



B.tech 1st Year Admission Batch 2026-2027



Date: 28/07/2026

To

The Controller of Examination,
IEM-UEM Group

Subject: Endorsement of the Proposed Syllabus

Dear Madam,

We are pleased to endorse the proposed syllabus for the B.Tech. First year syllabus offered by the Department of **Basic Science and Humanities**.

The syllabus has been carefully prepared and reviewed by the departmental faculties across all campuses in accordance with the curriculum framework, programme outcomes, and the latest developments in the respective discipline.

The department is of the opinion that the proposed syllabus is academically sound, aligns with the institutional objectives and regulatory guidelines, and adequately addresses the requirements of industry, research, and higher education. The syllabus has also been designed to promote critical thinking, problem-solving abilities, and experiential learning among students.

We, hereby recommend and endorse the syllabus for consideration and approval by the competent academic authority for implementation from the **academic session 2026**.

Thank you for your kind consideration.

Yours sincerely,

Head of the Department

Basic Science and Humanities,

Institute of Engineering & Management (Salt- Lake)

Head of the Department

Basic Science and Humanities,

Institute of Engineering & Management (Newtown)

B.Tech. 1st Year Course Structure : 2026-2027 – Odd Semester

Semester 1 (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	BSCPH101	Physics	3	1	0	0	4	4
2	Basic Science Course	BSCM103A	Mathematics - Calculus	3	1	0	0	4	4
3	Basic Science Course	BSCBE104	Biology for Engineers	2	0	0	0	2	2
4	Engineering Science Course	ESCEE101	Basic Electrical Engineering	3	1	0	0	4	4
5	Engineering Science Course	ESME102A	Engineering Mechanics - Principles	1	1	0	0	2	2
6	Engineering Science Course	ESCCS101	Programming for Problem Solving using C	2	1	0	0	3	3
7	Professional subject for career development	ESEP101	Essential Studies for Engineering Professionals (ESEP)-I	2	0	0	0	2	2

PRACTICAL									
8	Basic Science Course	BSCPH191	Physics Laboratory	0	0	3	0	3	1.5
9	Basic Science Course	BSCBE194	Biology for Engineers Laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCEE191	Basic Electrical Engineering Laboratory	0	0	2	0	2	1
11	Engineering Science Course	ESCME192	Engineering Graphics & Design	1	0	4	0	5	3
12	Engineering Science Course	ESCCS191	Programming for Problem Solving Laboratory using C	0	0	4	0	4	2
SESSIONAL									
13	Mandatory Courses	IKS171	Indian Knowledge System for Engineers	0	0	0	2	2	2
Mandatory Industry and Value Added Courses (IVC)									
14	Mandatory Industry and Value Added Courses (IVC)	IVC181	Design Thinking & Innovation- Basic	0	0	0	1	1	0
15	Mandatory Industry and Value Added Courses (IVC)	IVC182	Economics, Finance and Entrepreneurship Skills - Basic	0	0	0	1	1	0
Total Credit Points of Semester				17	5	15	4	40	31.5
16	Mandatory Courses	MAR	Mandatory Additional Requirements	0	0	0	0	0	0
17	Mandatory Online Courses	MOOCs	Massive Open Online Courses	0	0	0	0	0	0
18	Mandatory Online Courses	IFC	Industry and Foreign Certification	0	0	0	0	0	0
19	Mandatory Courses	SAR	Skill Additional Requirements	0	0	0	0	0	0
Skill Addition Requirements (SAR) 1. Foreign Language, 2. Physical Education, 3. Soft Skill									

B.Tech. 1st Year Course Structure : 2026-2027 – Odd Semester

Semester 1 (Group – B)

Sl. No.	Type of Course	Subject code	Subject name	L	T	P	S	Total Contact Hours	Credit Points
THEORY									
1	Basic Science Course	BSCCH102	Chemistry	3	1	0	0	4	4
2	Basic Science Course	BSCM103B	Mathematics and Basic Statistics	3	1	0	0	4	4
3	Humanities and social sciences including Management	HSMC101	English	2	0	0	0	2	2
4	Engineering Science Course	ESCEC101	Basic Electronics Engineering	3	1	0	0	4	4
5	Engineering Science Course	ESME102B	Engineering Mechanics - Essentials	1	1	0	0	2	2
6	Engineering Science Course	ESCCS101	Programming for Problem Solving using C	2	1	0	0	3	3
7	General Studies Course	ESP101	Essential Studies for Professionals - I	1	0	0	0	1	1
PRACTICAL									
8	Basic Science Course	BSCCH192	Chemistry Laboratory	0	0	3	0	3	1.5
9	Humanities and social sciences including Management	HSMC191	Language laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCEC191	Basic Electronics Engineering Laboratory	0	0	2	0	2	1
11	Engineering Science Course	ESCME193	Workshop/ Manufacturing Practices	1	0	4	0	5	3
12	Engineering Science Course	ESCCS191	Programming for Problem Solving Laboratory using C	0	0	4	0	4	2

SESSIONAL									
13	Mandatory Courses	IKS171	Indian Knowledge System for Engineers	0	0	0	2	2	2
Mandatory Industry and Value Added Courses (IVC)									
14	Mandatory Industry and Value Added Courses (IVC)	IVC181	Design Thinking & Innovation- Basic	0	0	0	1	1	0
15	Mandatory Industry and Value Added Courses (IVC)	IVC182	Economics, Finance and Entrepreneurship Skills - Basic	0	0	0	1	1	0
Total Credit Points of Semester				17	5	15	4	40	31.5
16	Mandatory Courses	MAR	Mandatory Additional Requirements	0	0	0	0	0	0
17	Mandatory Online Courses	MOOCs	Massive Open Online Courses	0	0	0	0	0	0
18	Mandatory Online Courses	IFC	Industry and Foreign Certification	0	0	0	0	0	0
19	Mandatory Courses	SAR	Skill Additional Requirements	0	0	0	0	0	0
Skill Addition Requirements (SAR) 1. Foreign Language, 2. Physical Education, 3. Soft Skill									

B.Tech. 1st Year Course Structure : 2026-2027 – 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 Management	HSMC201	English	2	0	0	0	2	2
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	Introduction to AI and Data Science using Python	2	1	0	0	3	3
7	General Studies Course	ESP201	Essential Studies for Professionals - II	1	0	0	0	1	1
PRACTICAL									
8	Basic Science Course	BSCCH292	Chemistry Laboratory	0	0	3	0	3	1.5
9	Humanities and social sciences including Management	HSMC291	Language laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCEC291	Basic Electronics Engineering Laboratory	0	0	2	0	2	1
11	Engineering Science Course	ESCME293	Workshop/ Manufacturing Practices	1	0	4	0	5	3
12	Engineering Science Course	ESCCS292	Introduction to AI and Data Science Laboratory using Python	0	0	4	0	4	2

SESSIONAL									
13	Humanities and social sciences	UHV272	Universal Human Values- II	0	0	0	2	2	3
Mandatory Industry and Value Added Courses (IVC)									
14	Mandatory Industry and Value Added Courses (IVC)	IVC281	Design Thinking & Innovation- Imtermediate	0	0	0	1	1	0
15	Mandatory Industry and Value Added Courses (IVC)	IVC282	Economics, Finance and Entrepreneurship Skills – Intermediate	0	0	0	1	1	0
Total Credit Points of Semester				17	5	15	4	40	32.5
16	Mandatory Courses	MAR	Mandatory Additional Requirements	0	0	0	0	0	0
17	Mandatory Online Courses	MOOCs	Massive Open Online Courses	0	0	0	0	0	0
18	Mandatory Online Courses	IFC	Industry and Foreign Certification	0	0	0	0	0	0
19	Mandatory Courses	SAR	Skill Additional Requirements	0	0	0	0	0	0
Skill Addition Requirements (SAR) 1. Foreign Language, 2. Physical Education, 3. Soft Skill									

B.Tech. 1st Year Course Structure : 2026-2027 – Even Semester

Semester 2 (Group – B)

