

Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

NBA Accredited, NAAC Accredited with A+ Grade, ISO 21001:2018



DEPARTMENT OF MECHANICAL ENGINEERING

Curriculum Structure and Syllabus of

F.Y. B. Tech. - Mechanical Engineering

(2026 Pattern)

(With effect from - Academic Year 2026 - 27)

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
 - To imbibe the research culture for addressing industry and societal needs.
 - To inculcate social attitude through community engagement initiatives.
 - To provide conducive environment for building the entrepreneurial skills.

DEPARTMENT OF MECHANICAL ENGINEERING

VISION:

To be recognized as center for quality education in the field of mechanical engineering, integrating top-tier teaching, innovative research, and fostering socially conscious and entrepreneurial engineers.

MISSION:

- M1:** To impart value-added education by creating an ambiance of academic excellence in teaching-learning processes.
- M2:** To inculcate research approach through innovation and skill development centers.
- M3:** To inculcate a strong sense of social responsibility and empathy among the students.
- M4:** To imbibe the entrepreneur skill amongst the students by strengthening Industry- Institute interaction.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- PEO1:** Mechanical Engineering graduates excel in solving industrial challenges, innovating for society, and leveraging core engineering principles for industry advancement.
- PEO2:** Graduates will apply technical expertise, leadership, and entrepreneurship, to establish ethical organizations to address societal needs and pursue higher studies.
- PEO3:** Graduates will work effectively as individuals and as team members with high ethical values and motivation for life-long learning for the benefit of society.

PROGRAM OUTCOMES (POs):

- PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).
- PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

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- PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOs):

- PSO1:** Identify, formulate and analyze real-life mechanical engineering problems by applying the principles of thermal, design, manufacturing, interdisciplinary and allied engineering.
- PSO2:** Select and apply appropriate materials, metallurgical processes, measurement techniques, feedback control systems, hydraulic and pneumatic control systems to develop appropriate solutions to mechanical engineering problems.
- PSO3:** Select and apply appropriate manufacturing technologies and tools, and develop competencies for working in manufacturing and allied industries.
- PSO4:** Apply acquired knowledge, skills, and hands-on experiences to work professionally in mechanical and related systems.

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LIST OF ABBREVIATIONS

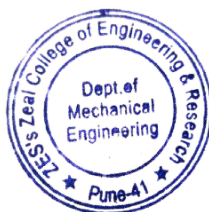
Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Program Core Course
PEC	Program Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TW	Term Work
OR	Oral
PR	Project

DEPARTMENT OF MECHANICAL ENGINEERING

First Year B. Tech. – Mechanical Engineering: Semester - I

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/ Tut	Total						
26MEBS101	BSC	Engineering Mathematics I	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEBS102	BSC	Engineering Physics	2	-	-	2	2	-	2	40	60	-	-	-	100
26MEBS102P	BSC	Engineering Physics Lab	-	2	-	2	-	1	1	-	-	-	-	25	25
26MEES101	ESC	Engineering Drawing and Drafting	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEES101P	ESC	Engineering Drawing and Drafting Lab	-	2	-	2	-	1	1	-	-	50	-	25	75
26MEES102	ESC	Fundamentals of Mechanical Engineering	2	-	-	2	2	-	2	40	60	-	-	-	100
26MEES102P	ESC	Fundamentals of Mechanical Engineering Lab	-	2	-	2	-	1	1	-	-	-	-	50	50
26MEVS101	VSEC	IT Proficiency	1	2	-	3	1	1	2	-	-	25	-	-	25
26MECC101	CC	Professional Development - I	1	2	-	3	1	1	2	-	-	50	-	-	50
26MECC102	CC	Liberal Learning - I	-	2	-	2	-	1	1	-	-	25	-	-	25
26MEIK101	HSSM-IKS	Indian Knowledge System & Financial Literacy	2	-	-	2	2	-	2	-	-	50	-	-	50
Total			14	12	-	26	14	6	20	160	240	200	-	100	700


