

B.Tech. 1st Year Course Structure : 2025-2026 – 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	1	0	0	3	3
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	ESCCS201	Introduction to AI and Data Science using Python	2	1	0	0	3	3
7	Humanities and social sciences including Management	ESP201B	Essential Studies for Career Development - I	2	0	0	0	2	0.5
PRACTICAL									
8	Basic Science Course	BSCPH291	Physics Laboratory	0	0	3	0	3	1.5
9	Engineering Science Course	ESCEE291	Basic Electrical Engineering Laboratory	0	0	2	0	2	1
10	Engineering Science Course	ESCME292	Engineering Graphics & Design	1	0	4	0	5	3
11	Engineering Science Course	ESCCS291	Introduction to AI and Data Science Laboratory using Python	0	0	4	0	4	2
SESSIONAL									
12	Humanities and social sciences including Management	SDP281A	Common Aptitude Training - I	0	0	0	1	1	0.5
13	Humanities and social sciences including Management	IKS281	Indian Knowledge System for Engineers	0	0	0	4	4	2
Mandatory Industry and Value Added Courses (IVC)									
14	Mandatory Industry and Value Added Courses (IVC)	IVC281A	Design Thinking and Innovation - Ideation & Research	0	0	0	1	1	0
15	Mandatory Industry and Value Added Courses (IVC)	IVC282A	Economics and Business Models	0	0	0	1	1	0
16	Mandatory Co-curricular Courses	MCC281B	Co - Curricular Subjects A	0	0	0	1	1	0
Total Credit Points of Semester				17	6	13	8	44	30.5

Co-curricular Subjects: 1. Foreign Language, 2. Physical Education, 3. Soft Skill



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University of Engineering & Management, Jaipur



1st Semester Syllabus for B.Tech All Streams Batch 2025-2026

Subject Name: Physics

Credit: 4

Lecture Hours: 42

Subject Code: BSCPH201

Pre-requisite: Physics of Higher Secondary Standard

Relevant Links:

[Study Material](#)

[Coursera](#)

[NPTEL](#)

[Linkedin Learning](#)

COURSE OBJECTIVES:

1. To train the students to grasp the concepts of different areas of physics, appropriate for applications indifferent 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:

- CO 1:** 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.
- CO 2:** 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.
- CO 4:** Develop an ability to analyze and solve theoretical problems of physics

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	Mechanics	<p>Part A: Vector Calculus Representation of a vector, Some Important Definitions about Vectors, Resolution of a Vector into Components, Product of Two Vectors, Triple Product, 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</p> <p>Part B: Classical Mechanics Inertial and Non-Inertial Frame of references, 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</p>	<p><i>International Academia:</i> https://catalog.mit.edu/subjects/8/</p> <p><i>AICTE-prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf</p> <p><i>Industry Mapping: Matlab software</i></p>	8	<i>Engineering Physics,</i> Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 1	<ul style="list-style-type: none"> ❖ 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

2	Oscillations	<p>Oscillations: Introduction, Relation of Simple Harmonic Motion with Circular Motion, Differential Equation of Simple Harmonic Motion, Various Characteristics of SHM, 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 Damped vibration, Analysis of Forced Vibration, Resonance, Energy of a Forced Vibrator, Sharpness of Resonance, Quality Factor, Forced Vibration in an LCR Circuit</p>	<p>International Academia: https://catalog.mit.edu/subjects/8/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final ECE.pdf</p> <p>Industry Mapping: Matlab software</p>	5	<p>Engineering Physics, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 2.</p>	<p>❖ To generate parametric scillations in a string using Melde's experimental set-up.</p>
3	Optics	<p>Interference : Interference of light, Young's experiment, Resultant intensity due to superposition of two interfering waves, Interference and conservation of energy, Determination of fringe width in Young's experiment, Shape of interference fringes, conditions for interference of light, coherent sources, production of coherent sources, Fresnel's biprism, displacement of fringes, phase change on reflection, interference due to thin films, interference due to wedge shaped thin films, formation of Newton's ring.</p> <p>Diffraction: Different types of diffraction phenomena, difference between</p>	<p>International Academia: https://catalog.mit.edu/subjects/8/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final ECE.pdf</p> <p>Industry Mapping: Matlab software</p>	10	<p>Physics, B.K.Pandey, Monoj K Harbola et. al., Cengage, Chapter 2.</p> <p>Engineering Physics, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 3.</p>	<p>❖ To determine the radius of curvature of a Plano convex lens by formation of Newton's ring method.</p> <p>❖ To determine the wavelengths of a given light source by diffraction grating method.</p>

		<p>interference and diffraction, Fraunhofer diffraction due to a single slit, Fraunhofer diffraction due to a double slit, difference between single slit and a double slit diffraction pattern, diffraction due to plane diffraction grating, Rayleigh's criteria on resolution, resolving power of a grating, application of diffraction grating.</p> <p>Laser: Characteristics of laser, Absorption and emission of radiations by matter, working principle of 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.</p>			<p><i>Engineering Physics</i>, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 5.</p>	
4	<p>Introduction to Electromagnetic Theory</p>	<p>Maxwell's equations: 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</p>	<p><i>International Standards :</i> https://catalog.mit.edu/subjects/8/</p> <p><i>AICTE prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf</p>	6	<p><i>Engineering Physics</i>, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 7.</p>	<ul style="list-style-type: none"> ❖ Determination of electron charge to mass ratio (e/m) ❖ Determination of Hall coefficient. ❖ Conversion of vibration to voltage using piezoelectric materials

5	Quantum Mechanics	<p>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, Quantum harmonic oscillator, The Hydrogen atom</p>	<p>International Standards: https://catalog.mit.edu/subjects/8/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf</p> <p>Industry Mapping: Matlab software</p>	7	<p>Engineering Physics, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 10.</p>	<ul style="list-style-type: none"> ❖ 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
6	Statistical Mechanics	<p>Statistical Mechanics : Introduction, Concept of Phase Space, Concept of Energy levels and Energy states, Macrostate and Microstate, Thermodynamic Probability and Entropy, Equilibrium Macrostate, MB, BE and FD statistics, Maxwell-Boltzmann (MB) Statistics, Bose-Einstein (BE) Statistics, Fermi-Dirac (FD) Statistics, Classical Statistics as a special case of Quantum Statistics, Density of states or Quantum states in energy range between ϵ and $\epsilon+d\epsilon$, Fermi distribution at zero and non-zero temperature, Derivation of</p>	<p>International Standards: https://catalog.mit.edu/subjects/8/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf</p>	6	<p>Engineering Physics, Sujay Kumar Bhattacharya, Mc Graw Hill Education, Chapter 11.</p>	

		plank's law of Radiation from BE Statistics, Comparative study of three Statistical Distribution functions				
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Study Material:

<https://drive.google.com/file/d/1XEgDWZnaywZ9ifVfIovqLxidCLMgn2cH/view?usp=sharing>

MATLAB Project :

1. Probability distribution of 1D quantum harmonic oscillator

Link : https://in.mathworks.com/matlabcentral/fileexchange/83163-probability-distribution-of-1d-quantum-harmonic-oscillator?s_tid=srchtitle

2. Schrodinger's equation in the 1-dimensional potential well

Link : https://in.mathworks.com/matlabcentral/fileexchange/75495-schrodinger-s-equation-in-the-1-dimensional-potential-well?s_tid=srchtitle&site_search_1_schrodinger%20equation

LINKEDIN Courses :

1. Introduction to Quantum Cryptography

Link : <https://www.linkedin.com/learning/introduction-to-quantum-cryptography/what-is-quantum-physics>

2. Physics and rigid bodies

Link : <https://www.linkedin.com/learning/unity-2023-essential-training/physics-and-rigid-bodies>

COURSERA Courses :

1. Electrodynamics: Electric and Magnetic Fields

Link : <https://www.coursera.org/learn/electrodynamics-electric-magnetic-fields>

2. Electrodynamics: In-depth Solutions for Maxwell's Equations

Link : <https://www.coursera.org/learn/electrodynamics-solutions-maxwells-equations>

3. Quantum Mechanics for Engineers Specialization

Link : <https://www.coursera.org/specializations/quantum-mechanics-for-engineers>

4. Mechanics: Motion, Forces, Energy and Gravity, from Particles to Planets

Link : <https://www.coursera.org/learn/mechanics-particles-planets>

5. Quantum Mechanics

Link : <https://www.coursera.org/learn/quantum-mechanics>

6. Vector Calculus for Engineers

Link : <https://www.coursera.org/learn/vector-calculus-engineers>

7. Physics of Oscillators and Waves

Link : <https://www.coursera.org/learn/oscillators-waves>

8. Exploring Quantum Physics

Link : <https://www.coursera.org/learn/quantum-physics>

TEXT BOOKS:

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 book stall, Revised Ninth Edition, 2009
3. A textbook on Optics, B.Ghosh and K.G.Majumder, Sreedhar Publishers, fifth edition
4. Introduction to Electrodynamics by David J.Griffiths 3rd Edition
5. Concepts of Modern Physics (Sixth Edition) by Arthur Beiser (PublishedbyMcGraw-Hill)



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Syllabus for B.Tech Admission Batch 2025

Subject Name: Mathematics-Calculus

Credit: 4

Lecture Hours: 48

Subject Code: BSCM203A

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; Maxima and Minima; Evolutes and Involutes.	T1: Chapter 4, Secs. 4.3 - 4.5, 4.10 – 4.12, 4.14, 4.15	<i>International Academia:</i> https://ocw.mit.edu/courses/18-01-Calculus-I-Single-Variable-Calculus https://ocw.mit.edu/courses/18-01-Single-Variable-Calculus <i>AICTE-prescribed syllabus:</i> Untitled_1-min.pdf (aicte-india.org) <i>Industry Mapping & Simulation:</i> MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/ <i>MATLAB File Exchange:</i>	8	1. Plotting of the following special graphs: <ul style="list-style-type: none"> Sketch the graph of sine and cosine functions in $[-2\pi, 2\pi]$ Plot a graph for e^{3x} on \mathbf{R} Draw $[x]$, the greatest integer function in the interval $[0, 5]$. 2. Draw the graph of the evolute of a parabola.

				<p><i>Cleve_Lab: A Mathematical Exportium</i></p> <p>https://in.mathworks.com/matlabcentral/fileexchange/59085-cleve_lab?s_tid=srchtitle</p> <p><i>Drawing Code for Mathematical Benchmark Functions</i></p> <p>https://in.mathworks.com/matlabcentral/fileexchange/125645-drawing-code-for-mathematical-benchmark-functions?s_tid=srchtitle</p> <p><i>Generative AI: Photomath</i></p>		
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2	Calculus (Integration)	Evaluation of Definite and 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. 6.8 – 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 <i>AICTE prescribed syllabus:</i> Untitled_1-min.pdf (aicte-india.org) <i>Industry Mapping & Simulation :</i> MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/ <i>MATLAB File Exchange:</i> <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	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	<p>International Academia: Syllabus Calculus of Several Variables Mathematics MIT OpenCourseWare</p> <p>Linear Algebra, Calculus, & Applications I Stanford Online</p> <p>AICTE prescribed syllabus: Untitled_1-min.pdf (aicte-india.org)</p> <p>Industry Mapping & Simulation: MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/</p> <p>MATLAB File Exchange:</p> <p>Cleve_Lab: A Mathematical Exportium https://in.mathworks.com/matlabcentral/fileexchange/59085-cleve_lab?s_tid=srchtitle</p> <p>Drawing Code for Mathematical Benchmark Functions https://in.mathworks.com/matlabcentral/fileexchange/125645-drawing-code-for-mathematical-benchmark-functions?s_tid=srchtitle</p> <p>Generative AI: Photomath</p>	12	<ol style="list-style-type: none"> 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), Orthogonal Curvilinear Coordinates, 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	<i>International Academia:</i> Syllabus Calculus of Several Variables Mathematics MIT OpenCourseWare Linear Algebra, Calculus, & Applications I Stanford Online <i>AICTE-prescribed syllabus:</i> Untitled_1-min.pdf (aicte-india.org) <i>Industry Mapping:</i> MATLAB	12	<ol style="list-style-type: none"> 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 Convergence [Statement only] – Comparison Test, Integral Test,	T2: Chapter 18	<i>International Academia:</i> https://ocw.mit.edu/courses/18-01-Calculus-I-Single-Variable-Calculus <i>AICTE prescribed syllabus:</i> Untitled_1-min.pdf (aicte-india.org) <i>Industry Mapping & Simulation:</i> MATLAB/Mathematica https://in.mathworks.com/ https://www.wolfram.com/mathematica/	10	<ol style="list-style-type: none"> 1. To evaluate the sum of an infinite series. 2. To check the convergence or divergence of an infinite series.

		D'Alembert's Ratio Test, Raabe's Test and Cauchy's Root test. Alternating Series - Leibnitz's test [Statement only], Absolute and Conditional Convergence.				
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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/>

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.



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

Subject Name: Biology for Engineers

Credit: 3

Lecture Hours: 36

Subject Code: BSCBE204

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	Biology for Engineers Chapter:1	International standard https://ocw.mit.edu/courses/7-014-introductory-biology-spring-	3	There are no corresponding labs.