Sl. No.	Type of Course	Subject code	Subject name	L	T	P	S	Total Contact Hours	Credit Points
THEORY									
1	Basic Science Course	BSCPH201	Physics	3	1	0	0	4	4
2	Basic Science Course	BSCM203A	Mathematics - Calculus	3	1	0	0	4	4
3	Basic Science Course	BSCBE204	Biology for Engineers	2	0	0	0	2	2
4	Engineering Science Course	ESCEE201	Basic Electrical Engineering	3	1	0	0	4	4
5	Engineering Science Course	ESME202A	Engineering Mechanics - Principles	1	1	0	0	2	2
6	Engineering Science Course	ESCCS202	Introduction to AI and Data Science using Python	2	1	0	0	3	3
7	General Studies Course	ESP201	Essential Studies for Professionals - II	1	0	0	0	1	1
PRACTICAL									
8	Basic Science Course	BSCPH291	Physics Laboratory	0	0	3	0	3	1.5
9	Basic Science Course	BSCBE294	Biology for Engineers Laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCEE291	Basic Electrical Engineering Laboratory	0	0	2	0	2	1
11	Engineering Science Course	ESCME292	Engineering Graphics & Design	1	0	4	0	5	3
12	Engineering Science Course	ESCCS292	Introduction to AI and Data Science Laboratory using Python	0	0	4	0	4	2

SESSIONAL									
13	Humanities and social sciences	UHV272	Universal Human Values- II	0	0	0	2	2	3
Mandatory Industry and Value Added Courses (IVC)									
14	Mandatory Industry and Value Added Courses (IVC)	IVC281	Design Thinking & Innovation- Intermediate	0	0	0	1	1	0
15	Mandatory Industry and Value Added Courses (IVC)	IVC282	Economics, Finance and Entrepreneurship Skills - Intermediate	0	0	0	1	1	0
Total Credit Points of Semester				17	5	15	4	40	32.5
16	Mandatory Courses	MAR	Mandatory Additional Requirements	0	0	0	0	0	0
17	Mandatory Online Courses	MOOCs	Massive Open Online Courses	0	0	0	0	0	0
18	Mandatory Online Courses	IFC	Industry and Foreign Certification	0	0	0	0	0	0
19	Mandatory Courses	SAR	Skill Additional Requirements	0	0	0	0	0	0
Skill Addition Requirements (SAR) 1. Foreign Language, 2. Physical Education, 3. Soft Skill									



**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 2026

Subject Name: Physics

Credit: 4

Lecture Hours: 42

Subject Code: BSCPH101 / BSCPH201

Pre-requisite: Physics of Higher Secondary Standard

Relevant Links:

Study Material

Coursera

NPTEL

[IEM Learning](#)

COURSE OBJECTIVES:

1. To train the students to grasp the concepts of different areas of physics, appropriate for applications in different branches of engineering.
2. To expand their knowledge of Physics, which will be suitable for different engineering streams.
3. Learn to apply the different theories of physics in real life problems.
4. Try to think new problems of physics for applications in engineering.

COURSE OUTCOMES:

CO1: Develop an understanding of the fundamental theories of physics such as optics, electromagnetic theory, classical mechanics, quantum mechanics and statistical mechanics for engineering applications in societal and environmental contexts.

CO2: Study the wave nature of light by means of phenomena like interference, diffraction and LASER and to study the Maxwell's equations to understand the concepts of electromagnetic theory.

CO 3: Using the concepts of classical mechanics to study the motion of particles and systems, learning the postulates of quantum mechanics to analyze the behavior of particles in quantum levels and understanding the behavior of physical systems by statistical methods.

CO4: Develop an ability to analyze and solve theoretical problems of physics.

Module number	Topic	Sub-topics	Books to be referred	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Mechanics	Part A: Vector Calculus Representation of a Vector, Some Important Definitions about Vectors, Resolution of a Vector into Components, Addition and Subtraction of Vector in Component Form, Product of Two Vectors, Triple Product – Scalar and Vector, Scalar and Vector Fields, Partial Derivative of Vectors, Gradient of Scalar Field, Divergence of Vector Field, Curl of a Vector Field, Curl in the Context of Rotational Motion.	Engineering Physics , Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 1	International Academia: https://catalog.mit.edu/subjects/8/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Matlab software	8	To determine the Rigidity modulus of the Material of a wire by Dynamic Method To determine the Rigidity modulus of the Material of a wire by Static Method To determine the Acceleration due to Gravity using Bar Pendulum

		Part B: Classical Mechanics Revision of Newton's Law of Motion, Inertial and Non-Inertial Frame of References : Pseudo Force, Friction, Problems including constraints and Friction, conservation Laws, Rigid Body, Angular Velocity Vector, Moment of Inertia, Acceleration of a Rigid Body Rolling Down an Inclined plane, Central Force, Kepler's laws, Planets and Satellites				
2	Oscillations	Oscillations: Introduction, Relation of Simple Harmonic Motion with Circular Motion, Differential Equation of Simple Harmonic Motion, Various Characteristics of SHM, Periodic, Oscillatory and SHM - Characteristics and Different Energy, Energy of a Particle Executing SHM and Law of Conservation of Energy, Differential Equation of Free or Undamped Vibrations, Damped vibrations, Solution of the Equation of a Damped Oscillator and its Analysis, Electrical Analogy of SHM and DV, Analysis of Forced Vibration, Resonance, Energy of a Forced Vibrator, Sharpness of Resonance, Quality Factor, Forced Vibration in an LCR Circuit	Engineering Physics , Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 2.	International Academia: https://catalog.mit.edu/subjects/8/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Matlab software	5	To generate parametric oscillations in a string using Melde's experimental set-up.

3	Optics	Interference : Introduction, Wave Propagation and the Wave Equation, Principle of superposition of waves, Huygens' Wave Theory, Interference of mechanical waves, Young's experiment on Interference of Light Waves (Double Slit Experiment), Theory of Interference (Analytical Treatment), Intensity Distribution Curve and Energy Conservation, Condition for Permanent Interference: Coherent Sources, Classification of Interference Phenomena, Calculation of Fringe Width, , Coherence, Newton's Ring. Diffraction: Introduction, Different types of diffraction phenomena, difference between interference and diffraction, Fraunhofer diffraction due to a single slit(no derivation), Fraunhofer diffraction due to a double slit(no derivation), Difference between Single slit and a double slit diffraction pattern, Diffraction due to Plane Diffraction Grating (no derivation), Rayleigh's Criteria on Resolution, Resolving Power of a Grating, Application of Diffraction Grating. Laser: Introduction, Characteristics of laser, Absorption and emission of radiations by matter, Einstein's A and B Coefficients, working principle of	<i>Physics,</i> B.K.Pandey, Monoj K Harbola et. al., Cengage, Chapter 2. <i>Engineering Physics,</i> Sujay Kumar Bhattacharya , Mc Graw Hill Education, Chapter 3.	International Academia: https://catalog.mit.edu/subjects/8/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Matlab software	10	To determine the radius of curvature of a plano convex lens by formation of Newton's ring method. To determine the wavelengths of a given light source by diffraction grating method.
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		laser, population inversion in laser, basic components of laser system, optical resonator and Q value, threshold condition for sustaining of laser action, typical lasers, application of lasers.	Engineering Physics , Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 5.			
4	Introduction to Electromagnetic Theory	Maxwell's equations: Introduction, Magnetic flux, Faraday's law of electromagnetic induction, electromotive force, Integral form of Faraday's law, Displacement current, Ampere's Circuital law, Modified Ampere's law, Continuity property of current, Maxwell's Equations, Wave Equation in Free Space, Transverse Nature of Electromagnetic Field	Engineering Physics , Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 7.	International Standards: AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf	6	Determination of electron charge to mass ratio (e/m) Determination of Hall coefficient. Conversion of vibration to voltage using piezoelectric materials

5	Quantum Mechanics	Quantum Mechanics: Introduction, Wave function and its physical Significance, Normalization of wave functions and Orthogonality of wave functions, Operators in Quantum Mechanics, Fundamental postulates of Quantum mechanics, Time-dependent Schrodinger's equation, Time-independent Schrodinger's wave equation, Application of Schrodinger's equation, Infinite Rectangular Potential Well , Quantum Harmonic Oscillator	Engineering Physics , Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 10.	International Standards: https://catalog.mit.edu/subjects/8/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Matlab software	7	Determination of Planck's constant by photoelectric emission process Determination the excitation potential of a given gas by Franck-Hertz experiment Determination of Planck's Constant using LED Determination of the band-gap of a semiconductor by measuring the resistivity at different Temperatures by four-probe method To study the different characteristics of a solar cell
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TEXT BOOK:

1. [Engineering Physics by Sujay Kumar Bhattacharya, McGraw-Hill Education](#)

REFERENCE BOOKS:

1. Theory and problems of Theoretical Mechanics by Murray R. Spiegel SI(Metric)edition
2. Advanced Acoustics by Dr. D.P. Raychaudhuri, The new bookstall, RevisedNinthEdition,2009
3. A text book on Optics, B. Ghosh and K.G. Majumder, Sreedhar Publishers, fifth edition
4. Introduction to Electrodynamics by David J. Griffiths 3rdEdition
5. Concepts of Modern Physics (Sixth Edition) by Arthur Beiser (Published by McGraw-Hill)



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 2026

Subject Name: Mathematics-Calculus

Credit: 4

Lecture Hours: 48

Subject Code: BSCM103A

Pre-requisite: High School Mathematics

Relevant Links:

[Study Material](#)

[Coursera](#)

[Coursera](#)

[NPTEL](#)

[NPTEL](#)

[NPTEL](#)

[Linkedin Learning](#)

[Infosys Springboard](#)

COURSE OBJECTIVES:

1. To give an exposure to some advanced concepts related to differential and integral calculus for functions of single variable, sequence and series and also lay the concept of multivariable differentiation and integration 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 modeling with application to real life problems.

