentation- (Topics from Industry)	**NO DIRECT MATCH**

7	**Case & Critique Connect**	Case Study/Caselets & Paper/Book/Movie Review	Listening to Speeches and Evaluating them (1.2), Skimming and Scanning, extensive reading, newspaper reading (2.1), Reading non/technical passages, graphics, diagrams, etc. (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1)	**NO DIRECT MATCH**	Movie Review

8	**Dramatico**	Drama Competition/R ole Play & Short Film (5 minutes)	Casual and Academic Listening (1.1), Listening to Speeches and evaluating them (1.2), Writing a piece of Fiction (3.2), Dialogue writing on the day-to-day situation (3.3), Storytelling- Virtual Field Trip, Design and Debate through Tinker cad (4.1), Discussion about current affairs, and mock job/placement interviews (4.2), Introducing Oneself (5.1), Impromptu Speech Delivery (5.2), Strategies for making and working in a group (6.1), Features of a group leader (6.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1), Business Etiquette, Formal Approach in the work field, Codes of Conduct, Body Language, and Non-verbal Techniques of Communication (8.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes (8.2)	Role Play	Role Play Activity
9	**Artist's Arcade**	Craft Exhibition - 'Using Best Out of Waste' & Create Your Personal Brand	Creative Writing (3.1), Discussion about current affairs, and mock job/placement interviews (4.2), Introducing Oneself (5.1), Strategies for making and working in a group (6.1), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self- control, and influencing others (7.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes (8.2)	**NO DIRECT MATCH**	**NO DIRECT MATCH**

10	**Profile Prism**	Video CV, one-page CV & ATS Resume Checker	Creative Writing (3.1), Introducing Oneself (5.1), Impromptu Speech Delivery (5.2), Strategies for making and working in a group (6.1), Features of a group leader (6.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self-Control, and influencing others (7.1), Business Etiquette, Formal Approach in the work field, Codes of Conduct, Body Language, and Non-verbal Techniques of Communication (8.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes (8.2)	Self-Introduction, Resume Writing, Mock Interviews	Mock Interview session, Exercises based on Reading Comprehension (Extract from IELTS sample papers)
11	**Group Discussion**	Job Skills: Learning Basics & Mastering Communication as a Leader	Discussion about current affairs, and mock job/placement interviews (4.2), Introducing Oneself (5.1), Impromptu Speech Delivery (5.2), Strategies for making and working in a group (6.1), Features of a group leader (6.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self Control, and influencing others (7.1), Business Etiquette, Formal Approach in the work field, Codes of Conduct, Body Language, and Non-verbal Techniques of Communication (8.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes (8.2)	Group Discussion	Group Discussion, Debate
12	**Professional Toolkit**	Create and Design Avatars Using AR/VR & Create Communicative Interfaces Using No-Code Platforms	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Reading non/technical passages, graphics, diagrams, etc. (2.2)	Vocabulary, Introduction to Phonetics	Exercises based on writing skills (Thematic presentation/ picture based
13	**Innovate & inspire**	Develop Comprehensive Case Models for Audio and Visual Communication Using Generative AI	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Reading non/technical passages, graphics, diagrams, etc. (2.2), Creative Writing (3.1), Writing a piece of Fiction (3.2), Dialogue writing on the day- to-day situation (3.3)	Vocabulary, Introduction to Phonetics	**NO DIRECT MATCH**

14	**Tune in and Think**	Create a Short-Animated Video 3D Using Text-to Animation Software	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Reading non/technical passages, graphics, diagrams, etc. (2.2)	Vocabulary, Introduction to Phonetics	Sci-fi Movie Screening
15	**Communicating to the Future**	Interaction with Digital Twins, Chatting with Digital Twins	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Reading non/technical passages, graphics, diagrams, etc. (2.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self- control, and influencing others (7.1)	Vocabulary, Introduction to Phonetics	**NO DIRECT MATCH**
16	**Minefield**	Leadership Team Skill Building, Trust & Collaboration	Casual and Academic Listening (1.1), Introducing Oneself (5.1), Strategies for making and working in a group (6.1), Features of a group leader (6.2), Acquiring Creative thinking and Critical thinking, Acquiring Assertiveness and Self Control, and influencing others (7.1), Business Etiquette, Formal Approach in the work field, Codes of Conduct, Body Language, and Non-verbal Techniques of Communication (8.1), Developing Intra and Interpersonal Skills through Practice, Acquiring Business Attributes (8.2)	Activity on Event Management / Expansion	Screening of motivational lectures (e.g. How to deal with stress etc.)
17	**MATLAB**	Activity Using MATLAB	Casual and Academic Listening (1.1), Listening to Speeches and Evaluating them (1.2), Reading non/technical passages, graphics, diagrams, etc. (2.2)	Vocabulary	**NO DIRECT MATCH**

Software Used:

- Orell Talk https://orelltalk.com/
- NLP: Neuro-Linguistic Programming (NLP) is a psychological approach that explores the connection between **neurology (the brain and nervous system), language (how we communicate), and programming (our learned patterns of behavior)**.