BoS Chairman




Director
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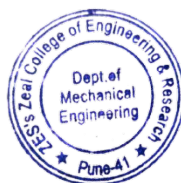
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*** Liberal Learning – I: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	26MECC102A	Guitar	6.	26MECC102F	Basketball
2.	26MECC102B	Singing	7.	26MECC102G	Cricket
3.	26MECC102C	Cinematography	8.	26MECC102H	Rifle and Pistol Shooting
4.	26MECC102D	Dance	9.	26MECC102I	Volleyball
5.	26MECC102E	Synthesizer	10.	26MECC102J	Football



BoS Chairman



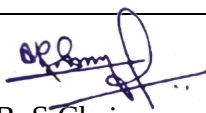

Director

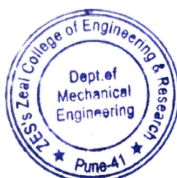
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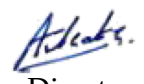
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First Year B. Tech. – Mechanical Engineering: Semester - II

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/ Tut	Total						
26MEBS203	BSC	Engineering Mathematics II	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEBS204	BSC	Engineering Chemistry	2	-	-	2	2	-	2	40	60	-	-	-	100
26MEBS204P	BSC	Engineering Chemistry Lab	-	2	-	2	-	1	1	-	-	-	-	25	25
26MEES203	ESC	Engineering Mechanics	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEES204	ESC	Fundamentals of Electrical and Electronics Engineering	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEES204P	ESC	Fundamentals of Electrical and Electronics Engineering Lab	-	2	-	2	-	1	1	-	-	-	-	25	25
26MEPC201	PCC	Manufacturing Technology - I	3	-	-	3	3	-	3	40	60	-	-	-	100
26MEVS202	VSEC	Computer Aided Engineering Drawing Lab	-	2	-	2	-	1	1	-	-	-	50	-	50
26MEVS203	VSEC	Basic Manufacturing Lab	-	2	-	2	-	1	1	-	-	25	-	-	25
26MECC203	CC	Professional Development - II	1	2	-	3	1	1	2	-	-	25	-	-	25
26MECC204	CC	Liberal Learning - II	-	2	-	2	-	1	1	-	-	25	-	-	25
26MEVS204	VSEC	Python & Generative AI Lab	-	2	-	2	-	1	1	-	-	-	25	-	25
Total			15	14	0	29	15	7	22	200	300	75	75	50	700


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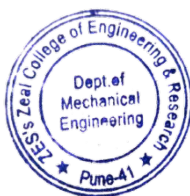

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* Liberal Learning – II: Choose any one from the following:

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	26MECC204A	Guitar	6.	26MECC204F	Basketball
2.	26MECC204B	Singing	7.	26MECC204G	Cricket
3.	26MECC204C	Cinematography	8.	26MECC204H	Rifle and Pistol Shooting
4.	26MECC204D	Dance	9.	26MECC204I	Volleyball
5.	26MECC204E	Synthesizer	10.	26MECC204J	Football


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First Year B. Tech.: Semester - I			
1	26MEBS101	Engineering Mathematics I	
2	26MEBS102	Engineering Physics	
3	26MEBS102P	Engineering Physics Lab	
4	26MEES101	Engineering Drawing and Drafting	
5	26MEES101P	Engineering Drawing and Drafting Lab	
6	26MEES102	Fundamentals of Mechanical Engineering	
7	26MEES102P	Fundamentals of Mechanical Engineering Lab	
8	26MEVS101	IT Proficiency	
9	26MECC101	Professional Development - I	
10	26MECC102	Liberal Learning - I	
11	26MEIK101	Indian Knowledge System & Financial Literacy	
First Year B. Tech.: Semester – II			
12	26MEBS203	Engineering Mathematics II	
13	26MEBS204	Engineering Chemistry	
14	26MEBS204P	Engineering Chemistry Lab	
15	26MEES203	Engineering Mechanics	
16	26MEES204	Fundamentals of Electrical and Electronics Engineering	
17	26MEES204P	Fundamentals of Electrical and Electronics Engineering Lab	
18	26MEPC201	Manufacturing Technology - I	
19	26MEVS202	Computer Aided Engineering Drawing	
20	26MEVS203	Basic Manufacturing Laboratory	
21	26MECC203	Professional Development - II	
22	26MECC204	Liberal Learning - II	
23	26MEVS204	Python & Generative AI Lab	