COURSE OUTCOMES:

CO 1: Demonstrate the domain of applications of mean value theorems and apply the concepts and techniques of differential and integral calculus to determine curvature and evaluate different types of improper integrals.

CO 2: Develop the knowledge for addressing real-life problems that comprise several variables or attributes and identify extremum points of different surfaces of higher dimensions.

CO 3: Recognize the methods for evaluating multiple integrals and apply to different physical problems.

CO 4: Use the tools of power series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.

Module number	Topic	Sub-topics	Mapping with Textbooks	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Calculus (Differentiation)	Rolle's Theorem, Mean Value Theorems, Taylor's and Maclaurin's Theorems with Remainders; Taylor's Series, Series for Exponential, Trigonometric and Logarithm Functions; Indeterminate forms and L' Hospital's Rule.	T1: Chapter 4, Secs. 4.3 - 4.5, 4.10 – 4.12	International Academia: https://ocw.mit.edu/courses/18-01-Calculus-I-Single-Variable-Calculus https://ocw.mit.edu/courses/18-01-Single-Variable-Calculus AICTE-prescribed syllabus: Untitled_1-min.pdf (aict-india.org) Industry Mapping & Simulation: MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/ MATLAB File Exchange:	8	1. Plotting of the following special graphs: - Sketch the graph of sine and cosine functions in $[-2\pi, 2\pi]$ - Plot a graph for e^x on $\mathbf{R}$ - Draw the greatest integer and least functions in the interval $[0, 5]$. 2. Draw the graph of the evolute of a parabola.

				<i>Cleve_Lab: A Mathematical Exportium</i> https://in.mathworks.com/matlabcentral/fileexchange/59085-cleve_lab?s_tid=srchtitle <i>Drawing Code for Mathematical Benchmark Functions</i> https://in.mathworks.com/matlabcentral/fileexchange/125645-drawing-code-for-mathematical-benchmark-functions?s_tid=srchtitle <i>Generative AI:</i> Photomath		
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2	Calculus (Integration)	Evaluation of Improper Integrals; Beta and Gamma Functions and their properties; Applications of Definite Integrals to evaluate surface area and volume of revolutions.	T1: Chapter 6, Secs. 6.12–6.13 Chapter 7, Secs. 7.14 – 7.16	International Academia: https://ocw.mit.edu/courses/18-01-Calculus-I-Single-Variable-Calculus https://ocw.mit.edu/courses/18-01-Single-Variable-Calculus AICTE prescribed syllabus: Untitled_1-min.pdf (aicte-india.org) Industry Mapping & Simulation : MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/ MATLAB File Exchange: Cleve_Lab: A Mathematical Exportium https://in.mathworks.com/matlabcentral/fileexchange/59085-cleve_lab?s_tid=srchtitle Drawing Code for Mathematical Benchmark Functions https://in.mathworks.com/matlabcentral/fileexchange/125645-drawing-code-for-mathematical-benchmark-functions?s_tid=srchtitle Generative AI: Photomath	6	1. Evaluate definite integrals.
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3	Multivariable Calculus (Differentiation)	Limit, Continuity and Partial Derivatives; Homogeneous Functions, Euler's Theorem of first and second order (Statement only); Change of variables, Composite function, Derivative of implicit functions, Total Derivative; Jacobian; Maxima, Minima and Saddle points; Method of Lagrange multipliers; Gradient, Directional Derivatives, Tangent Plane and Normal Line, Curl and Divergence.	T1: Chapter 5 Secs. 5.1 – 5.8, 5.11, 5.12 Chapter 8, Secs. 8.4 – 8.9	International Academia: Syllabus Calculus of Several Variables Mathematics MIT OpenCourseWare Linear Algebra, Calculus, & 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/ MATLAB File Exchange: Cleve_Lab: A Mathematical Exportium https://in.mathworks.com/matlabcentral/fileexchange/59085-cleve_lab?s_tid=srchtitle Drawing Code for Mathematical Benchmark Functions https://in.mathworks.com/matlabcentral/fileexchange/125645-drawing-code-for-mathematical-benchmark-functions?s_tid=srchtitle Generative AI: Photomath	12	1. Find partial differentiation of any function of two or three variables. 2. Find gradient, divergence and curl of any vector valued function. 3. Find the directional derivative of any vector. 4. Write a code to find the tangent plane and draw the surface.
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4	Multivariate Calculus (Integration)	Multiple Integration: Double Integrals (Cartesian), Change of Order of Integration in Double Integrals, Change of Variables (Cartesian to Polar), Applications: Areas and Volumes, Centre of Mass and Gravity (constant and variable densities); Triple Integrals (Cartesian), Cylindrical and Spherical Coordinates, Change of Variables (Cartesian to Cylindrical and Spherical), Simple applications involving cubes, sphere and rectangular parallelepiped; Scalar Line Integrals, Vector Line Integrals, Scalar Surface Integrals, Vector Surface Integrals, Theorems of Green, Gauss and Stokes.	T1: Chapter 7 Secs. 7.1 – 7.13 Chapter 8 Secs. 8.10 - 8.17	International Academia: Syllabus Calculus of Several Variables Mathematics MIT OpenCourseWare Linear Algebra, Calculus, & Applications I Stanford Online AICTE-prescribed syllabus: Untitled_1-min.pdf (aict-india.org) Industry Mapping: MATLAB	12	1. Evaluate double integral of any multivariate function. 2. Evaluate triple integral of any multivariate function.
5	Sequences and Series	Basic ideas on Sequence; Concept of Monotonic and Bounded sequence; Convergence and Divergence of Sequence; Algebra of Sequences (Statement only). Basic idea of an Infinite Series; Notion of Convergence and Divergence; Series of Positive Terms - Convergence of infinite G.P. series and p-series (Statement only); Tests of	T2: Chapter 18	International Academia: https://ocw.mit.edu/courses/18-01-Calculus-I-Single-Variable-Calculus AICTE prescribed syllabus: Untitled_1-min.pdf (aict-india.org) Industry Mapping & Simulation: MATLAB/Mathematica	10	1. To evaluate the sum of an infinite series. 2. To check the convergence or divergence of an infinite series.

		Convergence [Statement only] – Comparison Test, D’Alembert’s Ratio Test, Raabe’s Test and Cauchy’s Root test.		https://in.mathworks.com/ https://www.wolfram.com/mathematica/		
6	Advanced Proficiency Module	Evolutes and Involutives (From Module-1), Alternating Series - Leibnitz’s test [Statement only], Absolute and Conditional Convergence.(From Module-5)				

Digital Twins:

- **MATLAB/Simulink**
Provides a range of tools for modeling, simulation, and analysis of dynamic systems using mathematical methods.
<https://www.mathworks.com/>
- **GAMS (General Algebraic Modeling System):**
A high-level modeling system for mathematical programming and optimization.
<https://gams.com/>

Mathematical modeling with application to real life problems:

- **Traffic Flow Modeling** – Using derivatives to study rate of change of vehicles along a highway.
- **Pharmaceutical Drug Dosage** – Using definite integrals to determine total drug concentration in bloodstream over time.
- **Machine Learning** – Gradient, divergence, and curl in optimization algorithms (e.g., gradient descent).
- **Heat & Mass Transfer** – Applying Gauss’ theorem for flux calculations.
- **Financial Mathematics** – Compound interest, annuities, and EMIs modeled by geometric series.