Generative AI: Chatgpt, Gemini, Meta AI,

Image generator: Dall-E, Nvidia, Canva

Plagiarism checker: GptZero, Ithenticate

App: Tinkercad

ATS Resume Checker

LINKEDIN & COURSERA LINKS:

Linkedin:

- Mastering Communications as a Leader: **https://www.linkedin.com/learning/mastering-communications-as-a-leader**
- Job Skills: Learning the Basics: **https://www.linkedin.com/learning/job-skills-learning-the-basics**
- Create your Personal brand**: https://www.linkedin.com/learning/creating-your-personal-brand**

Coursera:

- English for Career Development**: https://www.coursera.org/learn/careerdevelopment**
- Business English: **https://coursera.org/specializations/english-for-business**

This Specialization serves as an introduction to Business English, where students will learn to communicate about topics such as management, finance and marketing. They will also write proposals, executive summaries, and marketing materials. Students will also learn the necessary language structures to run a meeting, achieve sales, and negotiate other business transactions.

Suggested Textbooks:

1. Technical Communication Principles and Practice by Meenakshi Raman, Oxford University Press.

Suggested Reference books:

1. Communication Skills for Professionals by Nira Konar, Publisher: PHI Learning.

1st Semester Syllabus for B.Tech. Admission Batch 2025-2029

Subject Name**: Design Thinking and Innovation- Creativity and IPR** Credit**: 0** Lecture Hours**: 12**

Subject Code**: IVC281B**

Prerequisite: Basic Knowledge of Physics, Chemistry and Mathematics of 10+2 Level

Relevant Links:

Linkedin Learning **Coursera** **SWAYAM**

Study Materials: Design Thinking and Innovation-Intermediate

Course Outcomes :

At the end of the course

CO1: The student will be able to Examine Design Thinking concepts and principles.

CO2: The student will be able to Practice the methods, processes, and tools of Design Thinking.

CO3: The student will be able to Apply the Design Thinking approach and model to real world situations.

CO4: The student will be able to Learn about Intellectual Property rights and how to file a Patent.

Module Number	Topics	Subtopics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Hands on Assignment
1	**Product Innovation**	Invention and Innovation, Importance of Innovation, Innovation and Modern-Day Civilization, Differences between Invention and Innovation with examples, How Innovations can help various Engineering disciplines, Types of Innovations and examples, Levels of Innovations, Incremental Innovation with Examples, Breakthrough innovation with Examples, Breakout Innovation with Examples, Characteristics of Innovation, Product Innovation, Various steps in Product Innovation by Design, Problem Identification, Analysis and Insights in Product Innovations, Design Brief, Concept Generation, Prototyping, Testing in Product Innovations, Various Types of Prototyping Methods, Introduction to New Product Development Process (NPD), Case studies of Product Innovation.	**International Academia:** ***MIT***- Design Thinking Certification at MIT Sloan | Online Program ***Stanford University***- Creativity and Design Thinking | Stanford Online ***AICTE Syllabus:*** AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org) **Industry Mapping:** *NPD is a systematic approach to bringing a new product to market.* Industries that heavily invest in research and development, such as pharmaceuticals and electronics, follow NPD processes to ensure the successful launch of new products. *Manufacturing, aerospace, and automotive industries use prototyping to test and validate designs before mass production.*	**4**	**Assignment 1:** Form small groups and select a problem related to any engineering discipline. Follow the steps of the product innovation process: problem identification, analysis, insights, design brief, concept generation, prototyping, and testing. Each group should present their final prototype along with the challenges faced and lessons learned during the process. **Assignment-2:** Researchand compile a comprehensive report on how innovation has impacted different engineering disciplines such as civil, mechanical, electrical, and computer engineering. Provide real-world examples of innovations in each discipline, discussing their significance and contributions to the respective fields. **Assignment-3:** Simulate a new product development process for a hypothetical product. Students will go through each stage of the process, from problem identification to the final
					case study of product innovation. The simulation should involve creating a design brief, generating concepts, developing prototypes, and testing the product. Each group should present their findings and reflections on the challenges faced.

2	**SCAMPER Technique**	Introduction SCAMPER Technique, Importance of SCAMPER Technique, How SCAMPER Technique can help in Innovation, Substitution Technique for Innovation with examples, Combine Technique for Innovation with examples, Adaptation Technique for Innovationwith examples, Minification Technique for Innovation with examples, Magnification Technique for Innovation with examples, Modification Technique for Innovation with examples, Put to Other Use Technique for Innovation withexamples, Elimination Technique for Innovation with examples, Rearrange/Replace/Reverse Techniques for Innovations, Case Studies of Scamper Techniques.	**International Academia:** *MIT*- Design Thinking Certification at MIT Sloan |Online Program *Stanford University*- Creativity and Design Thinking | Stanford Online **AICTE Syllabus:** AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org) **Industry Mapping:** Replacing traditional materials with advanced materials in electronic components for improved performance. Integrating different technologies (e.g., electric and autonomous) to create innovative automotive solutions. Modifying product features to meet changing consumer preferences or address emerging trends. Rearranging or reconfiguring manufacturing processes to improve efficiency and reduce costs.	**4**	**Assignment-4:** Select a product or service from a specific industry (e.g., technology, healthcare, automotive) and apply the SCAMPER techniques to generate innovative ideas for improvement. (Use at least three SCAMPER techniques (e.g., Combine, Adaptation, Minification) to brainstorm and propose modifications). **Assignment-5:** Choose a business process within a chosen industry and analyse how the SCAMPER techniques can be employed to optimize and innovate the workflow. (Identify specific steps in the chosen process and apply relevant SCAMPERtechniques). Explore how the SCAMPER techniques can be utilized to expand the market reach of an existing product or service. **Assignment-6:** Explore how the SCAMPER techniques can be utilized to expand the market reach of an existing product or service. (Select a product/service, and apply techniques like Put to Other Use, Modification, and Magnification to devise strategies for entering new markets or attracting new customer segments. Includea comprehensive market analysis and potential challenges). **Assignment-7:** Choose a commonly used product (e.g., a smartphone, a water bottle,a backpack). Apply each SCAMPER technique to brainstorm innovative ideas for

					improving the chosen product. Create a presentation or report showcasing your ideas and the impact each innovation could have on the product. Discuss potential challenges and benefits of implementing the suggested changes.