		<p>multicellular</p> <p>(b)ultrastructure- prokaryotes or eukaryotes.</p> <p>(c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes</p> <p>(d) Ammonia excretion – aminotelic, uricotelic, ureotelic</p> <p>(e) Habitat- aquatic or terrestrial</p> <p>(f) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification.</p> <p>Model organisms for the study of biology come from different groups. E.coli, S. cerevisiae, D. elanogaster, C. elegance, A. thaliana, M. musculus</p>		<p>2005/resources/17-carbon-and-energy-metabolism/</p> <p>AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p> <p>Industry Mapping: NIL</p>		
3	Genetics	<p>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 give 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</p>	<p>Campbell Biology: Campbell,N.A.;Reece,J.B.;Urry,Lisa;Cain,M,L.;Wasserman,S.A.;Minnorsky,P.V.;Jackson. 12th Edition Chapter: 14</p>	<p>International standard (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/genetics/)</p> <p>(https://pll.harvard.edu/course/principles-genetics)</p> <p>AICTE prescribed syllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p>	4	There are no corresponding labs.

		in humans. Discuss the concept of complementation using human genetics.		w.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf IndustryMapping: (https://www.global-engage.com/life-science/8-free-tools-genetic-engineering-molecular-synthetic-biology/) https://web.stanford.edu/group/pritchardlab/structure.html		
.4	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. Two carbon units and lipids	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	4	There are no corresponding labs

				<p>AICTE prescribesyllabus: (https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</p> <p>IndustryMapping: 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/</p>		
5.	Enzymes	Enzymology: How to monitor Enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto,	International Standards: (https://ocw.mit.edu/search/?q=Enzymes&type=resourcefile)	5	There are no corresponding labs.

		two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis	5th Edition. WH Freeman & Co Chapter: 8	(https://harvard.simplesyllabus.com/en-US/doc/sy2y033op) 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	Campbell Biology:Campbell I,N.A.;Reece,J.B.;Urry,Lisa;Cain, M,L.;Wasserman, S.A.;Minorsky,P. V.;Jackson. 12 th 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/) (<a 485="" 512="" 965="" 988"="" data-label="Page-Footer" href="https://ocw.mit.edu/courses/7-</td> <td>5</td> <td>There are no corresponding labs.</td> </tr> </table> </div> <div data-bbox=">23		

		and Application)		<p>01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/dna-replication/</p> <p>(https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/molecular-biology/transcription-translation/)</p> <p>-AICTE prescribesyllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf</p> <p>IndustryMapping: (https://web.expasy.org/translate/) https://blast.ncbi.nlm.nih.gov/Blast.cgi</p>		
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.	Biochemistry: Jeremy M. Berg, Lubert Stryer, John L.	International Standards: https://ocw.mit.edu/courses/7-01sc-	4	There are no corresponding labs.

		<p>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.</p>	<p>Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman & Co. Chapter:3,13</p>	<p><u>fundamentals-of-biology-fall-2011/pages/biochemistry/proteins-levels-of-structure-non-covalent-forces/</u></p> <p>AICTE prescribed syllabus:<u>(https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</u></p> <p>Industry Mapping: <u>(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3090454/)</u> <u>(https://nmr.science.oregonstate.edu/macromolecular-analysis)</u> <u>(https://moduler.aau.dk/course/2019-2020/K-KEM-K2-48?lang=en-GB)</u></p>		
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8.	Metabolism	<p>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</p> <p>Respiration: Breakdown of glucose to CO₂ + H₂O (Glycolysis and Gluconeogenesis and Krebs cycle). Electron transport chain and Oxidative phosphorylation</p> <p>Photosynthesis: Synthesis of glucose from CO₂ and H₂O. Cyclic and non-cyclic photophosphorylation. Calvin cycle. CAM cycle.</p>	<p>Biochemistry: Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, 5th Edition. WH Freeman Chapter: 16,17,18,19,20</p>	<p>International Standards: (https://ocw.mit.edu/courses/7-01sc-fundamentals-of-biology-fall-2011/pages/resource-index/) (https://ocw.mit.edu/courses/20-10j-thermodynamic-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/chemi-osmotic-</p>	5	There are no corresponding labs.
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				<p><i>principle-photosynthesis/</i></p> <p><i>(https://harvard.simplesyllabus.com/en-US/doc/sy2y033op)</i></p> <p>AICTE prescribesyllabus:</p> <p><i>(https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_ECE.pdf)</i></p> <p>IndustryMapping:</p> <p><i>(https://www.genome.jp/kegg/pathway.html)</i></p>	
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9.	Microbiology	<p>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.</p>	<p>Biology for Engineers.</p> <p>Chapter: 9</p>	<p>International Standards: https://ocw.mit.edu/courses/20-106j-systems-microbiology-fall-2006/pages/readings/</p> <p>AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum_Final_ECE.pdf</p> <p>Industry Mapping: https://pages.primuslabs.com/primuslabs-new-client-usa.html?gclid=CjwKCAiA9ourBhAVEiwA3L5RFieYQ2c6mskEkqLg0_vaDITGFqq7Ah5YAtvHdeawcqIhQ3ItsjM3BoChLIQAvD_BwE</p>	4	<p>There are no corresponding labs.</p>
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Experiential Learning:

1. Sequence analysis with Bioinformatics tools
2. Protein's 3-D structure prediction with the help of Alpha Fold (AI system developed by Google DeepMind)
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 *E.coli*.
4. 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 WmC. Brown Publishers
3. Principles of Biochemistry (VEdition), 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



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Syllabus for B.Tech Admission Batch 2025-2029

Subject Name: Basic Electrical Engineering

Credit: 4

Lecture Hours: 42

Subject Code: ESCEE201

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

Relevant Links:

COURSE OBJECTIVES:

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 and converter circuits. 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.

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.

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Module number	Topic	Text Book, Chapter	Sub-topics (Yellow highlighted portion: AICTE syllabus; Red highlighted portion: MIT Syllabus)	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignment
1	DC Circuits	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 1,2,21	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. Time-domain analysis of first-order RL and RC circuits.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Untitled_1-min.pdf	8	Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2	AC Circuits	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 11,12,13,14	Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf	8	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 verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3	Transformers	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 6, 7, 32, 33	Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. Analysis and design of modern energy conversion and delivery systems.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE Syllabus: https://www.aicte-india.org/sites/default/files/Model Curriculum/AICTE%20-%20UG%20CSE.pdf	6	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	Basic Electrical Engineering By B.L.Theraja S.Chand Publication Chapter 26, 27, 28, 29, 30, 34, 35	Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Untitled 1-min.pdf	8	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.
5	Power Converters	Power Electronics By P.S. Bhimbra New Age Publication Chapter 7	DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Untitled 1-min.pdf	6	Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.
6	Electrical Installations	Power Electronics By P.S. Bhimbra New Age Publication Chapter 11	Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. critical challenges associated with global energy systems	International Academia: https://catalog.mit.edu/subjects/6/ AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Untitled 1-min.pdf	6	Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

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)



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University of Engineering & Management, Jaipur



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

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

Subject Code: ESCME202A

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 operations -Force and moment representation using vectors	<p>International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: MATLAB</p>	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, Equations of Equilibrium of Coplanar Systems, Lami’s	<p>International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: MATLAB</p>	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

		Theorem.				
3	Friction	Laws of Friction, Static and Dynamic Friction; Application of Friction in various systems.	<p>International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: MATLAB</p>	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	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.	<p>International Academia: https://ocw.mit.edu/course/s/1-050-engineering-mechanics-i-fall-2007/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: ANSYS Mechanical</p>	4	Solving numerical problems on Trusses in ANSYS Mechanical and verifying with analytical calculations	Engineering Mechanics (Statics & Dynamics), D.S. Kumar – Chapter 5

5	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.	<p>International Academia: https://ocw.mit.edu/course/s/2-003sc-engineering-dynamics-fall-2011/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: Mujoco, PyBullet</p>	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
6	Kinetics of Particles	Application of Newton's laws and D'Alembert's principles to solve motion problems	<p>International Academia: https://ocw.mit.edu/course/s/2-003sc-engineering-dynamics-fall-2011/</p> <p>AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>Industry Mapping: Mujoco, PyBullet</p>	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

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.

REFERENCE BOOKS:

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



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University of Engineering & Management, Jaipur



Subject Name: Introduction to AI and Data Science using Python

Credit: 3

Lecture Hours: 36

Subject Code: ESCCS201

[Lecture Notes](#)

[Coursera](#)

[NPTEL](#)

[LinkedIn Learning](#)

Course Objectives:

- Understand fundamental concepts of AI and Data Science.
- Apply Python programming skills to solve data-oriented problems.
- Utilize key Python libraries for data manipulation, analysis, and visualization.
- Implement basic machine learning algorithms.
- Gain practical experience through hands-on projects and assignments.

Course Outcomes:

- CO1: Understand fundamental components of programming in python
- CO2: Implement solutions using object orient programming concepts using python classes and objects
- CO3: Develop databases, perform numerical computation and visualize data using python packages
- CO4: Apply concepts of python to solve challenges in AI and Data Science

Module	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Assignment
1	Python Basics	The Python Interpreter, Console I/O, Conditions, Control Flow, Functions, Datatypes, List, Tuple, Set, Dictionaries, File I/O	<p>International Academia:</p> <p>https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/</p> <p>https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/</p> <p>AICTE Curriculum: LINK</p> <p>Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual Studio Code</p> <p>Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab</p> <p>LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning</p>	10	<ol style="list-style-type: none"> Write a program in python to print all prime numbers inside a range of numbers provided by the user. Create one Fibonacci sequence till a specific no. of terms and count the number of variables used without any functions. Write one Python Program. Print the series upto N terms: 1, 3, 7, 13, 21, 31 and count the number of mathematical operators used without any functions. Write one Python Program. Input a number and check whether it is Krishnamurthy or not using functions and count the number of iterations used without any functions. Write one Python Program.\ Create one list of 20 values and find out Mean, Median and Mode of a list of numbers. Count the number of separators used. Write one Python Program. Given a list of numbers return the indices in which a specific number occurs. Take input from one file and place it to another file. Use Ascii value for comparison Rotate the content in the copied file. Design one hash function to check the integrity of the two files. Write a Python program. Write a Python program to demonstrate the use of Local and Global variables Implement the following functions/methods which operates on lists in Python with suitable

			<p>ng/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-revolution?u=229219690</p> <p>https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais</p> <p>Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690</p> <p>Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690</p> <p>Beginner: https://www.linkedin.com/learning/paths/getting-started-with-python</p> <p>Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631</p> <p>Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science</p>		<p>examples:</p> <p>a) list() b) len() c) count() d) index() e) append() f) insert() g) extend() h) remove() i) pop() j) reverse() k) sort() l) copy() m) clear()</p> <p>10. Implements the following functions/methods which operates on tuples in Python with suitable examples:</p> <p>a) len() b) count() c) index() d) sorted() e) min() f) max() g) cmp() h) reversed()</p>
2	Object Oriented Programming with Python	Classes, Objects, Special Methods: __init__ , __call__ , __iter__ ,	International Academia: https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/	10	<p>1. Write a Python program to define a class “ Box” and write functions to calculate its volume.</p> <p>2. Write a program to define a class “ Car” and necessary functions to calculate the velocity given starting velocity (input), acceleration (member</p>

		<p><code>__getitem__</code>, <code>__len__</code></p>	<p>https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/</p> <p>AICTE Curriculum: LINK</p> <p>Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual Studio Code</p> <p>Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab</p> <p>LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-revolution?u=229219690</p> <p>https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais</p>	<p>variable) and time of acceleration(input).</p> <ol style="list-style-type: none"> 3. Create a class that will return the Fibonacci numbers sequentially every time it is called using <code>__iter__()</code> 4. Write a Python Program to call data member and function using classes and objects 5. Write a Python Program to demonstrate the use of constructors. 6. Write a Python program that attempts to divide two numbers entered by the user. Use a try-except block to handle the ZeroDivisionError if the user enters zero as the divisor. 7. Write a Python program that calculates the square root, sine, and cosine of a number entered by the user, using functions from the math module.
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			<p>Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690</p> <p>Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690</p> <p>Beginner: https://www.linkedin.com/learning/paths/getting-started-with-python</p> <p>Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631</p> <p>Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science</p>	
3	Numerical Data Analysis with Python	NumPy N-D arrays, Indexing, Slicing, Reshaping, ND-Array Arithmetic	<p>International Academia:</p> <p>https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/</p> <p>https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/</p> <p>AICTE Curriculum: LINK</p> <p>Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual</p>	6

		<p>Studio Code Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab</p> <p>LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-revolution?u=229219690</p> <p>https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais</p> <p>Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690</p> <p>Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690</p> <p>Beginner:</p>	<p>these arrays.</p> <ol style="list-style-type: none"> 8. Calculate the dot product of the two arrays. 9. Given a 3x3 NumPy array, calculate its transpose. 10. Find the determinant of the same 3x3 array. 11. Create a NumPy array of 10 random floating-point numbers. Calculate the mean, median, and standard deviation of this array. 12. Apply the sine and cosine functions to all elements of the array. 13. Create a NumPy array of 15 random integers. Sort the array in ascending order. 14. Use NumPy functions to find the index of the maximum and minimum elements in the sorted array.
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			https://www.linkedin.com/learning/paths/getting-started-with-python Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631 Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science		
4	Database Handling with Python	Introduction to Pandas, Series, DataFrames, read CSV	International Academia: https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/ https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/ AICTE Curriculum: LINK Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual Studio Code Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning	4	<ol style="list-style-type: none"> 1. Create a Pandas Series containing the names of five different countries. 2. Create another Pandas Series containing the corresponding populations of those countries. 3. Combine these two Series into a single Series where the index is the country name and the value is the population. 4. Access the population of a specific country using its name. 5. Create a Pandas DataFrame from a dictionary containing data about students (name, age, grade). 6. Create a Pandas DataFrame from a list of lists representing student data. 7. Read a CSV file as a pandas DataFrame. 8. Load a sample CSV file (you can create a simple one or use a publicly available dataset). 9. Handle any missing values in the DataFrame (e.g., fill with the mean or drop rows with missing values). 10. Rename the columns of the DataFrame. 11. Display the value of specific columns of a pandas dataframe. 12. Find the mean and standard deviation of a specific column containing numeric data.