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS
SEMESTER - I

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Mathematics - I							Code: 26MEBS101		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic concept of Differentiation, Integration, Maxima and Minima, Matrices and Determinants.									
Course Objectives:									
1. To acquaint the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.									
2. To acquire techniques of the expansion of functions about any point and to evaluate the indeterminate forms of limits.									
3. To make students familiar with multivariable differentiation and its applications.									
4. To introduce to student awareness of concept of Fourier series.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Use of matrix method for solving system of simultaneous linear equations.								
CO2	Find Eigen values and Eigen vectors of the matrix.								
CO3	Describe the power series expansion of a given function and evaluate limits.								
CO4	Understand the basic concepts of partial derivatives.								
CO5	Evaluate partial derivatives to estimate maxima and minima of function of multiple variables.								
CO6	Determine the Fourier series representation and harmonic analysis for design.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	System of Linear Equations: Rank of a matrix, System of linear equations, Linear dependence and independence of vectors, Linear and orthogonal transformations, Application to problems in engineering.								7
2.	Eigen Values and Eigen Vectors, Diagonalization: Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix, Reduction of quadratic forms to canonical form by linear and orthogonal transformations.								7
3.	Differential Calculus: Rolle's theorem, Mean value theorems, Taylor's series and Maclaurin's series, Expansion of functions using standard expansions, Indeterminate forms.								7
4.	Partial Differentiation: Partial derivatives of first and higher orders, Euler's theorem on homogeneous functions, Partial derivative of composite functions, Total derivative and Implicit differentiation								7

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5.	Applications of Partial Differentiation: Jacobians and their applications, Errors and Approximations. Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	7
6.	Fourier Series: Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis.	7
TOTAL		42
Text Books:		
1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication 3. Howard Anton & Chris Rorres, "Elementary Linear Algebra", John Wiley & sons. 4. Seymour Lipschutz, Marc Lipson, "Schaum's outlines of Linear Algebra", 6th edition McGraw-Hill Education (India) Private Limited, New Delhi.		
Reference Books:		
1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd. 2. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education. 3. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning. 4. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Vol. I & Vol. II)", Vidyarthi Griha Prakashan, Pune. 5. Ron Larson and David C. Falvo, "Elementary Linear Algebra", Houghton Mifflin Harcourt Publishing Company		
E-Resources:		
1. A NPTEL Course on "Engineering Mathematics-I" IIT Khargpur - https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5 2. Paathshala Pandit, "Rank of Matrix Vector Space Engineering Mathematics" - https://www.youtube.com/watch?v=jHU3yasfpKw&list=PLU4tRlorU5wWPpemhfdG0Yc4zNiICSMVO&index=1 3. Eigenvalues and Eigenvectors Properties and Important Result Matrices- https://www.youtube.com/watch?v=1wjXVdwzgX8 4. Taylor Series Numericals Maths 1 B.Tech 1st year Engineering BSc - https://www.youtube.com/watch?v=0bHky1ocA1Y 5. Partial Differentiation Example And Solution Multivariable Calculus - https://www.youtube.com/watch?v=eTp5wq-cSXY&list=PLU6SqdyYcYsfLuIJdHwY92aGBg5-uRHBOb&index=1		

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Physics							Code: 26MEBS102		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100
Prerequisites:									
Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.									
Course Objectives:									
1. To make the students understand and study the basic principles of Physics. 2. To provide firm grounding to the students in the concept of physics to resolve many engineering and technological problems. 3. To impart the knowledge of the fundamentals of physics to the students through hands on experiments and extend it to relevant engineering applications.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain basics of interference and polarization connected to engineering applications.								
CO2	Make use of Laser technology and Optical fiber in various disciplines.								
CO3	Outline the fundamentals of Quantum Physics and relate it to engineering applications.								
CO4	Apply basics of semiconductors for solving the engineering problems.								
CO5	Extend the understanding of Ultrasonic and NDT in engineering.								
CO6	Interpret the use of nanoparticles and superconductors in the field of engineering.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Wave Optics: Units and its Conversion -Length, Mass, Velocity, Acceleration Momentum, Time, Temperature, Wavelength, Energy, Current, Voltage, Power, Intensity, Amplitude, Frequency, Pressure, Resistance, compressibility, resistivity, conductivity, Mobility, Angle. Interference - Interference in thin film of uniform thickness and its conditions (Simple Numerical), Engineering Applications – Ant-Reflection coating (ARC). Polarization - Polarization and its types, Malus law and Brewster’s law (Simple numerical), Double refraction, Huygens’s theory of double refraction, Differentiate between positive & negative crystal, Engineering applications of polarization: Liquid Crystal Display (LCD).								5