3	**Introduction to IPR and PatentFiling**	Introduction to IPR, Examples of IPR, Types of IPR, Patents, Copyrights, Trademarks, Industrial designs, Geographical indications, Trade secrets, Plant variety rights, Database rights, Integrated circuit topographies, Traditional knowledge, Importance ofIPR, The Patent Act 1970 and Patent System in India, Procedure of Patent Filling, Criteria for Patentability, Advantages of Patents, How to File a Patent in India, Sample Patent form ofIndia, Patent Databases for Patent Search, Patent System in USA, Importance of USA Patent, Difference between Indian Patent and USA Patent, Advantages of USA Patent, How to get Patent from USA, How to File Patent Application for USA Patent, Sample Patent Form of USA, CaseStudy of few interesting Patents.	**International Academia:** *MIT*- Design Thinking Certification at MIT Sloan |Online Program *Stanford University*- Creativity and Design Thinking | Stanford Online **AICTE Syllabus:** AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org) **Industry Mapping:** Technology, Pharmaceuticals, Biotechnology Companies in these sectors heavily rely on patent protection for their innovations. Understanding the patent system, criteria for patentability, and procedures is essential for research and development. Trademarks are crucial for companies to establish and protect their brand identity. Industries producing physical products often focus on industrial designs to protect the aesthetic and visual aspects of their products.	**4**	**Assignment-8:** (To develop practical skills in drafting a patent application) You are required to choose a simple invention (e.g., a household item, a gadget, or a process) and draft a provisional patent application. You should include detailed descriptions, drawings, and claims. Emphasis should be placed on meeting the criteria for patentability and clarity in expression. **Assignment-9:** (To understand the process of trademark registration and conduct a comprehensive search) Select a fictional business or product and perform a trademark search to ensure uniqueness. Then simulate the process of filing a trademark application, including completing the necessary forms and understanding the associated legal considerations. You should also discuss the importance of trademarks for businesses. **Assignment-10:** (To compare and contrast the patent systems of India and the USA) Do research and prepare a report on the differences between the Indian and USA patent systems. You should focus on the legal frameworks, criteria for patentability, and procedural aspects. Additionally, You should analyze the advantages and disadvantages of each system.

Reference Book: ***Design Thinking and Innovations***

1st Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: Finance and Venture Design **Credit: 0** **Lecture Hours: 12**

Subject Code: IVC282B

Pre-requisite: Basic Mathematical Knowledge

Relevant Links:

Study Material

https://drive.google.com/drive/folders/1nG94FKCOI7kFTeAFPeYjdRwYv_2UpXpH?usp=drive_link

Coursera

https://www.coursera.org/programs/iem-uem-program-2024-2dvv9/learn/firm-level-economics?source=search&collectionId=skill~business-economics#modules https://www.coursera.org/programs/iem-uem-program-2024-2dvv9/learn/market-equilibrium-government-policies-and-elasticity?source=search&collectionId=skill~business-economics https://www.coursera.org/programs/iem-uem-program-2024-2dvv9/learn/introduction-to-tech-entrepreneurship?fromClip=sfc_page_course_link~U91j2 https://www.coursera.org/specializations/business-entrepreneurship

NPTEL
https://onlinecourses.nptel.ac.in/noc25_ec13/preview

COURSE OBJECTIVES:

1. To introduce the fundamental concepts of money, banking, financial systems, and market structures including financial instruments, risk–return trade-offs, and the role of central and commercial banks in the Indian economy.

2. To impart knowledge on cost and pricing concepts including cost structures, revenue streams, profitability analysis, cost control, variance analysis, break-even and profit–volume analysis, and their implications for financial decision-making.

3. To impart knowledge on entrepreneurial finance and strategy through lean business model design, MVP development, customer solution validation, risk assessment, branding, and positioning strategies.

4. To impart knowledge on preparing and presenting a comprehensive business pitch, incorporating sales and marketing planning, customer lifecycle understanding, and solution-focused innovation.

COURSE OUTCOMES:

CO 1: Apply basic economic principles and distinguish between micro and macroeconomic concepts in the context of engineering decision-making.

CO 2: Analyze market dynamics, demand-supply behavior, and consumer segmentation to evaluate business opportunities and market potential.

CO 3: Interpret consumer and producer behavior using economic laws and value proposition models to design customer-centric products and services.

CO 4: Demonstrate entrepreneurial mindset by identifying problems, applying effectuation principles, and developing team-based, resource-efficient startup solutions.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	**Introduction to Financial Economics**	Money and Banking, Structure of the Financial System, Financial Instruments, Risk and Return Concepts, Risk–Return Trade-off, Currency and Money Supply, Functions of Commercial and Central Banks, Indian Money and Financial Markets, Cost Structures (Startup, Fixed, Variable), Revenue Streams, Pricing Concepts and Strategies	***International Academia:*** *https://ocw.mit.edu/courses/15-414-financial-management-summer-2003/resources/lec9_risk_return/* , *https://ocw.mit.edu/courses/15-s12-blockchain-and-money-fall-2018/resources/session-16-central-banks-commercial-banking-part-2/* ***AICTE-prescribed syllabus:*** *NA* ***Industry Mapping:*** *Wadhwani Global Foundation*	3	**Book: Engineering Economics and Costing by Sasmita Mishra** Chapter 10: Reserve Bank of India and Chapter 11: Indian Money Market	❖ Perform the financial and sales planning of your own business.