		<p>ng/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-revolution?u=229219690</p> <p>https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais</p> <p>Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690</p> <p>Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690</p> <p>Beginner: https://www.linkedin.com/learning/paths/getting-started-with-python</p> <p>Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631</p> <p>Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science</p>	<p>13. Read data from a JSON file into a Pandas DataFrame.</p> <p>14. Write a Pandas DataFrame to an Excel file.</p> <p>15. Using a DataFrame of student data, write Pandas queries to:</p> <ol style="list-style-type: none"> Select students older than a certain age. Select students in a specific grade. Sort the DataFrame by name or age.
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5	Data Visualization	Introduction to Matplotlib: Pyplot, markers, lines, labels, grid, subplot, scatter, bars, histograms, pie-chart	<p>International Academia: https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/ https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/</p> <p>AICTE Curriculum: LINK</p> <p>Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual Studio Code</p> <p>Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab</p> <p>LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-</p>	3	<ol style="list-style-type: none"> 1. Create a simple line plot showing the relationship between two sets of data (e.g., time vs. temperature). Label the axes and add a title. 2. Create a scatter plot to visualize the relationship between two numerical variables from a Pandas DataFrame. 3. Create a bar chart to represent the counts of different categories in a Pandas Series. 4. Customize a Matplotlib plot by changing the color, marker style, and line style. 5. Add a legend to a plot with multiple lines. 6. Add annotations to highlight specific data points. <p>Subplots: Create a figure with two subplots: one showing a histogram of a numerical variable and the other showing a box plot of the same variable.</p> <ol style="list-style-type: none"> 7. Create a basic 3D scatter plot using mplot3d. 8. Create a distribution plot (e.g., histogram with KDE) using Seaborn. 9. Create a pair plot to visualize the relationships between multiple numerical variables in a DataFrame. 10. Create a box plot or violin plot to compare the distribution of a numerical variable across different categories.
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			revolution?u=229219690 https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690 Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690 Beginner: https://www.linkedin.com/learning/paths/getting-started-with-python Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631 Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science		
6	Introduction to AI and Prompt Engineering	Introduction to AI, Application Areas, Discriminative vs Generative AI, Definition & Types of Machine Learning, Prompt Engineering – Ethical Policies, Ideal Programming Practices with AI	International Academia: https://ocw.mit.edu/courses/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2008/pages/syllabus/ https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/pages/syllabus/	3	<ol style="list-style-type: none"> 1. Introduction to Generative AI tools 2. Introduction to Prompt Engineering 3. Research and list at least five different real-world applications of Artificial Intelligence across various domains (e.g., healthcare, finance, transportation). Briefly describe how AI is used in each application. 4. Explain the key differences between discriminative and generative AI models.

			<p>AICTE Curriculum: LINK</p> <p>Industry Mapping GitHub platform IDEs-PyCharm, IDLE, Visual Studio Code</p> <p>Competitive Coding Platform HackerRank, TCS Codevita projects web-based interactive computing platform jupyter notebook, google colab</p> <p>LinkedIn Learning Artificial Intelligence https://www.linkedin.com/learning/introduction-to-artificial-intelligence-24947908</p> <p>Prompt Engineering https://www.linkedin.com/learning/tech-trends/welcome-to-tech-trends?u=229219690</p> <p>https://www.linkedin.com/learning/introduction-to-prompt-engineering-for-generative-ai-24636124/joining-the-nlp-revolution?u=229219690</p> <p>https://www.linkedin.com/learning/prompt-engineering-how-to-talk-to-the-ais</p> <p>Data Science https://www.linkedin.com/learning/learning-data-science-understanding-the-basics/welcome?u=229219690</p>	<ol style="list-style-type: none"> 5. Briefly describe the three main types of machine learning: supervised learning, unsupervised learning, and reinforcement learning. Give a simple example of a problem that can be solved using each type. 6. Discuss one ethical consideration that arises in the field of AI or data science. Explain why it is important and suggest a potential way to mitigate the issue.
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			<p>Python https://www.linkedin.com/learning/python-functions-for-data-science/python-functions-you-should-know?u=229219690</p> <p>Beginner: https://www.linkedin.com/learning/paths/getting-started-with-python</p> <p>Intermediate: https://www.linkedin.com/learning/paths/advance-your-skills-in-python-8969631</p> <p>Expert: https://www.linkedin.com/learning/paths/advance-your-python-skills-for-data-science</p>	
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Text Books:

- 1) Python for Everybody: Exploring Data in Python 3, Charles Severance, SPD
- 2) Python Computing Fundamentals and Applications, Abhijit Kar Gupta, Techno World.
- 3) Python Programming, Subrata Saha, Aryan Publishing House.
- 4) Prompt Engineering for Generative AI by James Phoenix, Mike Taylor, O’Reilly Media, Inc.

Reference Books:

- 1) Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinney, O’Reilly
- 2) Python: The Complete Reference, Martin C. Brown, Osborne/McGraw-Hill

Alternate Courses

NPTEL –Python for Data Science – Prof. Rangunathan Rengasamy, IIT Madras. <https://nptel.ac.in/courses/106106212>

COURSERA– Python for Data Science, AI & Development, Joseph Santarcangelo - <https://www.coursera.org/learn/python-for-applied-data-science-ai>



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



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

Subject Name: Essential Studies for Career Development-I Credit: 0.5 Lecture Hours: 48

Subject Code: ESP201B

Pre-requisite: Basic knowledge of school-level Social Science and Mathematics.

Relevant Links:

Study Material links:

1. <http://egyankosh.ac.in/handle/123456789/80893>
2. <https://ncert.nic.in/textbook/pdf/iess101.pdf>
3. <https://ncert.nic.in/textbook.php?kegy1=1-6>
4. <http://egyankosh.ac.in/handle/123456789/80895>
5. <https://ncert.nic.in/textbook/pdf/iess102.pdf>
6. <http://egyankosh.ac.in/handle/123456789/67479>
7. <https://ncert.nic.in/textbook.php?leec1=1-6>
8. https://books.google.co.in/books?id=lvAfP7uyKJsC&pg=PA18&source=gbs_toc_r&cad=2#v=onepage&q&f=false
9. <http://egyankosh.ac.in/handle/123456789/67653>
10. <https://ncert.nic.in/textbook.php?leec1=2-6>
11. https://books.google.co.in/books?id=4lGQISi9G7wC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
12. <http://egyankosh.ac.in/handle/123456789/75067>

COURSE OBJECTIVES:

1. To introduce fundamental techniques of quantitative aptitude and logical reasoning.
2. To impart knowledge on practical methods for solving problems related to percentage, profit & loss, mixtures, and related.
3. To impart knowledge on India's political and physiographic divisions.
4. To impart knowledge on basic economic concepts, national income measures, unemployment and poverty

COURSE OUTCOMES:

CO 1: Apply basic quantitative techniques to solve real-life numerical problems.

CO 2: Analyze and solve logical reasoning questions using structured approaches

CO 3: Identify and describe key features of India's political and physiographic geography.

CO 4: Demonstrate an understanding of core economic concepts and current socio-economic issues.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
	Quantitative Aptitude	<ol style="list-style-type: none"> Quant Foundation Percentage- Basic concept of percentage & its shortcut rules & applications. Profit & Loss- Basic concept, formulae, shortcut tricks & application. Mixture & Alligation- Proportion & mixtures in percentages, populations & liquids, shortcuts & application. 	<p>International Exams</p> <p>1. GRE (https://www.ets.org/gre/test-takers/general-test/prepare/content/verbal-reasoning.html#accordion-9f58105fc6-item-88093eca37)</p> <p>National Exams:</p> <p>1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26</p> <p>2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21</p> <p>3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22</p> <p>4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Sylla)</p>	12	<p>1. Textbook: Quantitative Aptitude, Author: R.S Aggarwal, Publisher: S. Chand (Chapter 1, 10, 11, 20)</p>	<p>❖ Assignment on Numerical Problem Solving on percentage, profit and loss and mixture alligation.</p>

			bus.pdf&param2=advertisement, pg 1 2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf) pg 1		
2	Logical Reasoning	1. Coding and Decoding i. Conditional Coding, ii. Word-Pattern Coding, iii. Chinese Coding 2. Direction Sense Test i. Direction Sense Test, ii. Direction Distance Test, iii. Shadow based Questions. 3. Syllogism		12	1. Textbook: A Modern Approach to Verbal and Non-Verbal Reasoning, Author Dr. R.S Aggarwal, Publisher: S.Chand (Chapter 4, 8) ❖ Assignment on Letter Coding, Number Coding, Conditional Coding and Chinese Pattern. ❖ Assignment on Directions and Distance ❖ Assignment on Syllogism
3	Geography	1. Political Division of India 2. Physiographic Division of India	National Exams: 1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26 2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21 3. Combined Graduate Level	12	1. IGNOU study material: IGNOU-Block 1, BGGET- 141 (Unit 1, 2) 2. NCERT textbook for class IX: Social Science Contemporary India- I (Chapter 1, 2) ❖ Essay on “Comparative analysis of the political divisions in India and another country of their choice”. ❖ Brain-storming session on “Climate Change Impact Analysis to research and analyze the impact of climate change on the

			<p><i>conducted by SSC</i> (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22</p> <p>4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement) pg 1</p> <p>2. Miscellaneous Services Recruitment Examination (https://adda247jobs-wp-assetsrod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/27079702019.pdf)) pg 1</p>		<p>3. NCERT textbook for class XI: India Physical Environment (Chapter 1)</p>	<p>Himalayan region.”</p> <p>❖ Class Discussion on “Island Sustainability plan for environmental preservation.”</p> <p>** All the assignments are in line of GS Paper I of UPSC CSE Mains Examination</p>
4	Economics	<p>1. Basic Concept of Economics</p> <p>2. National Income</p> <p>3. Unemployment and Poverty</p>	<p>National Exams:</p> <p>1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26</p> <p>2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26</p>	12	<p>1. IGNOU study material:</p> <p>a. BECC-101, Block-1, Unit-1, Unit-2, Unit-3,</p> <p>b. BECC-103, Unit-1, Unit-2, Unit-3,</p> <p>c. BECC-106,</p>	<p>❖ Essay on “Consumer Behavior Shifts: Navigating the Dynamics of Changing Demand Patterns in India”</p>

			<p>ult/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21</p> <p>3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22</p> <p>4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>5. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement), pg 1</p> <p>2. Miscellaneous Services Recruitment Examination (https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp</p>		<p>Block-2, Unit-6</p> <p>2. NCERT textbook for class XII- Introductory Macroeconomics (Chapter 1, 2)</p> <p>3. Frank, ISC Economics class XI (Chapter 12, 14, 15, 16)</p>	<ul style="list-style-type: none"> ❖ Class discussion on “Per Capita Income in India: Challenges and Pathways to Growth ❖ Critical account on “Navigating Unemployment and Economic Recession: Policy Responses for Sustainable Recovery”.
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			content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf) <i>pg 1</i>			
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TEXT BOOKS:

1. Textbook: Quantitative Aptitude, Author: R.S Aggarwal, Publisher: S. Chand
2. Textbook: A Modern Approach to Verbal and Non-Verbal Reasoning, Author Dr. R.S Aggarwal, Publisher: S. Chand
3. IGNOU study material: IGNOU-Block 1, BGGET- 141
4. NCERT textbook for class IX: Social Science Contemporary India- I
5. NCERT textbook for class XI: India Physical Environment
6. IGNOU study material: BECC 101, 103, 106
7. NCERT textbook for class XII- Introductory Macroeconomics
8. Frank, ISC Economics Class XI

REFERENCE BOOKS:

1. ESP – I Study Material



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

Syllabus for B.Tech. Admission Batch 2025

Course Name: Physics Laboratory	
Course Code: BSCPH291	
Course Code: BSCPH291	Category: Basic Science Courses
Course Title: Physics Laboratory	Semester: First/Second
L-T-P: 0-0-3	Credit: 1.5
Pre-Requisites: Basic Knowledge of Algebraic Calculation and graph plot, Basic knowledge about measurement techniques by vernier calipers and screw gauge, Basic concepts of 12 th standard physics	
Course Outcomes CO1. Apply the working principles, learn to handle instruments, analyze data and comparison of results with theoretical calculations. CO2. Develop familiarity with range of experiments related to elastic, electric and electronic properties of materials. CO3. Verify theories of different optical and quantum phenomenon by conducting relevant experiments. CO4. Develop an ability to work in team to design innovative projects with engineering knowledge in solving real time problems in societal and environmental contexts.	