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2.	Laser and Optical Fiber: Laser- Basic Principles of laser, Elements of Laser, Characteristics of laser, He-Ne laser (Gas laser), Applications of laser – Medical, Industrial and Holography- Recording. Optical fibres- Propagation of light - Acceptance angle, Acceptance cone, Numerical aperture, Fractional Refractive Index Change (Simple numerical). Types of optical fibres, Advantages of optical fibre communication, Applications of optical fibre in Medical, Communication, Entertainment, Data Security.	5
3.	Quantum Physics: De-Broglie hypothesis of matter waves, de-Broglie wavelength for a particle accelerated by Kinetic Energy (K.E) and a charged particle accelerated by Potential difference (PD) “V”, (Simple Numerical), Properties of matter waves, Heisenberg’s uncertainty principle for wide wave packet and narrow wave packet (Simple Numerical), Tunneling Effect, Engineering applications - Scanning Tunneling Microscope (STM), Introduction to Quantum Computing.	4
4.	Semiconductor Physics: Classification of solids on the basis of band theory, Fermi level for metal and semiconductor, Position of Fermi level in extrinsic semiconductors (only diagram), Solar cell: principle, working, IV-characteristics, Efficiency and fill factor, Factor to improve efficiency of solar cell, Application, advantages and disadvantages of solar cell, Hall effect: derivation for Hall voltage and Hall coefficient (Simple numerical).	5
5.	Ultrasonic and Non-destructive Testing: Ultrasonic- Properties of ultrasonic waves, Piezoelectric effect and inverse of piezoelectric effect, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor), Compressibility of liquid by using ultrasonic waves (Simple Numerical). Non- Destructive Testing (NDT): Definition and its objectives, Difference between destructive testing and non-destructive testing, Application of NDT as an Ultrasonic flaw detection technique (Simple numerical), Advantages of NDT.	4
6.	Nanophysics and Superconductivity: Nanophysics- Introduction of nanophysics, Properties of nanoparticles (Optical, Electrical, Mechanical), Applications of nanomaterials in Electronics, Automobile, Medical. Superconductivity- Definition of superconductivity on the basis of temperature dependence of resistivity, Properties of Superconductors, Meissner effect, Critical magnetic field (Simple Numerical), Type I and Type II Superconductors, Engineering applications of superconductivity in Superconducting Quantum Interface Device (SQUID) with its principle, working, general application of superconductors - Power Transmission, electronics, medical, principle of Maglev train.	5
TOTAL		28

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Text Books:

1. M. N. Avadhanulu and P.G. Kshirsagar, “Engineering Physics”, S. Chand Publications.
2. S. O. Pillai, “Solid State Physics”, New Age International Publications.
3. J. J. Sakurai, “Modern Quantum Mechanics”, Pearson Publication.
4. V K Mehta and Rohit Mehta, “Basic Electrical Engineering”, S Chand Publications.
5. Robert L. Jaffe and Washington Talyer, “The Physics of Energy”, Cambridge University Press”.