2	**Financial Analysis**	Cost Concepts (Including Marginal and Standard Costing), Variance Analysis, Cost Control and Reduction, Cash Flow Types and Diagrams, Depreciation (Causes, Properties, Methods), Break-Even Analysis (Point, Chart, Assumptions, Uses, Limitations), Profit–Volume Analysis, Cost Structures, Revenue Generation, Profitability, Pricing Analysis, Financial Decision Impact, Risk Assessment	***International Academia:*** *https://ocw.mit.edu/courses/14-01-principles-of-microeconomics-fall-2018/resources/lec-6-costs/*, *https://ocw.mit.edu/courses/1-133-masters-of-engineering-concepts-of-engineering-practice-fall-2007/resources/lec_03/*, *https://ocw.mit.edu/courses/1-011-project-evaluation-spring-2011/resources/mit1_011s11_chpt10/* ***AICTE-prescribed syllabus:*** *NA* ***Industry Mapping:*** *Wadhwani Global Foundation*	3	**Book: Engineering Economics and Costing by Sasmita Mishra** Chapter 5: Cash Flows for Investment Analysis – Concepts and Diagrams, Chapter 6: Evaluation of Engineering Alternatives and Chapter 12: Costing and Cost Concepts	❖ Create one practice venture from your own new business idea. ❖ Pitch your idea.
3	**Proposing a sustainable business**	Lean Business Model Design, Minimum viable product (MVP), Early adopters, Customer solution validation, Blue Ocean strategy	***International Academia:*** *https://ocw.mit.edu/courses/15-394-designing-and-leading-the-entrepreneurial-organization-spring-2003/* ***AICTE-prescribed syllabus:*** *NA* ***Industry Mapping:*** *Wadhwani Global Foundation*	3	**Book: Entrepreneurship (Second Edition) by Rajeev Roy, Oxford University Press** Chapter 14: New Product Development	❖ Design Lean Business model of your own business.

4	**Solution demo, Sales and Branding**	Solution Demo and Minimum Viable Product (MVP), Sales and Business Plan, Marketing and Promotion Strategy, Customer Lifecycle, Branding and Positioning (Including Value-Based Branding and Positioning Statement), Pitch Deck Preparation	***International Academia:*** https://ocw.mit.edu/courses/15-s21-nuts-and-bolts-of-business-plans-january-iap-2014/ https://ocw.mit.edu/courses/15-835-entrepreneurial-marketing-spring-2002/ ,https://ocw.mit.edu/courses/15-431-entrepreneurial-finance-spring-2011/ ***AICTE-prescribed syllabus:*** *NA* ***Industry Mapping:*** *Wadhwani Global Foundation*	3	**Book: Entrepreneurship (Second Edition) by Rajeev Roy, Oxford University Press** Chapter 10: Making a Business Plan	❖ Pitch Deck Presentation – Showcasing Your Entrepreneurial Mindset

TEXT BOOKS:

1. Engineering Economics and Costing by Sasmita Mishra, PHI Learning Private Limited
2. Microeconomics | Ninth Edition | By Pearson [Paperback] Pindyck,Robert and Rubinfeld, Daniel by Robert Pindyck and Daniel Rubinfeld
3. Entrepreneurship (Second Edition) by Rajeev Roy, Oxford University Press

REFERENCE BOOKS:

1. Entrepreneurship Development & Project Management by Supriya Biswas and Dr. Shampa Chakraborty, Aryan Publishing House
2. Financial Economics: A Simple Introduction (Simple Introductions), by K.H. Erickson
3. Economics for Engineers by Partha Chatterjee, Vrinda Publication (P) Ltd.

University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

1st Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: Skill Development for Professionals-I **Credit: 0.5** **Lecture Hours: 48**

Subject Code: SDP281A

Pre-requisite: Basic understanding of mathematics, reasoning, and current affairs.

COURSE OBJECTIVES:

1. To introduce foundational concepts in quantitative aptitude.
2. To impart knowledge on pattern recognition through alphanumeric and number series.
3. To impart knowledge on blood relation and seating arrangement problems using logical reasoning techniques.
4. To impart knowledge on national and international current events and key general awareness topics.

COURSE OUTCOMES:

CO 1: Apply shortcut methods to solve problems on ratio, proportion, averages, time & work, and simplification.

CO 2: Solve alphanumeric series and number pattern problems using logical reasoning.

CO 3: Analyze and solve various types of blood relation and seating arrangement questions.