List of Hands on experiment to be conducted in the laboratory			
Sl No.	Name of Experiments	Digital Twin link	Mapping with MIT & Stanford
1	Determination of Planck's constant by photoelectric emission process.	http://vlab.amrita.edu/?sub=1&brch=195&sim=547&cnt=1	https://applets.kcvs.ca/photoelectricEffect/PhotoElectric.html
2	To determine the radius of curvature of a Plano convex lens by formation of Newton's ring method	https://lo-au.vlabs.ac.in/laser-optics/Newtons_Rings_Wavelength_of_light/experiment.html	NA
3	To determine the wavelengths of a given light source by diffraction grating method	https://ov-au.vlabs.ac.in/optics/Diffraction_Grating/	NA
4	Determination the excitation potential of a given gas by Franck-Hertz experiment	https://www.laboratoriovirtual.fisica.ufc.br/experimento-de-frank-hertz?lang=en	https://www.laboratoriovirtual.fisica.ufc.br/experimento-de-frank-hertz?lang=en
5	To determine the Young's Modulus of material of a bar by Flexure method	https://amv-au.vlabs.ac.in/advanced-mechanics/Youngs_Modulus_Uniform_Bending/	NA
6	Determination the band-gap of a semiconductor by measuring the resistivity at different Temperatures by four-probe method	https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/index.html	NA
7	To determine the resistance per unit length of a given bridge wire and hence to determine the very low unknown resistance	https://bop-iitk.vlabs.ac.in/exp/carey-foster-bridge/index.html	NA

	by using Carey Foster's bridge		
8	To determine the Modulus of rigidity of a material of a rod by static method	https://amv-au.vlabs.ac.in/advanced-mechanics/Rigidity_Modulus/experiment.html	NA
9	To determine the Modulus of rigidity of a material of a wire by dynamic method	https://amv-au.vlabs.ac.in/advanced-mechanics/Rigidity_Modulus/Torsion_Pendulum/	NA
10	Determination of Planck's Constant using LED	http://vlab.amrita.edu/?sub=1&brch=195&sim=547&cnt=1	NA
11	To study the different characteristics of a solar cell	https://vlab.amrita.edu/?sub=1&brch=195&sim=360&cnt=1	NA
12	Determination of Hall coefficient.	https://mpv-au.vlabs.ac.in/modern-physics/Hall_Effect_Experiment/experiment.html	NA
13	To generate parametric oscillations in a string Melde's Experimental setup	NA	NA
14	Deflection of charged particle under electric field and magnetic field	NA	NA
15	Laser based free space communication.	NA	NA
16	To study the characteristics and morphology of a material by digital microscope.	NA	NA

18	Conversion of vibration to voltage using piezoelectric materials.	NA	NA
19	Conversion of thermal energy into voltage using thermoelectric modules.	NA	NA
21	Determining electronic charge by its mass (e/m) by JJ Thomson method.	NA	NA
22	Optical Emission Spectra of Hydrogenic Atoms	https://javalab.org/en/spectrum_of_hydrogen_en/	https://ocw.mit.edu/courses/8-13-14-experimental-physics-i-ii-junior-lab-fall-2016-spring-2017/pages/experiments/optical-emission-spectra-of-hydrogenic-atoms/
23	Doppler-Free Laser Spectroscopy	NA	https://ocw.mit.edu/courses/8-13-14-experimental-physics-i-ii-junior-lab-fall-2016-spring-2017/pages/experiments/doppler-free-laser-spectroscopy/
24	Michelson Interferometer	https://lo-au.vlabs.ac.in/laser-optics/Michelsons_Interferometer_Wavelength_of_Laser_Beam/	https://ocw.mit.edu/courses/8-13-14-experimental-physics-i-ii-junior-lab-fall-2016-spring-2017/pages/experiments/michelson-interferometer/

List of virtual lab experiments			
Sl No	Name of the experiment	Simulation software link	Mapping link with MIT/Standford
1	Poisson Statistics	Using Matlab	https://ocw.mit.edu/courses/8-13-14-experimental-physics-i-ii-junior-lab-fall-2016-spring-2017/pages/experiments/poisson-statistics/
2	Compton Scattering	https://www.geogebra.org/m/dgx8uSXJ	https://ocw.mit.edu/courses/8-13-14-experimental-physics-i-ii-junior-lab-fall-2016-spring-2017/pages/experiments/compton-scattering/
3	Millikan's oil drop experiment	https://vlab.amrita.edu/?sub=1&brch=195&sim=357&cnt=2	
4	Numerical Aperture of Optical Fiber	https://vlab.amrita.edu/?sub=1&brch=189&sim=343&cnt=4	
5	Black Body Radiation	https://htv-au.vlabs.ac.in/heat-thermodynamics/Black_Body_Radiation/experiment.html	

6	Thermo Couple-Seebeck Effect	https://htv-au.vlabs.ac.in/Thermo_Couple_Seebeck_Effect/experiment.html	
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List of Experiment/project using Generative AI

1	Solve Schrodinger equation for quantum harmonic oscillator by using Elvet, a neural-network based differential equation solver. Compare analytical solution and Elvet's prediction by plotting. (Programming language: Python 3)	gitlab.com/elvet/elvet https://arxiv.org/abs/2103.14575	NA
2	Consider a uniform gyroelectric medium. a plane electric wave linearly polarized along x axis is launched. The polarization vector will precess around the gyrotropy axis (z axis) as the wave propagates. This is called Faraday rotation. Using MEEP simulation software, gyroelectric material. Set Up	https://meep.readthedocs.io/en/latest/Scheme_Tutorials/Gyrotropic_Media/	Meep (MIT Electromagnetic Equation Propagation) software package for electromagnetic simulations

	and run MEEP simulation. Plot variation of E_x and E_y versus z .		
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LASER BASED PROJECTS:

- 1. Build a LASER interferometer**
- 2. Make LASER light at the laboratory**
- 3. Engrave a QR code with LASER**

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

Syllabus for B.Tech. Admission Batch 2025

Course Name: Basic Electrical Engineering Laboratory	
Course Code: ESCEE291	
Course Code: ESCEE291	Category: Basic Science Courses
Course Title: Basic Electrical Engineering Laboratory	Semester: First
L-T-P: 0-0-3	Credit: 1
Pre-Requisites: High School Mathematics & Physics	
<p>Course Outcomes</p> <p>CO1: Get an exposure to common electrical components and their ratings and make electrical connections by wires of appropriate ratings</p> <p>CO2: Understand the usage of common electrical measuring instruments.</p> <p>CO3: Understand and verify different networking theorems.</p> <p>CO4: Understand the basic characteristics of transformers and electrical machines.</p>	

List of Hands on experiment to be conducted in the laboratory

Sl No.	Name of Experiments	Digital Twin link	Mapping with MIT & Stanford	Use of Software
1	<p>1. (a) Basic safety precautions mentioning do's and don'ts.</p> <p>(b) Introduction and uses of electrical instrument :- Ammeter, Voltmeter, Wattmeter, Variac , Autotransformer and colour codes of resistors.</p>	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
2	Demonstration about the cut section of a.c & d.c. machines.	NA	NA	NA
3	Demonstration about the LT switch gears and electrical components.	NA	NA	NA
4	Verification of Super position theorem with theoretical calculations	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
5	Verification of Thevenin theorem with theoretical calculations	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
6	Verification of Maximum power theorem with theoretical calculations	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox

7	Calibration of wattmeter. Draw the curve between percentage error vs test meter reading	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
8	Verification of Norton's theorem with theoretical calculations	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
9	Determination of steady state response of R-L, R-C, R-L-C Series circuit and calculation of Impedance, power factor., power losses and draw the vector diagram	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
10	Calibration of ammeter, voltmeter . Draw the curve between percentage error vs test meter reading	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB, Simulink toolbox
11	Open circuit and short circuit test of 1ph transformer and determination of efficiency on Full load, Half of full load, ¾ of full load, 1/4 of full load and draw the efficiency curve.	https://em-coep.vlabs.ac.in/List%20of%20experiments.html	NA	MATLAB, Simscape toolbox

12	Determination of steady state response of R-L, R-C, R-L-C parallel circuit and Calculation of impedance and power factor.	https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/	NA	MATLAB
13	Determination of torque speed characteristic of separately excited D.C Shunt Motor.	https://em-coep.vlabs.ac.in/List%20of%20experiments.html	NA	MATLAB, Simscape toolbox
14	No load characteristics of separately D.C. Shunt generator. Draw the characteristics Curve.	https://em-coep.vlabs.ac.in/List%20of%20experiments.html	NA	MATLAB, Simscape toolbox
15	Speed control of D.C shunt motor (Armature volt. and field current control method. Draw the characteristics.	https://em-coep.vlabs.ac.in/List%20of%20experiments.html	NA	MATLAB, Simscape toolbox
16	Measurement of 3ph power by two wattmeter method.	https://em-coep.vlabs.ac.in/List%20of%20experiments.html	NA	MATLAB, Simscape toolbox

List of Innovative Experiments in Laboratory

1	To study and run the 1ph a.c. motor and change the D.O.R.	NA	NA	MATLAB, Simscape toolbox
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2	Using FLUX.AI creat a complex circuit and solve load current and voltage using KVL and KCL	NA	NA	https://www.flux.ai/p
3	Speed control of AC Motor by variable frequency drive (beyond Syllabus)			

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Syllabus for B.Tech Admission Batch 2025

Subject Name: Engineering Graphics & Design

Credit: 3

Lecture Hours: 70

Subject Code: ESCME292

Total of 10 Lecture Hours & 60 Hours of Lab. Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory (as per AICTE).

Course Objective:

1. Introduction to engineering design and its place in society,
2. Exposure to the visual aspects of engineering design,
3. Exposure to engineering graphics standards,
4. Exposure to creating working drawings,
5. Exposure to computer-aided geometric design,
6. Exposure to engineering communication.

Course Content:

Module No.	Module Name with details	Mapping with Industry and International Academia	Lecture (L)	Practical (P)
1.	INTRODUCTION TO ENGINEERING DRAWING: Principles of Engineering Graphics and their significance, usage of Drawing instruments,	<i>AICTE prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf <i>International Standards :</i> https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-	1	4

	<p>lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales</p>	<p>resources/drawing_and_sketching/</p> <p>Industry Mapping:</p> <p>AutoCAD, Solidworks, Creo</p> <p>Linkedin Learning Course: https://www.linkedin.com/learning/autocad-2024-essential-training?trk=learning-serp_learning-search-card_search-card&upsellOrderOrigin=default_guest_learning</p>		
2.	<p>ORTHOGRAPHIC PROJECTIONS: Principles of Orthographic Projections- Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes -Auxiliary Planes;</p>	<p>AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>International Standards : https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p>Industry Mapping:</p> <p>AutoCAD, Solidworks, Creo</p>	1	8
3.	<p>PROJECTIONS OF REGULAR SOLIDS: Solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower</p>	<p>AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p>International Standards : https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p>Industry Mapping:</p> <p>AutoCAD, Solidworks, Creo, Tinkercad</p>	1	8

4.	<p>SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)</p>	<p><i>AICTE prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p><i>International Standards :</i> https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p><i>Industry Mapping:</i> AutoCAD, Solidworks, Creo</p>	1	8
5.	<p>ISOMETRIC PROJECTIONS Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;</p>	<p><i>AICTE prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p><i>International Standards :</i> https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p><i>Industry Mapping:</i> AutoCAD, Solidworks, Creo, Tinkercad</p> <p>Linkedin Learning Course: https://www.linkedin.com/learning/cert-prep-certified-solidworks-professional-2/welcome?u=229219690</p>	2	8

6.	<p>OVERVIEW OF COMPUTER GRAPHICS</p> <p>The computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids</p>	<p><i>AICTE prescribed syllabus:</i></p> <p>https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p><i>International Standards :</i></p> <p>https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p><i>Industry Mapping:</i></p> <p>AutoCAD, Solidworks, Creo</p>	1	8
7.	<p>CUSTOMISATION & CAD DRAWING</p> <p>Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for</p>	<p><i>AICTE prescribed syllabus:</i></p> <p>https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p><i>International Standards :</i></p> <p>https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p>	1	8

	<p>coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;</p>	<p>Industry Mapping: AutoCAD, Solidworks, Creo</p>		
8.	<p>ANNOTATIONS , LAYERING & OTHER FUNCTIONS Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface;</p>	<p>AICTE prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf International Standards : https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/ Industry Mapping: AutoCAD, Solidworks, Creo</p>	1	2

9	<p>DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT</p> <p>Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids in 3D printed model; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid- modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling</p>	<p><i>AICTE prescribed syllabus:</i></p> <p>https://www.aicte-india.org/sites/default/files/Model_Curriculum/Final_Mechanical%20Engg.pdf</p> <p><i>International Standards :</i></p> <p>https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/</p> <p><i>Industry Mapping:</i></p> <p>Solidworks, Creo, Staad Pro, Cura, Aurdino, Raspberry pi</p> <p>Linkedin Learning Course: https://www.linkedin.com/learning/product-design-from-cad-to-3d-model/welcome?u=229219690</p> <p>Linkedin Learning Course: https://www.linkedin.com/learning/solid-works-simulationxpress/welcome?u=229219690</p> <p>Coursera Learning Course: https://www.coursera.org/learn/modelling-analysis-and-design-of-steel-buildings</p> <p>Linkedin Learning Course: https://www.linkedin.com/learning/learning-arduino-foundations-2/getting-started-with-arduino-22858971?u=229219690</p>	1	6
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Course Outcomes

- Prepare students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Prepare students to communicate effectively.
- Prepare students to use the techniques, skills, and modern engineering tools necessary for engineering practice
- Helping students to increase their visualization power

Learning Resources

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of Software Theory and User Manual

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Syllabus for B.Tech. Admission Batch 2025

Course Name: Workshop/Manufacturing Practices Laboratory	
Course Code: ESCME193/293	
Course Code: ESCME193/ 293	Category: Basic Science Courses
Course Title: Workshop/Manufacturing Practices Laboratory	Semester: First/Second
L-T-P: 1-0-4	Credit: 3
Pre-Requisites: Knowledge in dimensions and units. Usage of geometrical instruments and analytical ability.	
Course Outcomes CO1: Upon completion of this laboratory course, students will be able to fabricate components with their own hands. CO2: They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes. CO3: By assembling different components, they will be able to produce small devices of their interest. CO4: Exposure to some of the advanced and latest manufacturing techniques being employed in the industry.	

List of Hands on experiment to be conducted in the laboratory

Sl No.	Name of Experiments	Digital Twin link	Mapping with MIT & Stanford	Use of Software
1	<p>Fitting shop : Typical jobs that may be made in this practice module: To prepare a simple type fitting job</p> <p>Fitting shop: Typical jobs that may be made in this practice module: To make a Gauge from MS plate.</p>	<ul style="list-style-type: none"> • http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMM/exp2/index.html • http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMM/exp1/index.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks , Creo, Fusion 360, Catia .
2	<p>Casting : Typical jobs that may be made in this practice module: One/ two green sand moulds to prepare, and a casting be demonstrated.</p>	<ul style="list-style-type: none"> • https://fab-coep.vlabs.ac.in/exp/molding-casting-polyurethane-parts/ 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks , Creo, Fusion 360, Catia .
3	<p>Welding shop: Typical jobs that may be made in this practice module: ARC WELDING (4 hours): To join two thick (approx</p>	<ul style="list-style-type: none"> • https://mm-coep.vlabs.ac.in/exp/welding-ndyag-laser/procedure.html • https://mm-coep.vlabs.ac.in/exp/welding-ndyag-laser/procedure.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ 	Auto CAD, Solidworks , Creo, Fusion 360, Catia .