Reference Books:

1. H. D. Young and R. A. Freedman, “University Physics”, Pearson Publication.
2. Resnick and Halliday, “Principles of Physics”, John Wiley and Sons.
3. Jenkins and White, “Optics”, Tata McGraw Hill.
4. Noson S. Yanofsky and Mirco A. Mannucci, “Quantum computing for computer scientists”, Cambridge University Press

E-Resources:

1. NPTEL Course:

- a) NPTEL lecture based on interference of polarized light by IIT Roorkee - https://youtu.be/e-4QK_JVsdU?si=gWIBt41dDgeABO8Y
- b) NPTEL lecture based on Introduction of Polarization by IIT Roorkee- <https://youtu.be/fIVlZKB4bBQ?si=meWFP5matsopCABi>
- c) NPTEL lecture based on Malus Law by IIT Roorkee <https://youtu.be/iFG82I3nFA0?si=JClN6fJqGNw6ix5U>
- d) NPTEL lecture based on Double Refraction by IIT Roorkee <https://youtu.be/Pt5wvYyguq0?si=4mowxORZQXGXNxmW>
- e) NPTEL lecture based on Semiconductor Physics by IIT Roorkee - <https://youtu.be/q7VIITSysMs?si=62lAMoJ2tMHKRiDH>
- f) NPTEL lecture based on Introduction to superconductivity <https://youtu.be/hGPA1g8fKug?si=FdYfJju6bf6u2zRe>
- g) NPTEL lecture based on Meissner Effect- <https://youtu.be/EkNnxBakJMs?si=qRnSvPID2NTe4rf->

2. Feynman lecture series: <https://www.feynmanlectures.caltech.edu/>

3. Concepts of Modern Physics, Arthur Beiser: -

https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf

4. Lectures by Walter Lewin: <https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw>

5. Quantum Mechanics Lecture Series by Prof. H.C.Verma -

https://www.youtube.com/watch?v=JFWuAQRZPjQ&list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At

6. Virtual Labs, Amrita University- <https://vlab.amrita.edu/?sub=1&brch=195>

7. Virtual Labs, IIT Kanpur- <https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html>

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Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Physics Lab							Code: 26MEBS102P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.									
Course Objectives:									
1. To provide hands-on experience in fundamental optical phenomena such as interference, diffraction, polarization, and double refraction. 2. To develop experimental skills in determining optical constants like wavelength, refractive index, radius of curvature, and numerical aperture.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply the principles of interference and diffraction to determine optical parameters such as wavelength, radius of curvature, and grating characteristics.								
CO2	Demonstrate experimental skills in precise measurement, data analysis, error estimation, and scientific interpretation of results.								
List of Experiments:									
Perform any 08 experiment out of 12:									
1. Experiment based on Newton’s rings (determination of wavelength of monochromatic light, determine radius of curvature of Plano-convex lens). 2. Experiment based on polarization (To verify Law of Malus). 3. Determination of refractive index using Brewster’s law. 4. Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal). 5. Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface). 6. Determination of Planck’s constant using available experimental setup. 7. To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency). 8. To determine Hall coefficient and charge carrier density. 9. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer. 10. An experiment based on optical fiber. (To determine the numerical aperture acceptance angel acceptance cone of optical fiber of laser diode. 11. Experiment based on semiconductor (To determine the temperature dependence characteristics of semiconductor). 12. To determine the unknown wavelength by using plane diffraction grating.									
Reference Books:									
1. H. D. Young and R. A. Freedman, “University Physics”, Pearson Publication. 2. Resnick and Halliday, “Principles of Physics”, John Wiley and Sons.									

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|---|
| <ol style="list-style-type: none">3. Jenkins and White, “Optics”, Tata McGraw Hill.4. Noson S. Yanofsky and Mirco A. Mannucci, “Quantum computing for computer scientists”, Cambridge University Press |
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Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Drawing and Drafting							Code: 26MEES101		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Shapes, Mathematics, Geometry and geometry construction, skills for handling drawing instruments.									
Course Objectives:									
1. To make students grasp engineering drawing basics for effective communication. 2. To guide students through accurately applying orthographic projection to depict points, lines, planes, and solids. 3. To educate students isometric projections for solids accurately in engineering contexts. 4. To empower students Create and interpret engineering drawings with precision, including sheet layout and fundamental constructions.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand fundamentals of engineering drawing, projection methods, and projection of points, lines, and planes.								
CO2	Develop skills for projection of standard solids inclined to reference planes, as per first angle method of projection.								
CO3	Apply orthographic projection principles, first and third angle methods, creating sectional orthographic views.								
CO4	Generate isometric views from orthographic views.								
CO5	Construct engineering curves, develop lateral surfaces, and understand their industrial applications.								
CO6	Gain skills in freehand sketching of mechanical components, representing threads, studs, and rivets accurately.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Fundamentals of Engineering Drawing: Need of engineering drawing and design, Sheet layout, Line types, dimension and simple geometrical constructions, Methods of projection (first and third angle method), Projection of points in four quadrants, Projection of oblique line using first angle projection method, Introduction to projection of planes.								8
2.	Projections of Solids: Projections of solids inclined to one reference plane, inclined to both the reference planes, Projections of cube, right regular prisms, right regular pyramids, right circular cylinder, right circular cone.								7
3.	Orthographic Projections: Reference planes, types of orthographic projections – First angle projections, Third								7