Text Books:

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.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	3	-	-	-	1	1	2	1
CO2	2	3	3	2	3	-	-	-	1	1	2	1
CO3	2	3	3	2	3	-	-	-	1	1	2	1
CO4	2	3	3	2	3	-	-	-	1	1	2	1



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

1st Semester Syllabus for B. Tech Batch 2026-2030

- **Subject Name:** Basic Electrical Engineering
- **Subject Code:** ESCEE101
- **Credit:** 4
- **Lecture Hours:** 42
- **Pre-requisite:** Basic knowledge of Physics and Mathematics in Class- XI and XII level

- **Relevant Links:**

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

- **Course Objective:**

1. **CO1:** Students can recognize different network elements, identify different network connections, and understand the concept of voltages and currents in AC or DC circuits.
2. **CO2:** Students can apply and relevant laws of electricity, network theorems to analyze electrical and magnetic circuits.
3. **CO3:** Students will be acquainted with the operations and characteristics of machines, converter circuits and new technology of energy generation and storage system. They can understand the realistic applications of these machines. They will gain knowledge on requirement of deferent electrical safety tools which are mandatory during electric installations.
4. **CO4:** Develop an ability to analyze and solve theoretical problems of Basic Electrical Engineering.

- **Course Outcomes:**

CO1: Students can recognize different network elements, identify different network connections, and understand the concept of voltages and currents in AC or DC circuits.

CO2: Students can apply and relevant laws of electricity, network theorems to analyze electrical and magnetic circuits.

CO3: Students will be acquainted with the operations and characteristics of machines, converter circuits and new technology of energy generation and storage system. They can understand the realistic applications of these machines. They will gain knowledge on requirement of deferent electrical safety tools which are mandatory during electric installations.

CO4: Develop an ability to analyze and solve theoretical problems of Basic Electrical Engineering.

• Detailed Syllabus:

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	DC Circuits	Electrical circuit elements (R, L and C), voltage and current sources, Fundamentals of linear systems, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	8	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 11,12,13,14	Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2	AC Circuits	Single Phase A.C. Circuits covering, Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series- parallel circuits; Resonance; Three Phase A.C. Circuits covering, Necessity and Advantages of three phase systems, Generation of three phase	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	10	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 11,12,13,14	Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits– impedance calculation and

		power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method;				verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3	Transformer	Basics of Electromagnetism, Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.	<i>International Academia:</i> https://catalog.mit.edu/subjects/6/ <i>AICTE-prescribed syllabus:</i> https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	6	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 6, 7, 32, 33	Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

4	Electrical Machines	AC machine: Three Phase Induction Motors covering; Concept of rotating magnetic field; Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors; Necessity of a starter, star-delta starter. Introduction to Synchronous Generators covering, Principle of operation; Types and constructional features; EMF equation; DC machine: DC Machines covering, working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, relation between EMF induced and terminal voltage enumerating the brush drop and drop due to armature reaction; DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor;	<i>International Academia:</i> https://catalog.mit.edu/subjects/6/ <i>AICTE-prescribed syllabus:</i> https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	10	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 26, 27, 28, 29, 30, 34, 35	Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding -slip ring arrangement) and single-phase induction machine. Torque Speed Characteristic of separately excited dc motor. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
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5	Overview of Electrical Power Generation System	Sources of Electrical Power covering, Introduction to Wind, Solar, Fuel cell, Tidal, Geothermal, Hydroelectric, Thermal-steam, diesel, gas, nuclear power plants; Concept of cogeneration, and distributed generation	Coursera link: Coursera Electrical Power Generation Page. [1] International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	6	Power Electronics By P.S. Bhimbra New Age Publication Chapter 11 Basic Electrical Engineering By B.L. Theraja S.Chand Publication Chapter 24	Demonstration of (a) PV module, (b) Battery energy storage system
6	Advanced Proficiency Module	Introduction to Synchronous Generators covering, Principle of operation; Power in balanced three phase circuits, measurement of power by two wattmeter method; Concept of cogeneration and distributed generation	AICTE-prescribed syllabus: https://www.aicte.gov.in/downloads/msyllabus/UG/ELECTRICAL%20Engg%20Final.pdf	2	--	--

• Reference Books:

TEXT BOOK:

1. Basic Electrical Engineering (Vol. 1 & 2) - B.L.Theraja; S.Chand Publication

REFERENCE BOOKS:

1. Basic Electrical Engineering –Dr. Jagadish Pal; Aryan Publication
2. Basic Electrical engineering- 1St Edition Paperback – P.V. Prasad | S. Sivanagaraju | K. R. Varmah | Chikku Abraham
3. Basic Electrical and Electronics Engineering – 2nd Edition Dr. Vinoth Kumar K; Dr. Saravanakumar R; Dr. Jegathesan, Wiley Publication

NPTEL Link:

<https://nptel.ac.in/courses/108105053>- NPTEL course link

<https://nptel.ac.in/courses/108106172>- NPTEL course link

<https://nptel.ac.in/courses/108108076>- NPTEL course link

<https://nptel.ac.in/courses/117106108>- NPTEL course link

MATLAB Assignment:

Design an R-L-C series circuit using MATLAB Simulation (values of R,L,C may be advised in class)
Design an R-L-C parallel circuit using MATLAB Simulation (values of R,L,C may be advised in class)



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. Admission Batch 2025-2029

Subject Name: Programming for Problem Solving

Credit: 3

Lecture Hours: 36

Subject Code: ESCCS101/ESCCS201

[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 Industry and 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	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

		Operators - Arithmetic, Logical, Assignment, Relational, Bitwise, Increment, Decrement, Conditional Operators - Operator Precedence			difference. - 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.

		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		• Declare and initialize a 2x3 integer matrix. Print 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, initialize them, and print the information of all

		unions • Struct vs. union • Enum definition and use in switch-case • Enum vs #define constants			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.
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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



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



1st Semester Syllabus for B.Tech Batch 2026-2030

Index:

Content	Page No.
Syllabus Structure	1
1 st Semester Syllabus of Biology For Engineers	2
Text Books and Reference Books	14

Syllabus Structure:

Sl. No.	Type	Subject Code	Subject Name	L	T	P	Total	Credit
1	Theory	BSCBE104	Biology For Engineers	3	0	2	5	4



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 2026-2030

Subject Name: Biology for Engineers

Credit: 3

Lecture Hours: 36

Subject Code: BSCBE104

Pre-requisite: Basic knowledge of Physics, Chemistry and Mathematics

Course Objective:

1. To introduce the fundamental differences between science and engineering
2. To impart knowledge on how biological observations of the 18th Century led to major discoveries
3. To impart knowledge on enzymes and their varied properties and functions
4. To impart knowledge on DNA as genetic material

Course Outcomes:

The concepts developed in this course will help the students in their higher studies. The course will enable the student to:

CO1: Identify the major biological discoveries that revolutionized science like the classification of organisms based on criteria such as morphology and ecology. Highlighting the identification and classification of microorganisms.

CO2: Convey that all forms of life have the same building blocks and yet the manifestations areas diverse as the classification of enzymes and their varied properties and functions which distinguish one from the other.

CO3: Analyze biological processes at the reductionist level and apply thermodynamic principles to biological systems.

CO4: Identify DNA as genetic material in the molecular basis of information transfer, impart the concept of recessiveness and dominance during the passage of genetic material from parent to offspring.

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Infosys SpringBoard](#)

Detailed Syllabus:

Module number	Topic	Sub-topics	Text Book Mapping	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	Introduction	Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why do we need to study biology? Discuss how biological observations of the 18th Century lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics refer to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	Biology for Engineers Chapter:1	No corresponding material	2	There are no corresponding labs.
2	Classification	Hierarchy of life forms at the phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b)ultrastructure- prokaryotes or eukaryotes.	Biology for Engineers Chapter:1	International standard https://ocw.mit.edu/courses/7-014-introductory-biology-spring-2005/resources/17-carbon-and-energy-	3	1. Phylogenetic tree construction (Bioinformatics)

		(c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat- aquatic or terrestrial (f) Molecular taxonomy : three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S. cerevisiae, D. elanogaster, C. elegans, A. thaliana, M. musculus.		metabolism/ AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: NIL		
3	Genetics	To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be given not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using	Campbell Biology: Campbell, N.A.; Reece, J.B.; Urry, L.; Cain, M.L.; Wasserman, S.A.; Minorsky, P.V.; Jackson, R. 12th Edition Chapter: 14	International standard (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/genetics/) (https://pll.harvard.edu/course/principles-genetics) AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)	3	1. Study of Genetic Variation (Alien Genetics Biology CK-12 PLIX Series https://www.labxchange.org/)

		human genetics.		efault/files/Model Curriculum/Final ECE.pdf Industry Mapping: (https://www.global-engage.com/life-science/8-free-tools-genetic-engineering-molecular-synthetic-biology/) https://web.stanford.edu/group/pritchardlab/structure.html)		
`	Biomolecules	Molecules of life: In this context discuss monomeric units and polymeric structures. Discuss sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Pioneering work in interpreting the genetic code and its function in protein synthesis was carried out by Nobel Laureates Hargobind Khorana, Marshall Nirenberg, and Robert Holley. Two carbon units and lipids. Structure of protein-PDB viewer, Protein structure prediction- AlphaFold	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman & Co Chapter: 3,5,11,12	International Standards: (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/resource-index/) https://harvard.simplesyllabus.com/en-US/doc/sy2y033op) AICTE prescribesyllabus: https://www.aicte-	5	1. Protein structure elucidation- PDBViewer (https://www.rcsb.org/) 2. Estimation of protein using Bradford assay 3. Identification of protein through SDS PAGE 4. Protein structure prediction using AlphaFold

				india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: https://guides.lib.byu.edu/c.php?g=216337&p=1428369 https://www.computabio.com/applications-of-pymol-software.html https://phd.leeds.ac.uk/project/173-computer-simulations-of-biological-macromolecules https://spdbv.unil.ch/		
5.	Enzymes	Enzymology: How to monitor Enzyme catalyzed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman & Co Chapter: 8	International Standards: https://ocw.mit.edu/search/?q=Enzymes&type=resourcefile https://harvard.simplesyllabus.com/en-US/doc/sy2y033op	5	1. Enzyme kinetics using UV-Vis spectrophotometer