	<p>6mm) MS plates by manual metal arc welding.</p> <p>Welding shop: Typical jobs that may be made in this practice module: To join two thin mild steel plates or sheets by gas welding.</p>		<ul style="list-style-type: none"> • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	
4	<p>Smithy :Typical jobs that may be made in this practice module: Prepare a simple type job by upsetting process</p> <p>Smithy: Typical jobs that may be made in this practice module: Prepare a simple type job by drawing down process</p>		<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	<p>Auto CAD, Solidworks , Creo, Fusion 360, Catia .</p>
5	<p>Carpentry: Typical jobs that may be made in this practice module: To make wooden joints and/or a pattern or like.</p>	<ul style="list-style-type: none"> • https://fab-coep.vlabs.ac.in/exp/computer-controlled-cutting/ 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	<p>Auto CAD, Solidworks , Creo, Fusion 360, Catia .</p>

			lletin0809/current/pdf/MechEng.pdf	
6	<p>Machine shop: Typical jobs that may be made in this practice module: To make a pin from a mild steel rod in a lathe.</p> <p>Machine shop: Typical jobs that may be made in this practice module: To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.</p>	<ul style="list-style-type: none"> • https://fab-coep.vlabs.ac.in/exp/3d-machining/ 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .
7	<p>Plastic moulding & Glass cutting: Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made.</p> <p>Plastic moulding & Glass cutting : Typical jobs that may be made in this practice module: For glass cutting, three rectangular glass pieces may be cut to make a</p>	<ul style="list-style-type: none"> • https://fab-coep.vlabs.ac.in/exp/molding-casting-polyurethane-parts/ • https://fab-coep.vlabs.ac.in/exp/pcb-design-fabrication/theory.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .

	kaleidoscope using a black colour diamond cutter, or similar other components may be made.			
8	<p>Electrical & Electronics: Familiarization with LT switchgear elements, making its sketches and noting down its specification. Kitkat fuse, Glass cartridge fuse, Plastic fuse holders (optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.</p> <p>Electrical & Electronics: Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.</p> <p>Electrical & Electronics: Simple wiring exercise to be executed to understand the basic electrical</p>	<ul style="list-style-type: none"> • https://be-iitkgp.vlabs.ac.in/ • https://be-iitkgp.vlabs.ac.in/ 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	<p>Auto CAD, Solidworks, Creo, Fusion 360, Catia .</p>

	<p>circuit.</p> <p>Electrical & Electronics: Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.</p> <p>Electrical & Electronics: Simple soldering exercises to be executed to understand the basic process of soldering.</p>			
9	<p>Advance Machining by using Advance Laser Cut machine.</p>	<ul style="list-style-type: none"> • http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMM/exp2/index.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/register/bulletin0809/current/pdf/MechEng.pdf 	<p>Auto CAD, Solidworks, Creo, Fusion 360, Catia .</p>
10	<p>Advance Welding by usng Advavnce Robotic Arm</p>	<ul style="list-style-type: none"> • https://www.weldsimulator.com/?gad_source=1&gclid=CjwKCAjwk8e1BhALEi 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/ 	<p>Auto CAD, Solidworks, Creo, Fusion 360,</p>

	welding .	wAc8MHiJyE9E0aVgudFeA93Gr_LBCtWysh33JuVvCIEjOibSPP4H9attARRoCeyQQAxD_BwE	ering/mechanical-engineering/ <ul style="list-style-type: none"> • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Catia .
11	Automated Material cutting by Smart Cutting machine like Cricut Maker3.	<ul style="list-style-type: none"> • https://guides.library.illinois.edu/Cricut 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .
12	Advanced machining by using CNC Lathe and CNC Milling.	<ul style="list-style-type: none"> • http://vlabs.iitkgp.ac.in/vlabs/rtvlab1/ncbase%20software.html • https://fab-coep.vlabs.ac.in/exp/computer-controlled-cutting/theory.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .

List of Innovative Experiments in Laboratory				
1	Advance Machining by using Advance Laser Cut machine.	<ul style="list-style-type: none"> • http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMM/exp2/index.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .
2	Advance Welding by usng Adavnce Robotic Arm welding .	<ul style="list-style-type: none"> • https://www.weldsimulator.com/?gad_source=1&gclid=CjwKCAjwk8e1BhALEjwAc8MHiJyE9E0aVgudFeA93Gr_LBCtWysh33JuVvCIEjOibSPP4H9attARRoCeyQQA vD_BwE 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .

3	Automated Material cutting by Smart Cutting machine like Cricut Maker3.	<ul style="list-style-type: none"> • https://guides.library.illinois.edu/Cricut 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .
4	Advanced machining by using CNC Lathe and CNC Milling.	<ul style="list-style-type: none"> • http://vlabs.iitkgp.net.in/vlabs/rtvlab1/cncbase%20software.html • https://fab-coep.vlabs.ac.in/exp/computer-controlled-cutting/theory.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .
5	<p>Plastic moulding & Glass cutting: Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made.</p> <p>Plastic moulding & Glass cutting : Typical jobs that</p>	<ul style="list-style-type: none"> • https://fab-coep.vlabs.ac.in/exp/molding-casting-polyurethane-parts/ • https://fab-coep.vlabs.ac.in/exp/pcb-design-fabrication/theory.html 	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/Mech 	Auto CAD, Solidworks, Creo, Fusion 360, Catia .

	<p>may be made in this practice module: For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black colour diamond cutter, or similar other components may be made.</p>		<p>hEng.pdf</p>	
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<p align="center">List of virtual lab experiments</p>			
<p>Sl No</p>	<p>Name of the experiment</p>	<p>Simulation software link</p>	<p>Mapping link with MIT/Standford</p>
<p>1</p>	<p>Advance Machining by using Advance Laser Cut machine.</p>	<p>Auto CAD, Solidworks, Creo, Fusion 360, Catia .</p>	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf
<p>2</p>	<p>Advance Welding by usng Adavance Robotic Arm welding .</p>	<p>Auto CAD, Solidworks, Creo, Fusion 360, Catia .</p>	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf

3	Automated Material cutting by Smart Cutting machine like Cricut Maker3.	Auto CAD, Solidworks, Creo, Fusion 360, Catia .	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf
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5	Plastic moulding & Glass cutting: Typical jobs that may be made in this practice module: For plastic moulding, making at least one simple plastic component should be made.	Auto CAD, Solidworks, Creo, Fusion 360, Catia .	<ul style="list-style-type: none"> • https://catalog.mit.edu/schools/engineering/mechanical-engineering/ • https://stanford.edu/dept/registrar/bulletin0809/current/pdf/MechEng.pdf

List of Experiments using MATLAB

1	Model-Based Design Series: Basic Component Modeling	https://in.mathworks.com/academia/courseware/basic-component-modeling.html	NA
2	Heat Transfer with MATLAB	https://in.mathworks.com/academia/courseware/heat-transfer.html	NA

List of Experiment/project using Generative AI

1	AI for Computational Design and Manufacturing	https://professional.mit.edu/course-catalog/ai-computational-design-and-manufacturing	NA
2	Robotic Welding	https://www.canadianmetalworking.com/canadianfabricatingandwelding/article/automationsoftware/ai-and-robotics-in-assembly-and-finishing	NA

Course Code: ESCCS291	Category: Engineering Science Course
Course Name: Introduction to AI and Data Science using Python Laboratory	Semester- First/Second
L-T-P: 0-0-4	Credit-2

Laboratory/Practical: List of Experiments:

Week	Ques	Problem Statements
1	1	Write a Python program that asks the user for his name and then welcomes him.
	2	Write a Python program that accepts principle, rate, and time from the user and prints the simple interest.
	3	Write a Python program that prompts the user to input principle, rate, and time and calculate compound interest.
	4	Write a program in Python to calculate the area and perimeter of various polygons such as triangles, rectangles, and circles.
	5	Write a program in Python to input 3 numbers separated by comma, and find the largest and smallest among them.
	6	Write a program in Python to find the roots of a quadratic equation using Python.
	7	Write a program in Python to print all prime numbers inside a range of numbers provided by the user.
2	8	Write a program in Python to print the mean and standard deviation of 5 scores input by the user.
	9	Write a program in Python to create a calculator that can perform basic arithmetic operations.
	10	Write a program in Python to convert temperatures between Celsius and Fahrenheit.
	11	Write a program in Python to check whether an input is even or odd.
	12	Write a program in Python to check whether an input is leap year or not.
	13	Write a python program that prompts the user to enter a number and determines whether it is positive, negative, or zero.
	14	Write a program that prompts the user to enter their age and prints the corresponding age group. The program should use the following age groups: 0-12: Child

		13-19: Teenager 20-59: Adult 60 and above: Senior Citizen
	15	<p>Write a program that prompts the user to enter their weight (in kilograms) and height (in meters). The program should calculate the Body Mass Index (BMI) using the formula: $BMI = \text{weight} / (\text{height} * \text{height})$. The program should then classify the BMI into one of the following categories:</p> <p style="padding-left: 40px;"> less than 18.5 - Underweight BMI between 18.5 and 24.9 - Normal weight BMI between 25 and 29.9 - Overweight BMI 30 or greater - Obesity </p>
3	1	Write a Python program that prompts the user to input a number from 1 to 7. The program should display the corresponding day for the given number. For example, if the user types 1, the output should be Sunday. If the user types 7, the output should be Saturday.
	2	Write a Python program that prompts the user to input the number of calls and calculate the monthly telephone bills as per the following rule: Minimum Rs. 200 for up to 100 calls. Plus Rs. 0.60 per call for the next 50 calls. Plus Rs. 0.50 per call for the next 50 calls. Plus Rs. 0.40 per call for any call beyond 200 calls.
	3	Write a program in Python to calculate the factorial of a number.
	4	Write a program in Python to calculate the Fibonacci sequence till a specific no. of terms.
	5	Write a program in Python to calculate the factors of numbers.
	6	Write a program in Python to calculate the magic square based on a given number.
	7	Write a program in Python to check if a number is a palindrome
	8	Write a program in Python to check if a number is an Armstrong number.

	9	Write a program in Python to check if a number is Krishnamurthy number.
	10	Write a program in Python to find the sum of digits of a number.
	11	Write a program in Python to reverse a given number.
	12	Write a program in Python to find the sum of squares of the first n natural numbers.
	13	Write a program in Python to convert a decimal number to a binary number.
	14	Write a program in Python that prompts the user to input a number and prints its multiplication table.
	15	Write a Python program to print the first 6 terms of a geometric sequence starting with 2 and having a common ratio of 3.
4	1	Print the series upto N terms: 1, 4, 9, 16, 25, 36...
	2	Print the series up to N terms: 2, 4, 8, 16, 32, 64...
	3	Print the series upto N terms: 1, 3, 7, 13, 21, 31.....
	4	Print the series upto N terms: 1, 2, 4, 8, 16, 23, 28, 38, 49, 62 ...
	5	Print the series upto N terms: 1,2,6,24,120,720 ...
	6	Write a program that takes a positive integer N as input and calculates the sum of the reciprocals of all numbers from 1 up to N. The program should display the final sum.
	7	Write a Python program that prompts the user to enter a base number and an exponent, and then calculates the power of the base to the exponent. The program should not use the exponentiation operator (**) or the math.pow() function.
5	8	Write a Python program that prompts the user to enter a positive integer. Your program should display all the factors of the number. Additionally, calculate and display the sum of its factors.
	9	Write a python program that uses a loop to repeatedly ask the user to enter integers. The loop will come to an end when zero is entered. After collecting all the integers, the program will compute and display the average of all the entered numbers.