CO 4: Recall and interpret important national and global events, agreements, awards, and economic updates.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	**Quantitative Aptitude**	1. **Ratio and Proportion** Basic concept of Ratio & Proportion, Shortcut tricks & applications. 2. **Average-** Concept on average, different missing numbers in average estimation, shortcuts & application. 3. **Time & Work -** Basic concept, Different problems & shortcut tricks. 4. **Simplification**	***International Exams*** ***1. GRE*** *(https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37)* ***National Exams:*** ***1. UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21* ***3. Combined Graduate Level conducted by SSC*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-*	20	1. **Textbook:** Quantitative Aptitude, Author: R.S Aggarwal, Publisher: S. Chand (Chapter 4, 6, 12, 15)	❖ Assignment on Ratio Applications ❖ Average Estimation Practice ❖ Time & Work Worksheet ❖ Simplification Practice

			Notification-Emp-News.pdf) ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2. Miscellaneous Services Recruitment Examination*** *(file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1*			
2	**Logical Reasoning**	**1. Alphanumeric Series Completion** i. Alphabet Series, ii. Random Series, iii. Number Series, iv. Letter Gap, v. Missing Number Series, vi. Series Completion **2. Blood Relations –** i. Family Tree Questions ii. Indication Type BR, iii. Coding Blood Relations, iv. Miscellaneous	***International Exams*** ***1. GRE*** *(https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37)* ***National Exams:*** ***1. UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21* ***3. Combined Graduate Level***	20	**1. Textbook:** Verbal and Non-Verbal reasoning , **Author:** R.S Agarwal, **Publishing House:** S.Chand (Chapter 1, 5)	❖ Assignment on Blood Relation, Alphanumeric series and sitting arrangement.

		Blood Relations. **3. Sitting Arrangement**	***conducted by SSC*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***4. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)* ***State Level Exams:*** ***1. Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2. Miscellaneous Services Recruitment Examination*** *(file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1*			
3	**Current Affairs and Static GK**	National News, International News, MOU's and agreements, Summits and Conclaves, Obituaries, Awards and Events, Sports, Important Days, Banking and Economic Awareness	***National Exams:*** ***1.UPSC Civil Services Exam*** *(https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26* ***2. UPSC Combined Defence Services*** *(https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-*	08	**1. Current Affairs Magazine of IEM-UEM** **Lucent GK**	❖ Discussion on National and International affairs ❖ Discussion on MOU's and agreements, Summits and Conclaves ❖ Discussion on recent Awards

			2023-Engl-211222.pdf), pg 20-21 ***3. RBI Grade B*** *(https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23* ***4. IBPS Probationary officer*** *(https://www.ibps.in/wp-content/uploads/Detailed-Advt.-CRP-PO-XII.pdf) , Pg 7.* ***5. Combined Graduate Level conducted by SSC*** *(https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22* ***6. Intelligence Bureau ACIO*** *(https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)* ***State Level Exams:*** ***1.Civil Services Executive Exam (WBCS)*** *(https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1* ***2. Miscellaneous Services***			and Events, Sports. ❖ Discussion on Economic Awareness

			Recruitment Examination *(https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf)), pg 1*			

TEXT BOOKS:

1. Textbook: Quantitative Aptitude, Author: R.S Aggarwal, Publisher: S. Chand
2. Textbook: Verbal and Non-Verbal reasoning , Author: R.S Agarwal, Publishing House: S.Chand
3. Lucent GK

REFERENCE BOOKS:

1. Current Affairs Magazine of IEM-UEM

University of Engineering and Management

Institute of Engineering & Management, Salt Lake CampusInstitute of Engineering & Management, New Town Campus

University of Engineering & Management, Jaipur

1st Semester Syllabus for B.Tech Batch 2025-2029

Index:

Syllabus Structure:

Sl. No.	Type	Subject Code	Subject Name	L	T	P	Total	Credit
1	Sessional	IKS281	IKS and Its Application for Engineers	0	0	4	4	2
				Total Credit points				2

University of Engineering and Management

Institute of Engineering & Management,

Salt Lake Campus Institute of Engineering & Management, New Town Campus

University of Engineering & Management, Jaipur

1st Semester Syllabus for B.Tech Batch 2025-2029

Subject Name: IKS and Its Application for Engineers **Credit:** 2 **Lecture Hours:** 40

Subject Code: IKS281

Pre-requisite: Passed 10+2 or equivalent examination

Relevant Links:

NPTEL
https://nptel.ac.in/courses/111101080
https://nptel.ac.in/courses/121104006
https://nptel.ac.in/courses/101104065
https://nptel.ac.in/courses/109106195

COURSE OBJECTIVES:

The course "IKS and its Application for Engineers" aims to introduce undergraduate engineering students to the foundational concepts and practical relevance of Indian Knowledge Systems (IKS).

1. This course aims to introduce students to the depth and diversity of Indian Knowledge Systems, cultivated over millennia across various domains of life, learning, and innovation. Students will:

- Grasp the definition, scope, and organization of IKS.
- Understand its historicity, cultural foundations, and relevance in the contemporary world.
- Appreciate IKS as a holistic and interdisciplinary framework integrating science, philosophy, and social values.

2. The course seeks to impart interdisciplinary knowledge by exploring key domains of traditional Indian wisdom and their scientific relevance, enabling students to:
    - Understand the structure and content of the Vedic corpus, Vedāṅgas, and systems of logic and epistemology.
    - Explore traditional Indian contributions to mathematics, astronomy, linguistics, architecture, and technology.
    - Analyze indigenous number systems, units of measurement, and algorithmic thinking rooted in Sanskrit and Chandaḥ Śāstra.
    - Discover ethical frameworks (like Karma Yoga) and moral reasoning applicable to engineering practice.
    - Examine town planning, temple architecture, and scientific advancements in ancient India through the lens of sustainability and design thinking.
    - Reflect on the potential of IKS in modern technological applications including computation, natural language processing, and water management.