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	angle projections, methods of obtaining orthographic views by First angle method, Hidden features, curved features, circular features, Sectional orthographic projections – full section	
4.	Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, construction of Isometric view from given orthographic views, Isometric view of a Plane and Cylindrical surfaces	7
5.	Engineering Curves: Introduction to conic sections and its significance, various methods to construct the conic sections. Development of Lateral Surfaces: Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, cylinder, pyramid and prism.	7
6.	Free Hand Sketches of Mechanical Component: Conventional representation of external and internal threads; Types of studs – Plain stud, Square-neck stud, Collar stud; Types of rivets – Snap head, Flat head, Pan head (without tapered neck), Counter Sunk Flat head.	6
TOTAL		42

Text Books:

1. Bhatt, N. D. and Panchal, V. M., “Engineering Drawing”, Charotar Publication, Anand.
2. K. Venugopal, K., “Engineering and Graphics”, New Age International, New Delhi.
3. Jolhe, D. A., “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill.

Reference Books:

1. C. M. Agawal, Basant Agrawal; Engineering Drawing; 2nd edition, Tata McGraw Hill.
2. Bhatt, N. D., “Machine Drawing”, Chartor Publishing house, Anand, India.
3. K. L. Narayana & P. Kannaiah, “Text Book on Engineering Drawing”, Scitech Publications, Chennai.
4. Dhawan, R. K., “A Textbook Of Engineering Drawing”, S. Chand, New Delhi
5. Warren Luzzader, “Fundamentals of Engineering Drawing”, Prentice Hall of India, New Delhi.

E-Resources:

1. Prof. P.S. Robi, IIT Guwahati NPTEL Course “Engineering Drawing”,
Link – <https://nptel.ac.in/courses/112103019>
2. RajaramLakkaraju, IIT Kharagpur, NPTEL Course “Engineering Drawing & Computer Graphics”, Link – <https://archive.nptel.ac.in/courses/112/105/112105294/>
3. Prof. Naresh Varma Datla, Prof. S. R. Kale , IIT Delhi, NPTEL Course “Engineering Graphics and Design”,
Link - https://onlinecourses.nptel.ac.in/noc21_me128/preview
4. Prof. Avalokita Agrawal, IIT, Roorkee, NPTEL Course, “Engineering/Architectural Graphics Part-1 and 2”, Link-

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https://www.youtube.com/watch?v=VrU73lwRyc4&list=PLLy_2iUCG87Bw9XPfEF3r3EW5UIAOv8iz

5. Prof. Anupam saxena, IIT Kanpur, NPTEL Course, “Mechanical Engineering Drawing”,
Link-

<https://www.youtube.com/watch?v=ZIZyQbCX30E&list=PLbMVogVj5nJRgBjyxu0PfH3UcdqmDo4o>