	10	Write a python program to enter the numbers till the user wants and at the end it should display the count of positive, negative and zeros entered.
	11	Write a python program that prompts the user to input two numbers and display its HCF.
	12	Write a python program to add first seven terms of the following series using a for loop: $\frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \dots$
	13	Compute the sum up to n terms in the series $1 - 1/2 + 1/3 - 1/4 + 1/5 - \dots 1/n$ where n is a positive integer and input by user.
	14	Write a program to compute sin x for given x. The user should supply x and a positive integer n. We compute the sine of x using the series and the computation should use all terms in the series up through the term involving x^n $\sin x = x - x^3/3! + x^5/5! - x^7/7! + x^9/9! \dots\dots$
	15	Write a program to compute cosine of x. The user should supply x and a positive integer n. We compute the cosine of x using the series and the computation should use all terms in the series up through the term involving x^n $\cos x = 1 - x^2/2! + x^4/4! - x^6/6! \dots$
6	1	Print the pattern upto N Lines: $\begin{array}{ccc} \cdot & \cdot & \cdot \\ / _ \backslash & / _ \backslash & / _ \backslash \\ / _ _ \backslash & / _ _ \backslash & / _ _ \backslash \\ / _ _ _ \backslash & & \end{array}$ <p style="text-align: center;">N=2 N=3 N=4</p>
	2	Print a number as a 8 segment display N Lines:

		<pre> _ _ _ N=2 N=3 N=4 </pre>															
3	Print the pattern upto N lines:	<pre> 1 2 1 2 3 1 2 3 4 4 3 8 9 4 12 13 14 5 7 6 5 11 16 15 6 10 9 8 7 N=2 N=3 N=4 </pre>															
4	Print the following pattern upto N lines:	<pre> 1 1 1 1 2 1 1 3 3 1 1 4 6 4 1 1 5 10 10 5 1 ... </pre>															
5	Print the shape for Height = N	<table border="1"> <tr> <td>***</td> <td>*****</td> <td>*****</td> </tr> <tr> <td>**</td> <td>* *</td> <td>* *</td> </tr> <tr> <td>**</td> <td>* *</td> <td>* *</td> </tr> <tr> <td></td> <td>*****</td> <td>* *</td> </tr> <tr> <td></td> <td></td> <td>*****</td> </tr> </table>	***	*****	*****	**	* *	* *	**	* *	* *		*****	* *			*****
***	*****	*****															
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		N=3	N=4	N=5
	6	<p>Floyd's triangle is a right-angled triangular array of natural numbers as shown below:</p> <pre> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 </pre> <p>Write a program to print the Floy'd triangle.</p>		
7	7	<p>Write programs to print following patterns:</p> <pre> ***** ***** ***** ***** </pre>		
	8	<p>Write programs to print following patterns:</p> <pre> * ** *** **** ***** </pre>		
	9	<p>Write programs to print following patterns:</p> <pre> * ** </pre>		

		<pre>*** **** *****</pre>
	10	<p>Write programs to print following patterns:</p> <pre> * *** ***** ******* ********* **********</pre>
	11	<p>Write programs to print following patterns:</p> <pre> 1 222 33333 4444444 555555555</pre>
	12	<p>Write a program that prints the following diamond pattern:</p> <pre> 1 123 12345 123 1</pre>
8	1	<p>Write a python program that accepts a string from user. Your program should count and display number of vowels in that string.</p>

	2	<p>Write a python program that reads a string from the keyboard and display:</p> <ul style="list-style-type: none"> * The number of uppercase letters in the string * The number of lowercase letters in the string * The number of digits in the string * The number of whitespace characters in the string
	3	<p>Write a Python program that accepts a string from user. Your program should create and display a new string where the first and last characters have been exchanged.</p> <p>For example if the user enters the string 'HELLO' then new string would be 'OELLH'</p>
	4	<p>Write a Python program that accepts a string from user. Your program should create a new string in reverse of first string and display it.</p> <p>For example if the user enters the string 'EXAM' then new string would be 'MAXE'</p>
	5	<p>Write a Python program that accepts a string from user. Your program should create a new string by shifting one position to left.</p> <p>For example if the user enters the string 'examination 2021' then new string would be 'xamination 2021e'</p>
9	6	<p>Write a program that asks the user to input his name and print its initials. Assuming that the user always types first name, middle name and last name and does not include any unnecessary spaces.</p> <p>For example, if the user enters Ajay Kumar Garg the program should display A. K. G. Note: Don't use split() method</p>
	7	<p>Write a program that determines whether the string is a palindrome.</p>
	8	<p>Write a program that display following output:</p> <p>SHIFT</p> <p>HIFTS</p> <p>IFTSH</p>

		FTSHI TSHIF SHIFT
	9	Write a program in python that accepts a string to setup a passwords. Your entered password must meet the following requirements: <ul style="list-style-type: none"> • The password must be at least eight characters long. • It must contain at least one uppercase letter. • It must contain at least one lowercase letter. • It must contain at least one numeric digit. <p>Your program should should perform this validation</p>
	10	Write a python program to check whether an input of an arithmetic expression is correct or not.
10	1	Write a program to Insert and Delete elements from list based on a given position.
	2	Find out Mean, Median and Mode of a list of numbers.
	3	Sort a list of numbers without using a user defined function.
	4	Use a dictionary to count the frequency of words in a string input by the user.
	5	Given a list of numbers return the indices in which a specific number occurs.
	6	Find and display the largest number of a list without using built-in function max().
	7	Write a program that accepts a list from user and print the alternate element of list.
	8	Write a program that rotates the element of a list so that the element at the first index moves to the second index, the element in the second index moves to the third index, etc., and the element in the last index moves to the first index.
	9	Write a program that input a string and ask user to delete a given word from a string.
	10	Write a program to add two matrices of size n x m.
	11	Write a program to multiply two matrices.

11	1	Write a program to create a text file as per the path and filename provided by the user and add text as input by the user.
	2	Write a program to copy the content of a text file to another file but while copying convert all capital letters to small letters.
	3	<p>Create a text file to append N lines such that each line displays the Fibonacci sequence upto the term corresponding to specific line number separated by '-'. For N = 5 the text file should read.</p> <p>1</p> <p>1-1</p> <p>1-1-2</p> <p>1-1-2-3</p> <p>1-1-2-3-5</p>
	4	<p>Take input four values from user with respect to number of books, pens, bags and total price as follows. 36, 116, 23, 4649 and save it as a text file</p> <p style="text-align: center;">Books: 36</p> <p style="text-align: center;">Pens: 116</p> <p style="text-align: center;">Bags : 23</p> <p style="text-align: center;">Price : Rs. 4649</p>
	5	<p>Write a program to create a dictionary by reading records from the text file output in program 4th</p> <p>Dictionary : {"Books":36, "Pens": 116, "Bags":23, "Price": "4649"}</p>
	6	Write a program to take inputs from user to create a dictionary for storing and displaying student data.
	7	Write a program to print all elements in a list those have only single occurrence.

12	8	Write a program to read 6 numbers and create a dictionary having keys EVEN and ODD. Dictionary's value should be stored in list. Your dictionary should be like: {'EVEN':[8,10,64], 'ODD':[1,5,9]}.																
	9	Write a program to input roll numbers and their names of students of your class and store them in the dictionary as the key-value pair. Perform the following operations on the dictionary: a) Display the Roll numbers and name for all students. b) Add a new key-value pair in this dictionary and display the modified dictionary c) Delete a particular student's record from the dictionary d) Modify the name of an existing students.																
	10	Write a program that reads string from user. Your program should create a dictionary having key as word length and value is count of words of that length. For example, if user enters 'A fat cat is on the mat'. <div style="margin-left: 40px;"> <table> <thead> <tr> <th>Word</th> <th>Word length</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1</td> </tr> <tr> <td>fat</td> <td>3</td> </tr> <tr> <td>cat</td> <td>3</td> </tr> <tr> <td>is</td> <td>2</td> </tr> <tr> <td>on</td> <td>2</td> </tr> <tr> <td>the</td> <td>3</td> </tr> <tr> <td>mat</td> <td>3</td> </tr> </tbody> </table> </div>	Word	Word length	A	1	fat	3	cat	3	is	2	on	2	the	3	mat	3
	Word	Word length																
	A	1																
	fat	3																
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on	2																	
the	3																	
mat	3																	
11	Write a program using matplotlib to display a line plot																	
12	Write a program using matplotlib to use different types of Matplotlib Markers																	
13	Write a program using matplotlib to use Matplotlib Labels and Title																	
14	Write a program using matplotlib to display a scatter plot																	
15	Write a program using matplotlib to display Matplotlib Histograms																	

Course Outcomes:

- CO1: Understand fundamental components of programming in python
- CO2: Implement solutions using object orient programming concepts using python classes and objects
- CO3: Develop databases, perform numerical computation and visualize data using python packages
- CO4: Apply concepts of python to solve challenges in AI and Data Science

Text Books:

- 1) Python for Everybody: Exploring Data in Python 3, Charles Severance, SPD
- 2) Python Computing Fundamentals and Applications, Abhijit Kar Gupta, Techno World.
- 3) Python Programming, Subrata Saha, Aryan Publishing House.
- 4) Prompt Engineering for Generative AI by James Phoenix, Mike Taylor, O'Reilly Media, Inc.

Reference Books:

- 1) Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinney, O'Reilly
- 2) Python: The Complete Reference, Martin C. Brown, Osborne/McGraw-Hill

Alternate Courses

NPTEL –Python for Data Science – Prof. Rangunathan Rengasamy, IIT Madras. <https://nptel.ac.in/courses/106106212>

COURSERA– Python for Data Science, AI & Development, Joseph Santarcangelo - <https://www.coursera.org/learn/python-for-applied-data-science-ai>



UNIVERSITY OF ENGINEERING & MANAGEMENT

INSTITUTE OF ENGINEERING & MANAGEMENT, SALT LAKE CAMPUS
INSTITUTE OF ENGINEERING & MANAGEMENT, NEWTOWN CAMPUS
UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR



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

Subject Name: **Design Thinking and Innovation- Ideation & Research** Credit: **0** Lecture Hours: **12**

Subject Code: **IVC281A**

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

Relevant Links:

[Linkedin Learning](#)

[Coursera](#)

[SWAYAM](#)

Study Materials: [Design Thinking and Innovation-Basic](#)

Course Outcomes

At the end of the course

CO1: The student will be able to Understand the concepts of design thinking approaches.

CO2: The student will be able to Create design thinking teams and conduct design thinking sessions.

CO3: The student will be able to Apply both critical thinking and design thinking in parallel to solve Problems

CO4: The student will be able to Understand how to conduct research and how to write a research paper.

Module Number	Topics	Subtopics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Hands on Assignment
1	Introduction to Design Thinking	Introduction to Design Thinking, Importance of Design Thinking and Innovation in Today's World, Stages of Design Thinking, Design Thinking: A Non-Linear Process, Understanding the User: Empathy and Empathy Mapping, Case Studies of Empathy Mapping, Customer Journey Mapping, Case Studies of Customer Journey Mapping, Techniques for generating ideas: Brainstorming and Its Importance, Techniques for generating ideas: Mind Mapping and Its Importance, Divergent Thinking and Convergent Thinking, Human Centered Design and Case Studies of Human Centered Design.	<p>International Academia: MIT- Design Thinking Certification at MIT Sloan Online Program Stanford University-Creativity and Design Thinking Stanford Online AICTE Syllabus: AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org)</p> <p>Industry Mapping: Many companies across various sectors, such as technology, healthcare, and finance, are adopting design thinking methodologies to foster innovation and create user-centric products and services. For example, companies like Apple, Google, and IDEO are known for incorporating design thinking into their product development processes. Industries recognize that design thinking is not just a buzzword but a crucial approach for staying competitive in a rapidly changing market. Companies like Airbnb, IBM, and Nike have all embraced design thinking to drive innovation and enhance customer experiences. Various industries follow the stages of design thinking, including empathizing with users, defining problems, ideating solutions, prototyping, and testing. Companies like Samsung, Toyota, and Procter & Gamble utilize these stages to develop products and services that meet customer needs effectively. Companies leverage empathy mapping techniques to gain deeper insights into their target audience's needs, desires, and pain points. For instance, companies like Netflix and Spotify use empathy mapping to understand user preferences and tailor their content recommendations accordingly.</p>	4	<p>Assignment-1: Empathy Interview: Conduct an empathy interview with a potential user or customer to understand their needs, challenges, and experiences. Create an empathy map based on the insights gathered.</p> <p>Assignment-2: Customer Journey Mapping: Choose a product or service and create a customer journey map to visualize the user's experience from start to finish. Identify pain points and areas for improvement.</p> <p>Assignment-3: Brainstorming Session: Organize a brainstorming session with a group to generate ideas for solving a specific design challenge. Use techniques such as "How Might We" questions to guide brainstorming.</p> <p>Assignment-4: Mind Mapping Exercise: Use mind mapping to explore and visualize connections between different ideas related to a design problem. Share your mind map and explain the connections you've identified.</p>

2	Introduction to Creative Process, Biomimicking and Prototyping.	<p>Introduction to Creative Process, Introduction to Creative Process, Stages of Creative Process, Preparation Stage of Creative Process, Incubation Stage of Creative Process, Illumination Stage of Creative Process, Evaluation Stage of Creative Process, Implementation Stage of Creative Process, Creative Thinking Principles: New ideas are composed of old elements., Creative Thinking Principles: Not all new ideas are on a par, Creative Thinking Principles: Creativity is Enhanced by the Ability to Detect Connections between Ideas, Steps to Enhance Creative Thinking, Introduction to Biomimicking, Importance of Biomimicking, Examples of Product designed from Biomimicking, Biomimicking for Engineering, Case Studies of Biomimicry.</p>	<p>International Academia: MIT- Design Thinking Certification at MIT Sloan Online Program Stanford University- Creativity and Design Thinking Stanford Online AICTE Syllabus: AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org)</p> <p>Industry Mapping: Industries employ customer journey mapping to visualize and optimize the entire customer experience across different touchpoints. Companies like Starbucks, Amazon, and Disney use this technique to identify opportunities for improving customer satisfaction and loyalty. Brainstorming and mind mapping are widely used in industries to foster creativity and innovation during problem-solving sessions. Companies like Google, Facebook, and 3M regularly conduct brainstorming sessions to generate new product ideas and improve existing processes. Industries value both divergent and convergent thinking to explore a wide range of possibilities and then converge on the best solutions. Companies like Tesla, SpaceX, and IDEO encourage their teams to think divergently to explore innovative ideas before converging on feasible solutions. Human-centered design principles are applied across industries to create products and services that prioritize the user's needs and preferences. Companies like Airbnb, Uber, and Slack integrate human-centered design into their design processes to deliver seamless user experiences.</p>	4	<p>Assignment-5: Design Challenge: Present a design challenge to students and ask them to come up with innovative solutions using the principles of human-centered design. Prototype and test the most promising ideas. Assignment-6: Creative Process Analysis: Analyze a creative process from a real-world example (e.g., a product design, a marketing campaign) and identify the stages of preparation, incubation, illumination, evaluation, and implementation. Assignment-7: Biomimicry Case Study: Research and present a case study where biomimicry was used to design a product or solve a problem. Discuss the principles of biomimicry and how they were applied in the case.</p>