COURSE OUTCOMES:

CO1. Demonstrate a foundational understanding of the Indian Knowledge System (IKS) — including its historical development, philosophical basis, and relevance to contemporary contexts.
(Mapped to Week 1: Introduction to IKS)

CO2. Explain key components of the Vedic corpus and Vedāṅgas, and articulate their significance in knowledge organization and cultural life.
(Mapped to Week 2: The Vedic Corpus)

CO3. Identify and interpret traditional Indian number systems and units of measurement, including Kaṭapayādi, Bhūta Saṃkhyā, and their applications in early science and technology.
(Mapped to Weeks 3–4: Number Systems & Indian Mathematics)

CO4. Analyze ancient Indian contributions to mathematics and astronomy, and connect these to modern scientific concepts in algebra, geometry, trigonometry, and celestial navigation.
(Mapped to Weeks 4–5)

CO5. Apply ethical frameworks derived from Indian philosophy (e.g., Karma Yoga) to engineering practice, decision-making, and personal integrity.
(Mapped to Week 6: Moral Science for Engineers)

CO6. Explore indigenous technological advancements in irrigation, surgery, shipbuilding, and art, recognizing their innovation and sustainability principles.
(Mapped to Week 7: Engineering and Technology in Ancient India)

CO7. Discuss principles of Vāstu-śāstra and ancient town planning, including Indian temple architecture and iconography, in the context of design thinking and spatial aesthetics.
(Mapped to Week 8)

CO8. Understand Indian epistemological frameworks (Nyāya-Vaiśeṣika) and their relevance in scientific reasoning, classification, and

logic systems.
(Mapped to Week 9: Knowledge Framework and Classifications)

CO9. Interpret the Aṣṭādhyāyī and principles of Sanskrit linguistics, and appreciate their role in computational logic and natural language processing.
(Mapped to Week 10: Linguistics and NLP Applications)

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	**Indian Knowledge System (IKS) – An Introduction**	• What is Indian Knowledge System (IKS) • Why do we need IKS? • Organization of IKS • Historicity of IKS • Salient aspects of IKS	***International Academia:*** South Asian Studies, Comparative Philosophy (Harvard, SOAS, Leiden) ***AICTE-prescribed syllabus:*** Unit 1: Definition, scope, salient features of IKS ***Industry Mapping:*** Education, Cultural Policy, Heritage Tech	4	1. *Kapil Kapoor – Indian Knowledge Systems* https://iks.iitgn.ac.in/wp-content/uploads/2020/06/Indian_Knowledge_Systems-Kapil-Kapoor.pdf?utm_source=chatgpt.com 2. *Charles A. Moore – The Indian Mind* https://ia801402.us.archive.org/13/items/in.ernet.dli.2015.533775/2015.533775.indian-mind_text.pdf	❖
2	**The Vedic Corpus**	• Introduction to Vedas • A synopsis of the four Vedas • Sub-classification of Vedas • Messages in Vedas	***International Academia:*** Indology, Vedic Studies (Oxford, Chicago, EFEO) ***AICTE-prescribed syllabus:***	4	1. *Roshen Dalal – The Vedas* https://tarapurbengali.in/books/The%20Ve	❖

		• Introduction to Vedāṅgas • Prologue on Śikṣā and Vyākaraṇa • Basics of Nirukta and Chandas • Introduction to Kalpa and Jyotiṣa Vedic Life: A Distinctive Features	Unit 2: Vedic corpus and Vedāṅgas ***Industry Mapping:*** Yoga, Ayurveda, Vedic research publishing		das_%20An%20Introduction%20to%20Hinduism%E2%80%99s%20Sacred%20Texts.pdf?utm_source=chatgpt.com 2. *F. Max Müller – The Six Systems* https://ia802302.us.archive.org/24/items/sixsystemsofindi005498mbp/sixsystemsofindi005498mbp.pdf	
3	**Number Systems and Units of Measurement:**	• Number systems in India - Historical evidence • Salient aspects of Indian Mathematics • Bhūta-Saṃkhyā system • Kaṭapayādi system • Measurements for time, distance, and weight Piṅgala and the Binary system	***International Academia:*** History of Mathematics (Cambridge, ETH Zurich) ***AICTE-prescribed syllabus:*** Unit 3: Ancient Indian number systems & Bhūta Saṃkhyā ***Industry Mapping:*** Fintech, Data encoding, NLP models	4	1. Datta & Singh – A History of Hindu Mathematics https://archive.org/details/history-of-hindu-mathematics-1-bibhutibhusan-datta-avadesh-narayan-singh?utm_source=chatgpt.com	❖

4	**Mathematics:**	• Introduction to Indian Mathematics • Unique aspects of Indian Mathematics • Indian Mathematicians and their Contributions • Algebra • Geometry • Trigonometry • Binary mathematics and combinatorial problems in Chandaḥ Śāstra Magic squares in India	***International Academia:*** Non-European Mathematics (University of Manchester, Rutgers) ***AICTE-prescribed syllabus:*** Unit 4: Contributions to algebra, geometry, combinatorics ***Industry Mapping:*** STEM Education, EdTech, Logic Design		*1. G. G. Joseph*, *The Crest of the Peacock* https://ia800600.us.archive.org/27/items/crest-of-the-peacock-joseph-george-gheverghese/Crest%20of%20the%20peacock%2C%20non-European%20roots%20of%20mathematics%20Joseph%20George%20Gheverghese%20Third%20Edition.pdf NPTL Course: https://nptel.ac.in/courses/111101080	❖
5	**Astronomy:**	• Introduction to Indian astronomy • Indian contributions in astronomy • The celestial coordinate system • Elements of the Indian calendar • Notion of years and months • Pañcāṅga – The Indian	***International Academia:*** Archaeoastronomy, Ancient Sciences (University of Arizona, Bonn) ***AICTE-prescribed syllabus:*** Unit 5: Indian calendar, celestial models	4	1. *Astronomy*, Author - Amitabha Ghosh, Published by The National Academy of Sciences, India and R K Mission Institute of Culture, Gol Park Kolkata	❖