				- AICTE prescribesyllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) IndustryMapping: (https://kintekcorp.com/software) (https://bio.tools/icekat)		
6.	Information Transfer	The molecular basis coding and decoding genetic information is the universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single-stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. Mutation, The DNA Technology (Use and Application), Sequence alignment- Pairwise and BLAST.	Campbell Biology:Campbell, N.A.; Reece, J.B.; Urry, Lisa; Cain, M, L.; Wasserman, S.A.; Minorsky, P. V.; Jackson. 12th Edition Chapter 16,17	International Standards: (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/dna-structure-classic-experiments/) (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/dna-replication/) (https://ocw.mit.edu)	5	1.Sequence alignment-Pairwise (Global and Local) and BLAST 2.Identification of DNA using Agarose gel electrophoresis

				du/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/transcription-translation/) -AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: (https://web.expasy.org/translate/) https://blast.ncbi.nlm.nih.gov/Blast.cgi		
7.	Macromolecular analysis	Examining biological processes at the reductionist level involves a comprehensive analysis of proteins, with a particular focus on their structure and function. This investigation encompasses the hierarchical organization of protein structures, spanning primary, secondary, tertiary, and quaternary levels. Additionally, proteins are explored in various roles, serving as enzymes, transporters, receptors, and essential structural elements within biological systems.	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman & Co. Chapter: 3, 13	International Standards: (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/biochemistry/proteins-levels-of-structure-non-covalent-forces/) AICTE	3	Membrane Channels (Membrane Channels - LabXchange)

				prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3090454/) (https://nmr.science.oregonstate.edu/macromolecular-analysis) (https://moduler.au.dk/course/2019-2020/K-KEM-K2-48?lang=en-GB)		
8.	Metabolism	Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Gibb's energy. Concept of Keq and its relation to standard free energy. Spontaneity, Energy yielding and energy consuming reactions. Concept of Energy charge Respiration: Breakdown of glucose to CO₂ + H₂O (Glycolysis and Gluconeogenesis and Krebs cycle). Electron transport chain	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman Chapter: 16,17,18,19,20	International Standards: (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/resource-index/) (https://ocw.mit.edu/courses/20-10j-thermodynamics)	5	Bioenergetics (https://www.labxchange.org/)

		and Oxidative phosphorylation Photosynthesis: Synthesis of glucose from CO₂ and H₂O. Cyclic and non-cyclic photophosphorylation. Calvin cycle. CAM cycle.	-of-biomolecular-systems-fall-2005/pages/lecture-notes) (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/biochemistry/respiration-and-fermentation/) (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/biochemistry/chemiosmotic-principle-photosynthesis/) https://harvard.simplesyllabus.com/en-US/doc/sy2y033op) AICTE prescribesyllabus: https://www.aicte-		
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				india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping : https://www.genome.jp/kegg/pathway.html		
9.	Microbiology	Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	Biology for Engineers. Chapter: 9	International Standards: https://ocw.mit.edu/courses/20-106j-systems-microbiology-fall-2006/pages/readings/ AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: https://pages.primuslabs.com/primuslabs-new-	3	1. Microscopic analysis of a living cell 2. Identification of bacteria through Gram staining 3. Digital Twin Experiment: digital Twin of Bacterial Growth (Microbiology Focus): Create a virtual model of bacterial growth to stimulate and predict how factors like nutrients or temperature affect proliferation, mirroring real cultures like <i>E.coli</i> .

				client-usa.html?qclid=CjwKCAiA9ourBhAVEiwA3L5RFieYQ2c6mskEkqLq0_vaDlTGfqq7Ah5YAt_vHdeawcqIhQ3ItsjM3BoChLIQAvD_BwE		
10.	Advanced topics	Pioneering work in interpreting the genetic code and its function in protein synthesis by Nobel Laureates Hargobind Khorana, Marshall Nirenberg, and Robert Holley. Structure of protein-PDB viewer, Protein structure prediction-AlphaFold. Sequence alignment-Pairwise and BLAST (Basic Concepts)		International Standards: https://ocw.mit.edu/courses/hst-508-genomics-and-computational-biology-fall-2002/ https://ocw.mit.edu/courses/7-88j-protein-folding-and-human-disease-spring-2015/download/	2	1.Sequence analysis with Bioinformatics tools 2. Protein's 3D structure prediction with the help of Alpha Fold (AI system developed by Google DeepMind)

				Industry Mapping: (https://web.expasy.org/translate/) (https://blast.ncbi.nlm.nih.gov/Blast.cgi) https://guides.lib.byu.edu/c.php?g=216337&p=1428369 https://www.computabio.com/applications-of-pymol-software.html https://phd.leeds.ac.uk/project/173-computer-simulations-of-biological-macromolecules https://spdbv.unil.ch/		
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Experiential Learning:

1. Microscopic image analysis and enzyme kinetics simulation using MATLAB.

Text Books:

1. Biology for Engineers. Wiley and Sons
2. Campbell Biology: Campbell, N.A.; Reece, J.B.; Urry, Lisa; Cain, M.L.; Wasserman, S.A.; Minorsky, P.V.; Jackson. 12th Edition
3. Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman & Co

Reference Books:

1. Molecular Genetics (Second edition), Stent, G.S and Calendar R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
2. Microbiology, Prescott, L.M.J.P. Harley and C.A. Klein 1995. 2nd edition Wm C. Brown Publishers
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M.M. W.H. Freeman and Company
4. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons



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 2026-2030

Subject Name: Engineering Mechanics-Principles Credit:2 Lecture Hours: 24

Subject Code: ESME102A

Pre-requisite: High School Mathematics

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

COURSE OBJECTIVES:

1. To introduce students to the fundamental concepts of force, moment, and equilibrium in two- and three-dimensional systems.
2. To develop the ability to model and analyze mechanical systems using vector operations and free-body diagrams.
3. To understand and evaluate frictional effects and structural behavior of trusses under various loading conditions.
4. To apply principles of kinematics and kinetics to describe and solve particle motion problems in engineering contexts

COURSE OUTCOMES:

CO 1: Apply vector operations to represent forces and moments for solving basic engineering problems.

CO 2: Analyse force systems to determine conditions of equilibrium using free-body diagrams.

CO 3: Evaluate the effects of static and kinetic friction in various mechanical systems.