3	<p>Introduction to Research and Research Ethics</p>	<p>Meaning, Objectives and Motivation in Research, Types of Research and its Examples, Research Approaches, Significance of Research, Research Methods versus Methodology, Library Research, Field Research, Laboratory Research, Introduction to Review Article, Structure of a Review Articles, How to Write a Review Article, Advantages of Writing a Review Article, Importance of Google Scholar, Google Patent and Research-gate for Design Thinking and Innovation, Literature Survey, Reading a Review Articles and Research Articles to Generate Ideas [with reference to few latest research article], Databases of Library Research, Open-Source Databases, Introduction to Journal Indexing, H-Index and i-10 Index, Introduction to Journal Impact Factor, Impact Factor and 5-Year Impact Factor, Choosing the right Journal for Your Article, Research Ethics, Importance of Research Ethics.</p>	<p>International Academia: MIT- Design Thinking Certification at MIT Sloan Online Program Stanford University- Creativity and Design Thinking Stanford Online AICTE Syllabus: AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering (Artificial Intelligence and Data Science (AI&DS)) (aicte-india.org) Industry Mapping: Biomimicry is increasingly being adopted by industries, such as architecture, automotive, and materials science, to design innovative products inspired by nature. Companies like Tesla, Airbus, and Nike draw inspiration from biological systems to create sustainable and efficient designs. Research methods and ethics are essential considerations for industries conducting product development, market research, and user testing. Companies like Microsoft, Pfizer, and Google adhere to ethical research practices and leverage various research methods to inform their decision-making processes.</p>	4	<p>Assignment-8: Literature Review: Conduct a literature review on a topic related to your domain of interest. Summarize key findings and identify gaps in the existing research. Assignment-9: Research Ethics Discussion: Lead a discussion on the importance of research ethics in design thinking and innovation. Discuss ethical considerations in research and how they can impact the design process. Assignment-10: Journal Selection Exercise: Explore different academic journals related to design thinking and innovation. Choose a journal and write a mock submission for an article on a relevant topic.</p>

TextBook: [Design Thinking for Beginners: Innovation as a factor for entrepreneurial success](#)



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



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

Subject Name: Economics and Business Model Credit: 0 Lecture Hours: 12

Subject Code: IVC282A

Pre-requisite: Basic Mathematical Knowledge

Relevant Links:

[Study Material](#)

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

[Coursera](#)

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

NPTEL

https://onlinecourses.nptel.ac.in/noc25_me98/preview

COURSE OBJECTIVES:

1. To introduce the fundamentals of economics with a focus on engineering applications, including basic economic problems, micro and macroeconomic concepts, and the scope of engineering economics.
2. To impart knowledge on market structures, demand and supply analysis, production and cost behavior, and strategies for identifying target markets and customer segments using analytical tools.
3. To impart knowledge on consumer and producer behavior, utility concepts, elasticity, equilibrium conditions, and value proposition frameworks through real-world case studies.
4. To impart knowledge on entrepreneurship skill development, including self-discovery, effectuation principles, team building, leadership styles, hiring, bootstrapping, and creative problem-solving techniques.

COURSE OUTCOMES:

- CO 1: Apply basic economic principles and distinguish between micro and macroeconomic concepts in the context of engineering decision-making.**
- CO 2: Analyze market dynamics, demand-supply behavior, and consumer segmentation to evaluate business opportunities and market potential.**
- CO 3: Interpret consumer and producer behavior using economic laws and value proposition models to design customer-centric products and services.**
- CO 4: Demonstrate entrepreneurial mindset by identifying problems, applying effectuation principles, and developing team-based, resource-efficient startup solutions.**

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	An Overview of Engineering Economics	What is Economics, Basic Economic Problems, Micro vs Macro, Engineering Economics Overview	<p>International Academia: https://ocw.mit.edu/courses/3-080-economic-environmental-issues-in-materials-selection-fall-2005/resources/lec_ee1/</p> <p>AICTE-prescribed syllabus: NA</p> <p>Industry Mapping: Wadhvani Global Foundation</p>	2	<p>Book: Engineering Economics and Costing by Sasmita Mishra</p> <p>Chapter 1: Engineering Economics- An Overview and Chapter 2: Microeconomics and Macroeconomics (2.1 and 2.2)</p>	❖ Plan your own new business idea.
2	Market Analysis	Utility Analysis, Demand and Supply, Market and Market Equilibrium under Perfect Competition, Production and Cost Analysis, Revenue and Profit, Target Customer Identification, Segmentation and Targeting (including Niche Marketing), Customer Jobs, Pains and Gains, Early Adopters	<p>International Academia: https://ocw.mit.edu/courses/2-964-economics-of-marine-transportation-industries-fall-2006/resources/market_econ/</p> <p>AICTE-prescribed syllabus: NA</p> <p>Industry Mapping: Wadhvani Global Foundation</p>	4	<p>Book: Engineering Economics and Costing by Sasmita Mishra</p> <p>Chapter 2: Microeconomics and Macroeconomics (2.3-2.8)</p>	❖ Plan your own new business idea. ❖ Pitch the same idea.
3	Consumer and Producer Behaviour	Law of Diminishing Marginal Utility, Elasticity of Demand, Consumer Equilibrium, Law of Variable Proportions, Stages of	<p>International Academia: https://ocw.mit.edu/courses/14-01sc-principles-of-microeconomics-fall-2011/pages/unit-3-producer-</p>	4	<p>Book: Microeconomics Ninth Edition By Pearson [Paperback] Pindyck, Robert and</p>	❖ Design Value Proposition Canvas of your own business.

		<p>Production and Returns to Scale, Elasticity of Supply, Producer Equilibrium, Customer vs Consumer, Value Proposition Design, Case Studies</p>	<p>theory/productivity-and-costs/ , https://ocw.mit.edu/courses/15-010-economic-analysis-for-business-decisions-fall-2004/resources/mkt_elstic_srpl/ , https://ocw.mit.edu/courses/14-01sc-principles-of-microeconomics-fall-2011/pages/unit-3-producer-theory/introduction-to-producer-theory/ , https://ocw.mit.edu/courses/11-203-microeconomics-fall-2010/resources/mit11_203f10_handout2/</p> <p>AICTE-prescribed syllabus: NA</p> <p>Industry Mapping: Wadhvani Global Foundation</p>		<p>Rubinfeld, Daniel by Robert Pindyck and Daniel Rubinfeld Part 2: Producers, Consumers and Competitive Market</p>	
4	Entrepreneurship Skill Development	<p>Entrepreneurship as a Domain of Expertise, Effectuation Principles, Self-Discovery and Flow, Team Building and Shared Leadership, Leadership Styles, Hiring Strategy, Bootstrapping, Problem Identification and Brainstorming</p>	<p>International Academia: https://ocw.mit.edu/courses/15-390-new-enterprises-spring-2013/resources/mit15_390s13_lec14/</p> <p>AICTE-prescribed syllabus: NA</p> <p>Industry Mapping: Wadhvani Global Foundation</p>	2	<p>Book: Entrepreneurship (Second Edition) by Rajeev Roy, Oxford University Press</p> <p>Chapter 1: Understanding Entrepreneurship and Chapter 2: Growth of a Business Idea</p>	<p>❖ Pitch Deck Presentation – Showcasing Your Entrepreneurial Mindset</p>

TEXT BOOKS:

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

REFERENCE BOOKS:

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



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University of Engineering & Management, Jaipur



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

Subject Name: Competitive Aptitude Training-I Credit: 0.5 Lecture Hours: 48

Subject Code: SDP282A

Pre-requisite: Basic knowledge of English, Mathematics and general awareness of current events.

COURSE OBJECTIVES:

1. To introduce key components of English grammar and their practical usage.
2. To impart knowledge on effective vocabulary usage and comprehension skills.
3. To impart knowledge on interpreting data from tables and structured formats.
4. To impart knowledge on recent current affairs and essential static general knowledge.

COURSE OUTCOMES:

CO 1: Demonstrate an understanding of nouns, pronouns, prepositions, and apply grammar rules correctly.

CO 2: Use synonyms and antonyms effectively in written and spoken English.

CO 3: Interpret tabular data accurately and draw relevant conclusions.

CO 4: Stay informed about national and international events, and recall key facts from static general knowledge.

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	Verbal English	<ol style="list-style-type: none"> Noun: What is noun, Kinds of Noun, Rules & Application. Pronoun: Definition of Pronoun, Examples, Rules & Application. Preposition: Preposition and its Application. Basic Application of Vocabulary (Synonyms and Antonyms) Reading Comprehension Personal Letter Writing 	<p>International Exams</p> <p>1. GRE (https://www.ets.org/pdfs/gre/gre-math-review.pdf)</p> <p>2. GMAT (https://downloads.mba.com/downloads/gmat-handbook.pdf)</p> <p>National Exams:</p> <p>1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26</p> <p>2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21</p> <p>3. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23</p> <p>4. IBPS Probationary officer (https://www.ibps.in/wp-content/uploads/Detailed-Advt.-CRP-PO-XII.pdf), Pg 7</p> <p>5. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg.</p>	20	<p>1. Textbook: Objective General English, Author: R.S Aggarwal, Publishing house: S. Chand</p>	<ul style="list-style-type: none"> ❖ Noun Identification: Underline nouns in given sentences. ❖ Pronoun Replacement: Replace nouns with appropriate pronouns. ❖ Synonym Matching: Match words with their synonyms. ❖ Synonym Rewrite: Replace underlined words with synonyms. ❖ Antonym Matching: Match words with their antonyms. ❖ Antonym Rewrite: Replace underlined words with antonyms. ❖ Antonym

			<p>20-22</p> <p>6. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>7. XAT (https://xat.org.in/xat-syllabus/)</p> <p>8. GATE (https://gate2024.iisc.ac.in/papers-and-syllabus/)</p> <p>9. CAT https://iimcat.ac.in/per/g01/pub/756/ASM/WebPortal/1/index.html?756@@1@@1</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1)</p> <p>2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf), pg 1</p>			<p>Listing: Write 10 words with their antonyms.</p>
2	Data Interpretation	1. Table Data Interpretation	<p>National Exams:</p> <p>1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-eng1-010223.pdf), pg 25-26</p> <p>2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf , pg 20-21)</p>	20	<p>1. Textbook: An Advanced Approach to Data Interpretation for Competitive Examinations, Author: R.S. Aggarwal, Publisher: S.</p>	<p>❖ Calculating Totals and Averages: Provide a table with sales data over several months. Ask students to calculate the total sales and average</p>

			<p>3. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22</p> <p>4. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1</p> <p>2. Miscellaneous Services Recruitment Examination (file:///C:/Users/UEMK/Downloads/2707970_2019.pdf), pg 1</p>	Chand	<p>sales for each month.</p> <p>❖ Comparing Data: Provide a table with data on two or more products or categories. Ask students to compare the data and determine which product/category performed better based on different criteria (e.g., sales, growth rate).</p>
3	Current Affairs and Static GK	National News, International News, MOU's and agreements, Summits and Conclaves, Obituaries, Awards and Events, Sports, Important Days, Banking and Economic Awareness	<p>National Exams:</p> <p>1. UPSC Civil Services Exam (https://upsc.gov.in/sites/default/files/Notif-CSP-23-engl-010223.pdf), pg 25-26</p> <p>2. UPSC Combined Defence Services (https://upsc.gov.in/sites/default/files/Notif-CDS-I-Exam-2023-Engl-211222.pdf), pg 20-21</p> <p>3. RBI Grade B (https://rbidocs.rbi.org.in/rdocs/Content/PDFs/DADVTGRB09052023</p>	08	<p>1. Current Affairs Magazine of IEM-UEM</p> <p>2. Lucent GK</p> <p>❖ Discussion on National and International affairs</p> <p>❖ Discussion on MOU's and agreements, Summits and Conclaves</p> <p>❖ Discussion on recent Awards and Events, Sports.</p> <p>❖ Discussion on Economic</p>

			<p>FA65E4FB1C2CF473396B4FD7E5F69CDDE.PDF), pg 22-23</p> <p>4. IBPS Probationary officer (https://www.ibps.in/wp-content/uploads/Detailed-Advt.-CRP-PO-XII.pdf) , Pg 7.</p> <p>5. Combined Graduate Level conducted by SSC (https://ssc.nic.in/SSCFileServer/PortalManagement/UploadedFiles/notice_CGLE_03042023.pdf) pg. 20-22</p> <p>6. Intelligence Bureau ACIO (https://www.pw.live/exams/wp-content/uploads/2023/11/IB-ACIO-Recruitment-2023-Notification-Emp-News.pdf)</p> <p>State Level Exams:</p> <p>1. Civil Services Executive Exam (WBCS) (https://wbpsc.gov.in/Download?param1=20230225142430_Syllabus.pdf&param2=advertisement, pg 1</p> <p>2. Miscellaneous Services Recruitment Examination (https://adda247jobs-wp-assets-prod.adda247.com/jobs/wp-content/uploads/sites/7/2022/11/21142422/2707970_2019.pdf), pg 1</p>			Awareness
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TEXT BOOKS:

1. Textbook: Objective General English, Author: R.S Agarwal, Publishing house: S. Chand
2. Textbook: An Advanced Approach to Data Interpretation for Competitive Examinations, Author: R.S. Aggarwal, Publisher: S. Chand
3. Lucent GK

REFERENCE BOOKS:

1. Current Affairs Magazine of IEM-UEM



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

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Syllabus Structure:

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



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

Subject Name: IKS and Its Application for Engineers

Credit: 2

Lecture Hours: 40

Subject Code: IKS281

Pre-requisite: Passed 10+2 or equivalent examination

Relevant Links:

[NPTEL](#)

<https://nptel.ac.in/courses/111101080>

<https://nptel.ac.in/courses/121104006>

<https://nptel.ac.in/courses/101104065>

<https://nptel.ac.in/courses/109106195>

COURSE OBJECTIVES:

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

1. This course aims to introduce students to the depth and diversity of Indian Knowledge Systems, cultivated over millennia across various domains of life, learning, and innovation. Students will:
 - Grasp the definition, scope, and organization of IKS.
 - Understand its historicity, cultural foundations, and relevance in the contemporary world.
 - Appreciate IKS as a holistic and interdisciplinary framework integrating science, philosophy, and social values.