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Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Drawing and Drafting Lab							Code: 26MEES101P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	50	75	-	75
Prerequisites:									
Shapes, Mathematics, Geometry and geometry construction, skills for handling drawing instruments.									
Course Objectives:									
1. To introduce students to fundamental principles of engineering drawing and drafting. 2. To develop students' spatial visualization and graphical representation skills. 3. To enhance students' problem-solving and engineering decision-making abilities.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Identify and select suitable methods for representing basic engineering objects.								
CO2	Interpret 2D/3D objects and select appropriate orthographic and isometric views.								
CO3	Apply basic drafting skills to solve graphical problems and make suitable engineering decisions.								
List of Assignments:									
1. Projection of lines (3 to 5 problems) 2. Projection of solids (3 to 5 problems) 3. Drawing Orthographic views for given 3D view of the object (3 to 5 problems) 4. Drawing Isometric view for given 2 D view of the object (3 to 5 problems) 5. Engineering curves (2 to 4 problems) and Development of surfaces (2 to 4 problems) 6. Free hand sketches of mechanical components (5 to 8 components)									
Reference Books:									
1. C. M. Agawal, Basant Agrawal; Engineering Drawing; 2nd edition,Tata McGraw Hill. 2. Bhatt, N. D., "Machine Drawing", Chartor Publishing house, Anand, India. 3. K. L. Narayana & P. Kannaiah, "Text Book on Engineering Drawing", Scitech Publications, Chennai. 4. Dhawan, R. K., "A Textbook Of Engineering Drawing", S. Chand, New Delhi 5. Warren Luzzader, "Fundamentals of Engineering Drawing", Prentice Hall of India, New Delhi.									

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Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Fundamentals of Mechanical Engineering							Code: 26MEES102		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100
Prerequisites:									
Basic of Physics and Mathematics									
Course Objectives:									
1. To provide an overview of mechanical engineering to students and explore the potential areas of application for mechanical engineering.									
Course Outcomes: At the end of course the students will be able to -									
CO1	Illustrate the fundamentals of engineering mechanics and mechanisms, including units, dimensions, and the principles of statics, kinetics, and kinematics.								
CO2	Understand stress-strain relationships, the mechanical properties of materials, and the types and components of power transmission systems.								
CO3	Explain the fundamentals of thermodynamics and heat transfer.								
CO4	Understand fluid properties, classifications, and their applications in fluid machines and energy sources.								
CO5	Demonstrate knowledge of automotive systems, including the components and functions of both traditional and electric vehicles.								
CO6	Understand manufacturing processes and their applications in component production.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Engineering Mechanics and Mechanisms: Units and dimensions, dimensional analysis, Scalars and vectors quantity, concepts particles and rigid body, laws of motion, concept of Statics, Kinetics, and Kinematics. Introduction to machines and mechanisms, Link, pair, kinematic chain, types of joints.								5
2.	Mechanics of Materials and Power Transmission Systems: Introduction to Stress-strain curve, elastic constants, bending, torsion and deflection, Failure of Mechanical Components, Factor of safety, classification and important mechanical Properties of materials Power Transmission Systems- Introduction, Types, Components- Gears, Belts and Pulleys, Chains and Sprockets, shafts, axles, keys, couplings, clutch, brakes, bearings and flywheels.								5
3.	Thermodynamics and Heat Transfer: Basic Concepts, Laws of Thermodynamics, thermodynamic processes, heat engines, heat pumps, and refrigerators Introduction to Heat Transfer, Modes of heat transfer and laws governing conduction, convection, and radiation								5

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4.	Fluid Mechanics and Energy Resources: Fluid, Fluid properties, Introduction to fluid machines, Introduction to conventional and non-conventional energy sources, includes thermal, hydroelectric, solar, wind, nuclear, biomass power plants.	5
5.	Automotive Systems: Automobile types and their functions, Components, Engine Fundamentals, Transmission systems, Drivetrain Systems, Suspension Systems (telescopic), Steering Systems (Ackermann mechanism), Chassis Layout, Brake Systems and Safety Features (<i>only basic concepts</i>) EV Fundamentals, EV Powertrains, EV Charging Technologies, Energy Management	4
6.	Manufacturing: Introduction to Casting, Forming, Machining and Joining Processes. Introduction to advanced manufacturing process. Introduction to smart manufacturing.	4
TOTAL		28

Text Books:

1. Nag P. K., "Engineering Thermodynamics," Tata McGraw-Hill Publisher Co. Ltd.
2. Kirpal Singh, 'Automobile engineering', Thirteenth Edition, Standard Publishers, Delhi.
3. Rajput R.K., "Basic Mechanical Engineering", Laxmi Publications Pvt. Ltd.
4. S. S. Rattan, 'Theory of Machines', Fourth Edition, Tata McGraw-Hill.
5. S. Kalpakjian, "Manufacturing Engineering and Technology", Pearson (India) Ltd.