CO 4: Apply kinematic and kinetic principles to solve particle motion problems using rectilinear framework

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	Introduction to Vectors	Basic concepts, types of forces, scalars and vectors, Vector addition and subtraction in component form, Vector operations - Force and moment representation using vectors	International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Enqq.pdf Industry Mapping: MATLAB	2	Solving vector mechanics problems in MATLAB	B.B. Ghosh, S. Chakrabarti, S. Ghosh “Engineering Mechanics”, Part I - Chapter 2
2	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, Lami’s Theorem, Equations of Equilibrium of Coplanar Systems.	International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Enqq.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

3	Friction	Laws of Friction, Static and Dynamic Friction; Application of Friction in various systems.	International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Enqq.pdf Industry Mapping: MATLAB	4	Solving numerical problems involving friction in MATLAB and validating the analytical solutions.	B.B. Ghosh, S. Chakrabarti, S. Ghosh “Engineering Mechanics”, Part I- Chapter 4
4	Kinematics of Particles	Definitions and basic concepts of particle motion, Rectilinear motion: equations of motion for constant and variable acceleration, Projectile motion, Introduction to relative motion.	International Academia: https://ocw.mit.edu/course/s/2-003sc-engineering-dynamics-fall-2011/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Enqq.pdf Industry Mapping: Mujoco, PyBullet	5	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 – Chapters 1,2

5	Kinetics of Particles	Application of Newton's laws and D' Alembert's principles to solve motion problems	International Academia: https://ocw.mit.edu/course/s/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: Mujoco, PyBullet	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
6	Basic Structural Analysis	Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members.	International Academia: https://ocw.mit.edu/course/s/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: ANSYS Mechanical	4	Solving numerical problems on Trusses in ANSYS Mechanical and verifying with analytical calculations	Engineering Mechanics (Statics & Dynamics), D.S. Kumar – Chapter 5

TEXT BOOKS:

1. B.B. Ghosh, S. Chakrabarti, S. Ghosh, “Engineering Mechanics”, Vikas Publishing House (Part I - Chapters 1, 2, 3, 4 Part II – Chapters 1, 2, 3)
2. D.S. Kumar, “Engineering Mechanics (Statics & Dynamics)”, S K Kataria and Sons
3. I. H. Shames, “Engineering Mechanics (Statics and Dynamics)”, Prentice Hall of India

REFERENCE BOOKS:

1. J. L. Meriam and L. G. Kraige, “Engineering Mechanics: Statics”, Wiley.
2. J. L. Meriam and L. G. Kraige, “Engineering Mechanics: Dynamics”, Wiley.
3. Timoshenko, Young, Rao, Pati, “Engineering Mechanics,” McGraw Hill



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 2026

Subject Name: Chemistry

Credit: 4

Lecture Hours: 42

Subject Code: BSCCH102/ BSCCH202

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

Relevant Links:

Study [Material](#)

[Coursera](#)

[NPTEL](#)

[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.

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:	7	1. Estimation of Hardness of water sample by Complexometric titration. 2. Synthesis of Nanoparticles	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 1

			https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf Industry Mapping: A Python Program for Solving Schrödinger's Equation in 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.	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/f	5	1. Food dyes and Beers law using UV-vis spectroscopy. 2. Estimation of metal ions using UV-vis spectroscopy. 3. Studies on	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 2

			iles/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 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/		the synthesis of Nanoparticles using UV-vis spectroscopy.	
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 ₂ F and HCN and trajectories on these surfaces.	International Academia: MIT- Unit III: Thermodynamics & Chemical Equilibrium Principles of Chemical Science Chemistry MIT Open Course Ware	3	1. Determination of surface tension of liquids using Stalagmometer Instrument 2. Determination of	Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 3

			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 petroleum industry.		viscosity of liquids using Ostwald Viscometer.	
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-	11	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	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition, chapter 5, 6, 7, 18

			<u>thermodynamics-chemical-equilibrium/lecture-16/</u> <u>https://ocw.mit.edu/courses/5-60-thermodynamics-kinetics-spring-2008/pages/lecture-notes/</u> AICTE-prescribed syllabus: <u>https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf</u> 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		two immiscible liquids (Heterogeneous Equilibrium). 6. Determination of hardness of water sample 7. Determination of alkalinity of water sample	
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			Gibbs Energy Minimization Software for Geochemical Modeling: https://www.bing.com/ck/a?!&&p=c92d076e6c36cf3aJmltdHM9MTcwMTEyOTYwMCZpZ3VpZD0xNjY1NGQ4Yy03NDMzLTYyMDAtMDE0Yi01YzYwNzU5ZTYzNWUmaW5zaWQ9NTIxMQ&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/M			
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			athWorks-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-Graph-2pdf	Chemistry- I, Second Edition, Gourkrishna Das mohapatra, chapter- 5
6	Stereochemistry	Representations of 3 dimensional structures, structural isomers and	International Standards : (https://ocw.mit.edu/courses/5-12-organic-	3	1. Determination of specific rotation of sugar solution by	Engineering Chemistry by Jain and Jain, Dhanpat

		stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds	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		polarimeter	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-CHEM=on https://catalog.mit.edu/subjects/5/	8	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

			<i>AICTE-prescribed syllabus:</i> 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. <i>Industry Tool:</i> Screening of drug molecules using Popular Industrial Software using AutoDock, AutoDock Vina, Open Babel,			
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			Biovia Discovery Studio			
8	Advanced Proficiency Module	Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.	AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf	2		Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, chapter- 2

TEXT BOOK:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.17th edition
2. Chemistry- I, Second Edition, Gourkrishna Dasmohapatra, Vikas Publishing House Private Limited.

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



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 6

Subject Name: Mathematics and Basic Statistics

Credit: 4

Lecture Hours: 48

Subject Code: BSCM103B

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	Linear Algebra-I	Vector Space, Vector Subspace, Linear Independence and Dependence of Vectors, Basis, Dimension; Rank of a Matrix, Application to Linear Systems of Equations, Eigenvalues and Eigenvectors; Eigenvalues of some special matrices; Cayley-Hamilton Theorem; Similarity Matrix.	T2: Chapter 15 T1: Chapter 2 Secs. 2.7, 2.9, 2.10, 2.13 – 2.16	<i>International Academia:</i> 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 largest absolute value in the column. Page 2

				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		2. Using MATLAB, find the determinant and rank of a matrix. 3. Check the consistency of a linear system of equations, and solve, if possible. 4. Write a program of check the independence of any three vectors in $\mathbf{R}^3$. 5. Compute eigenvalues and eigenvectors of a matrix $A \in \mathbf{R}^{n \times n}$.
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2	Linear Algebra-II	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: Chapters 25 & 27	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. Find the inner product of any two vectors of $\mathbf{R}^3$. 2. Using Gram-Schmidt Orthogonalization, find the orthonormal vectors for any three vectors in $\mathbf{R}^3$.
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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.	T1: Chapter 11 Secs. All Chapter 13 Secs. 13.1-13.8-I, 13.9	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 <i>AICTE prescribed syllabus:</i> Untitled 1-min.pdf (aicte-india.org) <i>Industry Mapping:</i> MATLAB	14	1. Solve any initial valued ordinary differential equation. 2. Solve any boundary valued ordinary differential equation
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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 (aict-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.
5	Advanced Proficiency Module	Diagonalization of matrices (From Module-1), Cauchy-Euler Equation (From Module-3)				

Digital Twins:

- **MATLAB/Simulink**
Provides a range of tools for modeling, simulation, and analysis of dynamic systems using mathematical methods.
<https://www.mathworks.com/>
- **GAMS (General Algebraic Modeling System):**
A high-level modeling system for mathematical programming and optimization.
<https://gams.com/>

- **Electric Circuits:** Apply Kirchhoff's laws and solve the resulting system using matrices.
- **Signal Processing:** Apply Gram-Schmidt Orthogonalization to orthogonalize signals in communication systems.
- **Epidemiology (SIR Model):** Model disease spread in a population using coupled ODEs.
- **Stock Market Analysis:** Apply regression and correlation to analyze stock price trends.

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.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	1	1	2	1
CO2	3	3	3	2	3	-	-	-	1	1	2	1

CO3	3	3	3	2	3	-	-	-	1	1	2	1
CO4	3	3	3	2	3	-	-	-	1	1	2	1



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 of Basic Electronics Engineering for Batch 2026-2030

Index:

Content	PageNo.
Syllabus Structure	3
Course Objective	4
Course Outcome	5
Detailed Syllabus	6-9
Textbooks & Reference Books	10

Syllabus Structure

Sl. No.	Type	Subject Code	Subject Name	L	T	P	Total	Credit
1	Engineering Science Course	ESCEC101	Basic Electronics Engineering	3	1	0	4	4
2	Engineering Science Course	ESCEC191	Basic Electronics Engineering Laboratory	0	0	2	2	1
				Total Credit points				5



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Management, Jaipur



1st Semester Syllabus of Basic Electronics Engineering for Batch 2026-2030

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

Subject Code: ESCEC101

Pre-requisite: Basic Knowledge in Physics in Class 12 level

Relevant Links:

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:

CO 1: To conceptualize the fundamentals of semiconductor physics, including the band structures.

CO 2: To be able to understand the basics of p-n junction diode and Zener diode and their applications.

CO 3: To be able to understand the concept of Transistors working principles, characteristics and their applications.