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

COURSE OUTCOMES:

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

(Mapped to Week 1: Introduction to IKS)

CO2. Explain key components of the Vedic corpus and Vedāṅgas, and articulate their significance in knowledge organization and cultural life.

(Mapped to Week 2: The Vedic Corpus)

CO3. Identify and interpret traditional Indian number systems and units of measurement, including Kaṭapayādi, Bhūta Saṃkhyā, and their applications in early science and technology.

(Mapped to Weeks 3–4: Number Systems & Indian Mathematics)

CO4. Analyze ancient Indian contributions to mathematics and astronomy, and connect these to modern scientific concepts in algebra, geometry, trigonometry, and celestial navigation.

(Mapped to Weeks 4–5)

CO5. Apply ethical frameworks derived from Indian philosophy (e.g., Karma Yoga) to engineering practice, decision-making, and personal integrity.

(Mapped to Week 6: Moral Science for Engineers)

CO6. Explore indigenous technological advancements in irrigation, surgery, shipbuilding, and art, recognizing their innovation and sustainability principles.

(Mapped to Week 7: Engineering and Technology in Ancient India)

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

(Mapped to Week 8)

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

logic systems.

(Mapped to Week 9: Knowledge Framework and Classifications)

CO9. Interpret the Aṣṭādhyāyī and principles of Sanskrit linguistics, and appreciate their role in computational logic and natural language processing.

(Mapped to Week 10: Linguistics and NLP Applications)

Module number	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Text Book Mapping	Corresponding Lab Assignment
1	Indian Knowledge System (IKS) – An Introduction	<ul style="list-style-type: none"> • What is Indian Knowledge System (IKS) • Why do we need IKS? • Organization of IKS • Historicity of IKS • Salient aspects of IKS 	<p>International Academia: South Asian Studies, Comparative Philosophy (Harvard, SOAS, Leiden)</p> <p>AICTE-prescribed syllabus: Unit 1: Definition, scope, salient features of IKS</p> <p>Industry Mapping: Education, Cultural Policy, Heritage Tech</p>	4	<p>1. <i>Kapil Kapoor – Indian Knowledge Systems</i> https://iks.iitgn.ac.in/wp-content/uploads/2020/06/Indian_Knowledge_Systems-Kapil-Kapoor.pdf?utm_source=chatgpt.com</p> <p>2. <i>Charles A. Moore – The Indian Mind</i> https://ia801402.us.archive.org/13/items/in.ernet.dli.2015.533775/2015.533775.indian-mind_text.pdf</p>	❖
2	The Vedic Corpus	<ul style="list-style-type: none"> • Introduction to Vedas • A synopsis of the four Vedas • Sub-classification of Vedas • Messages in Vedas 	<p>International Academia: Indology, Vedic Studies (Oxford, Chicago, EFEO)</p> <p>AICTE-prescribed syllabus:</p>	4	<p>1. <i>Roshen Dalal – The Vedas</i> https://tarapurbengali.in/books/The%20Ve</p>	❖

		<ul style="list-style-type: none"> • Introduction to Vedāṅgas • Prologue on Śikṣā and Vyākaraṇa • Basics of Nirukta and Chandas • Introduction to Kalpa and Jyotiṣa <p>Vedic Life: A Distinctive Features</p>	<p>Unit 2: Vedic corpus and Vedāṅgas</p> <p>Industry Mapping: Yoga, Ayurveda, Vedic research publishing</p>		<p>das_%20An%20Introduction%20to%20Hinduism%E2%80%99s%20Sacred%20Texts.pdf?utm_source=chatgpt.com</p> <p>2. F. Max Müller – <i>The Six Systems</i> https://ia802302.us.archive.org/24/items/sixsystemsofindi005498mbp/sixsystemsofindi005498mbp.pdf</p>	
3	Number Systems and Units of Measurement:	<ul style="list-style-type: none"> • Number systems in India - Historical evidence • Salient aspects of Indian Mathematics • Bhūta-Saṃkhyā system • Kaṭapayādi system • Measurements for time, distance, and weight <p>Piṅgala and the Binary system</p>	<p>International Academia: History of Mathematics (Cambridge, ETH Zurich)</p> <p>AICTE-prescribed syllabus: Unit 3: Ancient Indian number systems & Bhūta Saṃkhyā</p> <p>Industry Mapping: Fintech, Data encoding, NLP models</p>	4	<p>1. Datta & Singh – A History of Hindu Mathematics https://archive.org/details/history-of-hindu-mathematics-1-bibhutibhusan-datta-avadesh-narayan-singh?utm_source=chatgpt.com</p>	❖

4	Mathematics:	<ul style="list-style-type: none"> • Introduction to Indian Mathematics • Unique aspects of Indian Mathematics • Indian Mathematicians and their Contributions • Algebra • Geometry • Trigonometry • Binary mathematics and combinatorial problems in Chandaḥ Śāstra • Magic squares in India 	<p>International Academia: Non-European Mathematics (University of Manchester, Rutgers)</p> <p>AICTE-prescribed syllabus: Unit 4: Contributions to algebra, geometry, combinatorics</p> <p>Industry Mapping: STEM Education, EdTech, Logic Design</p>		<p><i>I. G. G. Joseph, The Crest of the Peacock</i> https://ia800600.us.archive.org/27/items/crest-of-the-peacock-joseph-george-gheverghese/Crest%20of%20the%20peacock%2C%20non-European%20roots%20of%20mathematics%20Joseph%20George%20Gheverghese%20Third%20Edition.pdf</p> <p>NPTL Course: https://nptel.ac.in/courses/111101080</p>	❖
5	Astronomy:	<ul style="list-style-type: none"> • Introduction to Indian astronomy • Indian contributions in astronomy • The celestial coordinate system • Elements of the Indian calendar • Notion of years and months • Pañcāṅga – The Indian 	<p>International Academia: Archaeoastronomy, Ancient Sciences (University of Arizona, Bonn)</p> <p>AICTE-prescribed syllabus: Unit 5: Indian calendar, celestial models</p>	4	<p><i>1. Astronomy</i>, Author - Amitabha Ghosh, Published by The National Academy of Sciences, India and R K Mission Institute of Culture, Gol Park Kolkata</p>	❖

		<p>calendar system</p> <ul style="list-style-type: none"> • Astronomical Instruments (Yantras) - Jantar Mantar of Rājā Jai Singh Sawai 	<p>Industry Mapping:</p> <p>Panchānga apps, Aerospace heritage, ISRO heritage outreach</p>	<p>2. Subhash Kak – Indian Astronomy: A Sourcebook</p> <p>https://archive.org/details/indian-astronomy-a-sourcebook-b.-v.-subbarayappa-k.-v.-sarma?utm_source=chatgpt.com</p> <p>3. NPTL Course</p> <p>https://nptel.ac.in/courses/121104006</p>	
6	<p>Moral Science for Engineers:</p>	<ul style="list-style-type: none"> • Foundations of Moral Philosophy- Morality, Utilitarianism • Moral relativism vs. moral universalism • Role of conscience and character • Moral leadership and ethical decision-making • Group thinking, peer pressure, and ethical fading • Karma Yoga – Work as worship • Cultivating moral courage and resilience 	<p>International Academia:</p> <p>Applied Ethics (Stanford, TU Delft, Oxford Uehiro Centre)</p> <p>AICTE-prescribed syllabus:</p> <p>Unit 6: Karma Yoga, moral reasoning</p> <p>Industry Mapping:</p> <p>Corporate Ethics, Leadership Training</p>	<p>1. Mike Martin & Roland Schinzinger – <i>Ethics in Engineering</i></p> <p>https://archive.org/details/ethicsinengineer000mart_x017/page/n3/mode/2up?view=theater</p>	❖

		in professional life				
7	Engineering and Technology: Other applications:	<ul style="list-style-type: none"> • Irrigation systems and practices in South India • Literary sources for science and technology • Physical structures in India • Irrigation and water management • Dyes and painting technology • The art of making perfumes • Surgical techniques • Shipbuilding • Sixty-four art forms (64 Kalās) • Status of Indigenous S & T 	<p>International Academia: Ancient Technology Studies (Max Planck Institute, UCLA)</p> <p>AICTE-prescribed syllabus: Unit 7: Water management, shipbuilding, arts</p> <p>Industry Mapping: Rural Tech, Heritage Science, Wellness Industry</p>	4	<p>1. Debiprasad Chattopadhyaya – <i>History of Science Philosophy and Culture (Vol. 2, Part I)</i></p> <p>2. Needham, Joshep, <i>History of Science and Technology in Ancient India</i> https://ia802909.us.archive.org/16/items/historyofscienceandtechnologyinancientindia/thebeginningsdebiprasadchattopadhyaya_57_k/History%20of%20Science%20And%20Technology%20In%20Ancient%20India%20The%20Beginnings%20Debi%20Prasad</p>	❖

					<p>%20Chattopadhyaya%20Firma%20K.L.%20Mukopadhyaya.pdf</p> <p>3. NPTL Course: https://nptel.ac.in/courses/101104065</p>	
	Town Planning and Architecture:	<ul style="list-style-type: none"> • Perspective of Arthaśāstra on town planning • Vāstu-śāstra – The science of architecture • Eight limbs of Vāstu • Town planning • Temples in India: marvelous stone architecture for eternity • Temple architecture in India • Iconography 	<p>International Academia: Architectural Anthropology, Urban Studies (Columbia GSAPP, UCL)</p> <p>AICTE-prescribed syllabus: Unit 8: Vāstu-śāstra, temple planning</p> <p>Industry Mapping: <i>Sustainable Architecture, Urban Design</i></p>		<p>1. <i>B. B. Puri – Vāstu Śāstra</i></p> <p>2. <i>Percy Brown – Indian Architecture</i> https://ia903201.us.archive.org/34/items/IndianArchitecture/IndianArchitecture.pdf</p>	❖
	Knowledge Framework and classifications:	<ul style="list-style-type: none"> • Indian scheme of knowledge • The knowledge triangle • Prameya – A vaiśeṣikan approach to physical reality • Dravyas – the constituents of the physical reality • Attributes – the properties of substances and Action 	<p>International Academia: Logic and Philosophy of Science (Carnegie Mellon, IITs)</p> <p>AICTE-prescribed syllabus: Unit 9: Nyāya-Vaiśeṣika, Pramāṇa, logic</p>	4	<p>1. <i>Subhash Kak – Nyaya-Vaisheshika</i></p> <p>2. <i>Daya Krishna – Indian Epistemology and Metaphysics</i></p> <p>3. <i>Prabhu, CSR, The Physics of Vaiśeṣika</i> https://ia803209.us.archive.org/19/items/the</p>	❖

		<p>– the driver of conjunction and disjunction</p> <ul style="list-style-type: none"> • Sāmānya, viśēṣa, samavāya • Pramāṇa – the means of valid knowledge • Saṃśaya – ambiguities in existing knowledge • Framework for establishing valid knowledge • Deductive or inductive logic framework • Potential fallacies in the reasoning process • Siddhānta: established tenets in a field of study 	<p>Industry Mapping: AI Ethics, Knowledge Systems, Decision Science</p>		<p>physicsofvaisheshika/The%20Physics%20of%20Vaisheshika_text.pdf</p>	
	Linguistics	<ul style="list-style-type: none"> • Introduction to Linguistics • Aṣṭādhyāyī • Phonetics • Word generation • Computational aspects • Mnemonics • Recursive operations • Rule based operations • Sentence formation • Verbs and prefixes • Role of Sanskrit in natural language processing 	<p>International Academia: Sanskrit Computational Linguistics (Heidelberg, Kyoto, IIT-H)</p> <p>AICTE-prescribed syllabus: Unit 10: Aṣṭādhyāyī, NLP and computation</p> <p>Industry Mapping: NLP, AI Language Tools, EdTech content systems</p>	4	<p>1. George Cardona, <i>Panini: His Work and Its Traditions</i></p> <p>2. NPTL Course: https://nptel.ac.in/courses/109106195</p>	❖

TEXT BOOKS:

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

REFERENCE BOOKS:

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

<https://india.mongabay.com/2022/05/fish-famine-livelihood-loss-because-of-upcoming-vizhinjam-port-say-fishers-of-south-kerala/>

16. Suraj A Pandit, “*Water Management System at Kanheri*”, Journal of the Asiatic Society of Mumbai, Vol 83, 2010 (27-45).

https://www.academia.edu/2624271/Water_Management_System_at_Kanheri

17. Shaikh, Ayesha U. “Made in India, Found in Egypt: Red Sea Textile Trade in the Thirteenth and Fourteenth Centuries.” In Heilbrunn Timeline of Art History. New York: The Metropolitan Museum of Art, 2000–. http://www.metmuseum.org/toah/hd/rstt/hd_rstt.htm (March 2023)

<https://www.metmuseum.org/essays/red-sea-textile-trade>

18. Indigenous Knowledge of using Medicinal Plants in Treating Skin deceases by Tribal's in Central Narmada Valley of Madhya Pradesh (India) By Dr Mahendra Singh choudhary

https://www.academia.edu/126472004/Indigenous_Knowledge_of_using_Medicinal_Plants_in_Treating_Skin_deceases_by_Tribals_in_Central_Narmada_Valley_of_Madhya_Pradesh_India

19. Diversity of freshwater fish in Narmada River, Madhya Pradesh by Shivani Pathak

https://www.academia.edu/111778970/Diversity_of_freshwater_fish_in_Narmada_River_Madhya_Pradesh