		calendar system • Astronomical Instruments (Yantras) - Jantar Mantar of Rājā Jai Singh Sawai	***Industry Mapping:*** Panchāṅga apps, Aerospace heritage, ISRO heritage outreach		2. Subhash Kak – Indian Astronomy: A Sourcebook https://archive.org/details/indian-astronomy-a-sourcebook-b.-v.-subbarayappa-k.-v.-sarma?utm_source=chatgpt.com 3. NPTL Course https://nptel.ac.in/courses/121104006	
6	**Moral Science for Engineers:**	• Foundations of Moral Philosophy- Morality, Utilitarianism • Moral relativism vs. moral universalism • Role of conscience and character • Moral leadership and ethical decision-making • Group thinking, peer pressure, and ethical fading • Karma Yoga – Work as worship • Cultivating moral courage and resilience	***International Academia:*** Applied Ethics (Stanford, TU Delft, Oxford Uehiro Centre) ***AICTE-prescribed syllabus:*** Unit 6: Karma Yoga, moral reasoning ***Industry Mapping:*** Corporate Ethics, Leadership Training		1. *Mike Martin & Roland Schinzinger – Ethics in Engineering* https://archive.org/details/ethicsinengineer0000mart_x0l7/page/n3/mode/2up?view=theater	❖

		in professional life				
7	**Engineering and Technology: Other applications:**	• Irrigation systems and practices in South India • Literary sources for science and technology • Physical structures in India • Irrigation and water management • Dyes and painting technology • The art of making perfumes • Surgical techniques • Shipbuilding • Sixty-four art forms (64 Kalās) • Status of Indigenous S & T	***International Academia:*** Ancient Technology Studies (Max Planck Institute, UCLA) ***AICTE-prescribed syllabus:*** Unit 7: Water management, shipbuilding, arts ***Industry Mapping:*** Rural Tech, Heritage Science, Wellness Industry	4	1. *Debiprasad Chattopadhyaya – History of Science Philosophy and Culture (Vol. 2, Part 1)* *2. Needham, Joshep, istory of Science and Technology in Ancient India* https://ia802909.us.archive.org/16/items/historyofscienceandtechnologyinancientindiathebeginningsdebiprasadchattopadhyaya_57_k/History%20Of%20Science%20And%20Technology%20In%20Ancient%20India%20The%20Beginnings%20Debi%20Prasad	❖

					%20Chattopadhyaya%20Firma%20K.L.%20Mukopadhyaya.pdf 3. NPTL Course: https://nptel.ac.in/courses/101104065	
	Town Planning and Architecture:	• Perspective of Arthaśāstra on town planning • Vāstu-śāstra – The science of architecture • Eight limbs of Vāstu • Town planning • Temples in India: marvelous stone architecture for eternity • Temple architecture in India • Iconography	***International Academia:*** Architectural Anthropology, Urban Studies (Columbia GSAPP, UCL) ***AICTE-prescribed syllabus:*** Unit 8: Vāstu-śāstra, temple planning ***Industry Mapping:*** *Sustainable Architecture, Urban Design*		1. *B. B. Puri – Vāstu Śāstra* 2. *Percy Brown – Indian Architecture* https://ia903201.us.archive.org/34/items/IndianArchitecture/IndianArchitecture.pdf	❖
	Knowledge Framework and classifications:	• Indian scheme of knowledge • The knowledge triangle • Prameya – A vaiśeṣikan approach to physical reality • Dravyas – the constituents of the physical reality • Attributes – the properties of substances and Action	***International Academia:*** Logic and Philosophy of Science (Carnegie Mellon, IITs) ***AICTE-prescribed syllabus:*** Unit 9: Nyāya-Vaiśeṣika, Pramāṇa, logic	4	1. *Subhash Kak – Nyaya-Vaisheshika* 2. *Daya Krishna – Indian Epistemology and Metaphysics* 3. Prabhu, CSR, The Physics of *Vaiśeṣika* https://ia803209.us.archive.org/19/items/thep	❖

		– the driver of conjunction and disjunction • Sāmānya, viśēṣa, samavāya • Pramāṇa – the means of valid knowledge • Saṃśaya – ambiguities in existing knowledge • Framework for establishing valid knowledge • Deductive or inductive logic framework • Potential fallacies in the reasoning process • Siddhānta: established tenets in a field of study	***Industry Mapping:*** AI Ethics, Knowledge Systems, Decision Science		hysicsofvaisheshika/The%20Physics%20of%20Vaisheshika_text.pdf	
	Linguistics	• Introduction to Linguistics • Aṣṭādhyāyī • Phonetics • Word generation • Computational aspects • Mnemonics • Recursive operations • Rule based operations • Sentence formation • Verbs and prefixes • Role of Sanskrit in natural language processing	***International Academia:*** Sanskrit Computational Linguistics (Heidelberg, Kyoto, IIT-H) ***AICTE-prescribed syllabus:*** Unit 10: Aṣṭādhyāyī, NLP and computation ***Industry Mapping:*** NLP, AI Language Tools, EdTech content systems	4	*1. George Cardona, Panini: His Work and Its Traditions* 2. NPTL Course: https://nptel.ac.in/courses/109106195	❖

TEXT BOOKS:

1. Kapil Kapoor – *Indian Knowledge Systems*
2. Debiprasad Chattopadhyaya – *History of Science Philosophy and Culture (Vol. 2, Part 1)*
3. Roshen Dalal – *The Vedas*
4. Amitabha Ghosh – *Astronomy,* Published by The National Academy of Sciences, India and R K Mission Institute of Culture, Gol Park Kolkata
5. Amitabha Ghosh – *History of Science in India Vol 1 Part 2*

REFERENCE BOOKS:

1. Bopearachchi, Osmund, and Susmita Basu Majumdar. From Hindu Kush to Salt Range: Mauryan, Indo-Greek and Indo-Scythian Coin Hoards. The ink: beyond imagination, Kolkata, 2020.
2. Osmund Bopearachchi, The Greek God Helios and the Indian Deity Surya, The ink: beyond imagination, Kolkata, 2021.
3. Gupta, Kanika. The Cursed Land of Lustful Women and the Power of Storytelling: Performance Text with Notes, Kaveri Books, Delhi, 2023.
4. Kannal, Deepak H., and Kanika Gupta. *Lupadakhe: Unknown Master Sculptors of Ancient India*. Mandala, 2019.
5. Alone, Y. S. Buddhist caves of western India: forms and patronage. Kaveri books, Delhi, 2016.
6. R.K. Sharma (ed.), History, Archaeology and Culture of the Narmada valley, Sharada publishing house, Delhi, 2007.
7. Zaria Gorvett, "*The ancient fabric that no one knows how to make*", BBS online, 17 March 2021 (accessed 10 June 2021). https://www.bbc.com/future/article/20210316-the-legendary-fabric-that-no-one-knows-how-to-make
8. Fergusson, James, and James Burgess. The cave temples of India. Cambridge University Press, 2013. https://archive.org/details/cavetemplesofind00ferguoft/page/78/mode/2up
9. Kuldeep Bhan, Some Important Aspects of Technology and Craft Production in the Indus Civilization with Specific Reference to Gujarat, Harappa.com. (accessed 10 June 2025) https://www.harappa.com/content/some-important-aspects-technology-and-craft-production-indus-civilization-specific-reference
10. Sharma S, Pokharia AK, Gahlaud SKS, et al. Royal burials and chariots from Sinauli (Uttar Pradesh, India): Radiocarbon dating and isotopic analysis based inferences. *Radiocarbon*. 2024;66(4):774-782. doi:10.1017/RDC.2024.89 https://www.cambridge.org/core/journals/radiocarbon/article/abs/royal-burials-and-chariots-from-sinauli-uttar-pradesh-india-radiocarbon-dating-and-isotopic-analysis-based-inferences/A33F911D8E6730AE557E1947A66A583C
11. Dharmendra, "*Leprosy in Ancient India*", International Journal of Leprosy and other mycobacterial diseases, Vol 15, No. 4, 1947. http://ijl.ilsl.br/detalhe_artigo.php?id=NTAwMQ%3D%3D&secao=ORIGINAL+ARTICLE
12. Arundhati Roy, "*The greater Common Good*", Outlook India, 2016. https://ecologise.in/2016/08/25/flashback-arundhati-roys-landmark-essay-on-the-narmada-resistance/
13. Ramanujan, A. K. "2. Three Hundred Rāmāyaṇas: Five Examples and Three Thoughts on Translation". *Many Ramayanas: The Diversity of a Narrative Tradition in South Asia*, edited by Paula Richman, Berkeley: University of California Press, 2023, pp. 22-49. https://doi.org/10.1525/9780520911758-004 https://archive.org/details/three-hundred-Ramayanas-A-K-Ramanujan
14. Nivedita Khandekar, Ecological degradation at Narmada's origin in Amarkantak spells more trouble, india.mongabay.com, 3 Feb 2021 (accessed 10 June 2025) https://india.mongabay.com/2021/02/ecological-degradation-at-narmadas-origin-in-amarkantak-spells-more-trouble/
15. Supriya Vohra, Fish famine, livelihood loss because of upcoming Vizhinjam port, say fishers of south Kerala, india.mongabay.com, 4 May 2022 (accessed 10 June 2025)

https://india.mongabay.com/2022/05/fish-famine-livelihood-loss-because-of-upcoming-vizhinjam-port-say-fishers-of-south-kerala/
16. Suraj A Pandit, "*Water Management System at Kanheri*", Journal of the Asiatic Society of Mumbai, Vol 83, 2010 (27-45). https://www.academia.edu/2624271/Water_Management_System_at_Kanheri
17. Shaikh, Ayesha U. "Made in India, Found in Egypt: Red Sea Textile Trade in the Thirteenth and Fourteenth Centuries." In Heilbrunn Timeline of Art History. New York: The Metropolitan Museum of Art, 2000–. http://www.metmuseum.org/toah/hd/rstt/hd_rstt.htm (March 2023) https://www.metmuseum.org/essays/red-sea-textile-trade
18. Indigenous Knowledge of using Medicinal Plants in Treating Skin deceases by Tribal's in Central Narmada Valley of Madhya Pradesh (India) By Dr Mahendra Singh choudhary https://www.academia.edu/126472004/Indigenous_Knowledge_of_using_Medicinal_Plants_in_Treating_Skin_deceases_by_Tribals_in_Central_Narmada_Valley_of_Madhya_Pradesh_India_
19. Diversity of freshwater fish in Narmada River, Madhya Pradesh by Shivani Pathak https://www.academia.edu/111778970/Diversity_of_freshwater_fish_in_Narmada_River_Madhya_Pradesh