CO 4: To study the basics of digital electronics including basic gates, universal gates and truth tables

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Textbook Mapping	Corresponding Lab Assignment
1	Semiconductor 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, Introduction to compound III-V semiconductors (GaAs), Einstein's Relation, generation and recombination and injection of carriers.	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	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky Chapter - 1	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.
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	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:	6	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky Chapter - 2	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

		Rectifier Circuits, Schottky Diode Characteristics.	(https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf) Industry Mapping: TCAD Software			clammer 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-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,	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	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky Chapter - 3	1. Study of Characteristic curves for CB, CE mode configuration and find the respective hybrid parameters.
4	Field effect	Junction Field Effect Transistor	International Academia: (https://ocw.mit.edu/courses	6	Electronic Devices and Circuits Theory by Robert	1. Study of I-V characteristics of Field Effect Transistors

	transistors	(JFET): Construction, Types, Operation, V-I characteristics, Regions of operation. Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Construction, Types, Operation, V-I characteristics, Regions of operation, MOSFET as switch & amplifier, CMOS technology.	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		L. Boylestad, Louis Nashelsky Chapter - 6	and show the characteristics in LTSpice.
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, logarithmic amplifiers, Comparator, Schmitt trigger.	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	Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky Chapter - 10,11	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	Boolean Algebra and Logic Gates, Basic Logic AND, OR, NOT Gates and Universal gates, XOR and XNOR gate, their symbols and Truth tables, De Morgan's Theorems, Combinational Circuit (adders/subtractors, magnitude comparator, multiplexer, demultiplexers, encoders, decoders). International Academia: https://web.stanford.edu/class/archive/ee/ee108a/ee108a.1082/schedule.html AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf Industry Mapping: Hardware Chipsets Software-TinkerCad, EDA Playground	6	Digital Logic Design 4th Edition by M . Morris Mana and Michael D. Ciletti Chapters - 1,2,4	1. Study of Logic Gates and realization of Boolean functions using Logic Gates. 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.
7	Advanced Proficiency Module	Density of state function and dimensional problem quantization, Frequency dependent negative resistance and solution of differential equations, Small signal analysis using h-parameter, to formulate current gain, voltage gain, input impedance and output impedance. 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		Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky Chapter - 1,3,10,11	

TEXT BOOKS:

1. Basic Electronics, Debashis De, Kamakhya Prasad Ghatak, Pearson Education India.

REFERENCE BOOKS:

1. Streetman, Solid State Electronic Devices, Pearson Education India.
2. Donald Neamen, Semiconductor Physics and Devices, McGraw-Hill Higher Education.
3. Electronic Devices and Circuits Theory by Robert L. Boylestad, Louis Nashelsky.
4. Simon M. Sze, Yiming Li, Kwok K. Ng, Physics of Semiconductor Devices, John Wiley & Sons .
5. Millman, Grabel, Microelectronics, McGraw Hill.
6. Digital Logic Design 4th Edition by M . Morris Mano and Michael D. Ciletti.
7. Sedra, Smith, Microelectronic Circuits, Oxford University Press.



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



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

Subject Name: Programming for Problem Solving

Credit: 3

Lecture Hours: 36

Subject Code: ESCCS101/ESCCS201

[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 Industry and 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	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

		Operators - Arithmetic, Logical, Assignment, Relational, Bitwise, Increment, Decrement, Conditional Operators - Operator Precedence			difference. - 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.

		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		• Declare and initialize a 2x3 integer matrix. Print 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, initialize them, and print the information of all

		unions • Struct vs. union • Enum definition and use in switch-case • Enum vs #define constants			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.
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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



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1st Semester Syllabus for B.Tech. Batch 2026-2030

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

Subject Code: ESME102B

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 apply 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 access 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/course/s/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 sections and composite sections; Concept of Mass moment inertia.	International Academia: https://ocw.mit.edu/course/s/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	5	Solving numerical problems on CG & MI in MATLAB and validating with analytical solutions	B.B. Ghosh, S. Chakrabarti, S. Ghosh "Engineering Mechanics", Part I - Chapter 5, 6

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/course/s/2-003sc-engineering-dynamics-fall-2011/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/FinalMechanical%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	Work, Energy & Power	Work-energy principle for particles, Kinetic energy, potential energy, and conservation of energy	International Academia: https://ocw.mit.edu/course/s/2-003sc-engineering-dynamics-fall-2011/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/FinalMechanical%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

5	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 Newton's laws or D'Alembert's principle for dynamic equilibrium; equations of motion for translation, rotation, and combined motion	International Academia: https://ocw.mit.edu/course/s/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
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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)
3. I. H. Shames, "Engineering Mechanics (Statics and Dynamics)", Prentice Hall of India

REFERENCE BOOKS:

1. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Statics", Wiley.
2. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley.
3. Timoshenko, Young, Rao, Pati, "Engineering Mechanics," McGraw Hill



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 2026-2030)

Subject Name: English

Credit: 2

Lecture Hours: 24

Subject Code: HSMC101

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) 1.2	International Academia: https://ocw.mit.edu/courses/21g-232-advanced-speaking-and-critical-listening-skills-els-spring-2007/	3	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i> .2024. Publisher(s): Aryan Publishing House	Activities on vocabulary building and Lexigraphy games. Exercises involve creating and using industry-specific vocabulary and

		1.3 Acquaintance with Prefixes and Suffixes (Ch-1.3, page 11) 1.4 Synonyms, antonyms, and Standard abbreviations (Ch-1.4, page 15)	https://ocw.mit.edu/courses/24-901-language-and-its-structure-i-phonology-fall-2010/ AICTE Prescribed Syllabus: https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf Industry Mapping: Business writing and corporate documents.			understanding jargon.
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)	International Academia https://ocw.mit.edu/courses/21w-011-writing-and-rhetoric-rhetoric-and-contemporary-issues-fall-2015/ AICTE Prescribed Syllabus: https://www.aicte-	3	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i>.2024. Publisher(s): Aryan Publishing House	Presentation activities and interactive activities with punctuation.

		2.6 Techniques for writing precisely (Ch-2.6, page71)	india.org/sites/default/files/Untitled_1-min.pdf Industry Mapping: Formal business Correspondence, project, and business writing.			
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) 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)	International Academia: https://ocw.mit.edu/courses/24-900-introduction-to-linguistics-spring-2022/ AICTE Prescribed Syllabus: https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf Industry Mapping: Formal business Correspondence.	4	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i> .2024. Publisher(s): Aryan Publishing House	Presentation skills on grammar and related topics on modifiers and redundancies.

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 Prescribed Syllabus: https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf Industry Mapping: Email writing and writing other relevant corporate documents.	3	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i>.2024. Publisher(s): Aryan Publishing House	Creative writing skills on descriptive essays, expository writing, persuasive writing, and Narrative writing.
5.	Writing Practices	5.1- Comprehension (Ch-5.1, page- 142) 5.2- Precis Writing (Ch-5.2, page- 149)	International Academia: https://ocw.mit.edu/course/21g-225-	5	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i>.2024. Publisher(s): Aryan Publishing House	Activities on reading comprehension and creative writing skills and assignments on concise writing.

		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)	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			
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6.	Listening and Speaking Practices	6.1- Listening Comprehension (Ch- 6.1, page-182) 6.2- Pronunciation, 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)	International Academia: https://ocw.mit.edu/courses/21g-223-listening-speaking-and-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.	4	Das Biswas, Samapika & Riya Barui. <i>Mastering the Art of English</i>.2024. Publisher(s): Aryan Publishing House	Interactive Practice sessions in language lab.
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7.	Teaching Language through Literature	7.1 – <i>Tiger, Tiger, Burning Bright</i> 7.2 - <i>There Will Come Soft Rains</i> 7.3 – <i>Harrison Bergeron</i>	Industry Mapping: Aligns with industry expectations by fostering communication proficiency, creativity, and information-processing skills that support employability in diverse professional sectors.	2	1.Ruskin Bond 2.Ray Bradbury 3. Kurt Vonnegut	Activities on reading comprehension and creative writing skills and assignments on concise writing.
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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.
4. *Tiger, Tiger, Burning Bright* by Ruskin Bond
5. *There Will come Soft Rains* by Ray Bradbury
6. *Harrison Bergeron* by Kurt Vonnegut



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 2026-2030

Index:

Content	Page No.
Syllabus Structure	1
Study material link	2
Course objective, course outcome	3
Detailed syllabus	4-12
Textbook and references	12-13

Syllabus Structure:

Sl. No.	Type	Subject Code	Subject Name	L	T	P	Total	Credit
1	Humanities and social sciences including management	ESP101	Essential Studies for Professionals-I	3	1	0	4	1
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
				Total Credit points				1



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



1st Semester Syllabus for B.Tech Batch 2026-2030

Subject Name: Essential Studies for Professionals-I Credit: 1 Lecture Hours: 36

Subject Code: ESP101

Pre-requisite: Basic understanding of school-level Social Science, Mathematics, and English language skills.

RELEVANT LINKS:

Study Material links:

1. <https://egyankosh.ac.in/handle/123456789/57861>
2. https://afeias.com/wp-content/uploads/2019/04/class11_Indian-Constitution-at-Work.pdf
3. https://www.google.co.in/books/edition/S_Chand_s_ICSE_History_and_Civics_IX/IkZxEAAQBAJ?hl=en
4. <https://egyankosh.ac.in/handle/123456789/67476>
5. <https://egyankosh.ac.in/handle/123456789/67477>
6. <https://egyankosh.ac.in/handle/123456789/67478>
7. <https://egyankosh.ac.in/handle/123456789/75070>
8. <https://ncert.nic.in/textbook.php?fess1=0-10>
9. https://nios.ac.in/media/documents/SrSec315NEW/315_History_Eng/315_History_Eng_Lesson3.pdf
10. <https://ncert.nic.in/textbook.php?lehs1=0-4>
11. <https://egyankosh.ac.in/handle/123456789/80894>
12. <https://ncert.nic.in/textbook/pdf/iess101.pdf>
13. <https://ncert.nic.in/textbook/pdf/iess102.pdf>
14. <https://blogmedia.testbook.com/blog/wp-content/uploads/2023/04/afastrack-objective-mathematics-bd6e1c73.pdf>
15. <https://www.scribd.com/document/813478052/A-New-Approach-to-REASONING-Book-by-Arihant-Admin>

COURSE OBJECTIVES:

1. To impart knowledge of basic concepts in polity, economics, history, and geography for developing general awareness and social understanding.
2. To introduce the foundations of grammar, vocabulary, and reading comprehension in functional English.
3. To develop quantitative aptitude skills through numerical problem-solving, ratio and proportion, percentage, and profit and loss.
4. To strengthen logical reasoning, analytical thinking, and problem-solving ability for academic and competitive examinations.

COURSE OUTCOMES:

- **CO1:** Explain the basic concepts of polity, economics, history, and geography for developing social and general awareness.
- **CO2:** Demonstrate understanding of grammar, vocabulary, and reading comprehension for effective communication in English.
- **CO3:** Apply quantitative aptitude concepts such as simplification, ratio and proportion, percentage, and profit and loss in numerical problem solving.
- **CO4:** Analyze logical reasoning problems involving coding-decoding, blood relation, alphanumeric series, and direction sense.
- **CO5:** Evaluate real-life situations and case studies using knowledge of social sciences, aptitude, and reasoning skills.
- **CO6:** Develop problem-solving and decision-making abilities for academic, professional, and competitive examinations.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1.	Polity	1. Making of Constitution & Preamble 2. FR (Upto Article 24)	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-Notification-Emp-News.pdf) State Level Exams:	4	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 IX Textbook : Sudeshna Sengupta (Chapter-1, 3)	1. Classroom Debate on “the principles outlined in the Preamble exploring their relevance in contemporary society” 2. Case Study: “Focus on real-life situations involving Fundamental Rights violations or protections” **All the assignments are in line of GS Paper I of UPSC CSE Mains Examination

			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.	Economics	1. Basic Concept of Economics 2. Poverty	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-Notification-Emp-News.pdf) State Level Exams: 1. Civil Services Executive Exam (WBCS)	4	1. IGNOU study material: a. BECC-101, Block-1, Unit-1, Unit-2, Unit-3, b. BECC-106, Block-2, Unit-6 2. NCERT textbook for class XII a. Introductory Macroeconomics (Chapter 1, 2) 3. Frank, ISC Economics class XI a. (Chapter 12, 14, 15, 16)	1. Essay on “Consumer Behavior Shifts: Navigating the Dynamics of Changing Demand Patterns in India” 2. Critical account on “Navigating Poverty: Policy Responses for Sustainable Recovery”. ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.

			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.	History	1. Introduction to ancient Indian History and Indus Valley 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 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	4	1. IGNOU study material - BHIC-131- (Unit 1) (History of India from the Earliest Times upto 300 C.E.), (Unit 5, 6, 8) 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	1. Class discussion on "Advanced Urban Planning in the Indus Valley: Comparisons with Modern City Planning." ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination.

			pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1			
4.	Geography	1. Geopolitical Setup of India 2. Landform of India-I: Himalayas	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-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	4	1. IGNOU study material: IGNOU-Block 1, BGGET-141 (Unit 1, 2) 2. NCERT textbook for class IX: Social Science Contemporary India- I (Chapter 1, 2) 3. NCERT textbook for class XI: India Physical Environment (Chapter 1)	1. Essay on “Comparative analysis of the political divisions in India and another country of their choice”. 2. Brain-storming session on “Landform of India – I: To research and examine the physical features, regional divisions, and geographical significance of the Himalayas in India. ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination

			2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1			
5.	Quantitative Aptitude	1. Quant Foundation/ Simplification 2. Ratio & Proportion 3. Percentage 4. Profit and Loss	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-Notification-Emp-News.pdf) 	6	1. Quantitative Aptitude, Author: R.S Aggarwal, Publishing house: S. Chand 2. Fast track Objective Arithmetic, Author: Rajesh Verma, Publishing house: Arihant	1. Assignment on Numerical Problem Solving on percentage, profit and loss. ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination

			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			
6.	Logical Reasoning	1. Coding and Decoding 2. Blood Relation 3. Alpha numeric series 4. Distance and Direction	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	6	1. A Modern Approach to Logical Reasoning, Author: R. S Aggarwal, Publishing House: S. Chand 2. A New Approach to Reasoning, Author: BS Sijawali, Indu Sijwari, Publishing House: Arihant Publication	1. Assignment on Letter Coding, Number Coding, Conditional Coding and Chinese Pattern. 2. Assignment on Directions and Distance 3. Assignment on Blood relation ** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination

			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			
7.	Verbal English	1. Noun, Pronoun 2. Preposition 3. Basic applications of Vocabulary 4. Reading Comprehension	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	6	1. Objective General English, Author: R.S Agarwal, Publishing house: S. Chand 2. Objective General English Chapter-wise & Topic-wise For All Competitive Examinations, Author: Oswaal Editorial Board, Publishing house: Oswaal Books 3. Arihant General English Book, Author: S. C. Gupta, Publishing House: Arihant Publications	1. Noun and Pronoun: Practice set based on Spot the Error. 2. Prepositions: Practice set based on Spot the Error. 3. Basic applications of Vocabulary: Practice set based on Antonyms and Synonyms.

			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 (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1			
8.	Current Affairs	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 (), 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.	2	1. Current Affairs Magazine of IEM-UEM	1. Discussion on National and International affairs 2. Discussion on MOU's and agreements, Summits and Conclaves 3. Discussion on recent Awards and Events, Sports.

		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,pg1 2. Miscellaneous Services Recruitment Examination file:///C:/Users/UEMK/Downloads/			4. Discussion on Economic Awareness
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TEXT BOOKS:

1. NCERT Textbook for class XI: India Constitution at Work (Chapter 1, 2)
2. History & Civics for ICSE Class IX Textbook : Sudeshna Sengupta (Chapter-1, 3)
3. IGNOU study material: (BECC-101, Block-1, Unit-1, Unit-2, Unit-3, BECC-106, Block-2, Unit-6)
4. NCERT textbook for class XII: Introductory Macroeconomics (Chapter 1, 2)
5. Frank, ISC Economics class XI (Chapter 12, 14, 15, 16)
6. IGNOU study material - BHIC-131- (Unit 1) (History of India from the Earliest Times upto 300 C.E.), (Unit 5, 6, 8)
7. NCERT textbook for Class VI: Exploring Society India and Beyond
8. NCERT textbook for Class XII): Themes in Indian History-I
9. NIOS History Module 1
10. IGNOU study material: IGNOU-Block 1, BGGET- 141 (Unit 1, 2)
11. NCERT textbook for class IX: Social Science Contemporary India- I (Chapter 1, 2)
12. NCERT textbook for class XI: India Physical Environment (Chapter 1)
13. Quantitative Aptitude, Author: R.S Aggarwal, Publishing house: S. Chand
14. Fast track Objective Arithmetic, Author: Rajesh Verma, Publishing house: Arihant
15. A Modern Approach to Logical Reasoning, Author: R. S Aggarwal, Publishing House: S. Chand

16. A New Approach to Reasoning, Author: BS Sijawali, Indu Sijwali, Publishing House: Arihant Publication
17. Objective General English, Author: R.S Agarwal, Publishing house: S. Chand
18. Objective General English Chapter-wise & Topic-wise For All Competitive Examinations, Author: Editorial Board, Oswaal Books
19. Arihant General English Book, Author: S. C. Gupta, Publishing House: Arihant Publications

REFERENCE BOOKS:

1. ESP Study Material
2. Current Affairs Magazine of IEM-UEM