Reference Books:

1. Khan B. H., "Non-Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.
2. V Ganeshan, 'Internal Combustion Engines', Third Edition, Tata McGraw-Hill.
3. Anderson Curtis Darrel and Anderson Judy, "Electric and Hybrid Cars: A History", 2nd Ed., McFarland
4. Pravin Kumar, "Basic Mechanical Engineering, 2nd Ed.", Pearson (India) Ltd.
5. Agrawal Basant and Agrawal, C. M., "Basics of Mechanical Engineering", John Wiley and Sons, USA, 2008.
6. Surinder Kumar, "Basic of Mechanical Engineering", Ane Books Pvt. Ltd. New Delhi.

E-Resources:

1. Prof. V. Babu, IIT Madras, NPTEL Course "Engineering Thermodynamics",
Link - <https://archive.nptel.ac.in/courses/112/106/112106310/>
2. Prof. Ratna Kumar, IIT Madras, NPTEL Course "Basic of Material Engineering"
Link - <https://archive.nptel.ac.in/courses/112/106/112106293/>
3. Prof. Janakranjan Ramkumar, Prof. Amandeep Singh Oberoi, IIT Kanpur, NPTEL Course on
"Basics of Mechanical Engineering – 1"
Link- https://onlinecourses.nptel.ac.in/noc24_me104/

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Program: B. Tech. (Mechanical Engineering)						Semester: I			
Course: Fundamentals of Mechanical Engineering Lab						Code: 26MEES102P			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic of Physics and Mathematics									
Course Objectives:									
1. To introduce basic mechanical systems and manufacturing processes.									
2. To develop practical understanding through demonstrations and industrial visits.									
3. To enhance analytical and engineering decision-making skills.									
Course Outcomes: At the end of course the students will be able to -									
CO1	Identify suitable mechanical systems, mechanisms, and components for basic applications.								
CO2	Analyze basic mechanical systems based on their applications and performance.								
CO3	Evaluate mechanical technologies based on technical, economic, and practical considerations.								
List of Experiments:									
Any 8 experiment from the following									
1. Measurement of physical quantities, various units and their conversions.									
2. Demonstration of various joints, linkages and mechanisms with their applications.									
3. Demonstrate of Refrigeration and air conditioning system.									
4. Demonstration of power transmission devices.									
5. Demonstration of power plant.									
6. Demonstration of Automotive Systems									
7. Case study on Comparison of Conventional and Electric vehicles on the basis of technical parameters like cost, manufacturing, efficiency etc.									
8. Demonstration of manufacturing process									
9. Identify the real-world applications of mechanical engineering across various industries and fields.									
10. Visit to any mechanical Industry /Workshop / Showroom.									
Reference Books:									
1. Khan B. H., “Non-Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.									
2. V Ganeshan, ‘Internal Combustion Engines’, Third Edition,Tata McGraw-Hill.									
3. Anderson Curtis Darrel and Anderson Judy, “Electric and Hybrid Cars: A History”, 2 nd Ed., McFarland									
4. Pravin Kumar, “Basic Mechanical Engineering, 2 nd Ed.”, Pearson (India) Ltd.									
5. Agrawal Basant & Agrawal C. M., “Basics of Mechanical Engineering”, John Wiley& Sons									
6. Surinder Kumar, “Basic of Mechanical Engineering”, Ane Books Pvt. Ltd. New Delhi.									

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Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: IT Proficiency							Code: 26MEVS101		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
01	02	-	02	-	-	25	-	-	25
Prerequisites:									
Basic Computer Skills									
Course Objectives:									
1. To develop proficiency in essential office software and tools, including MS Word, MS Excel, MS PowerPoint, and LaTeX, to create, analyze, and present professional documents and data effectively, while understanding ethical internet use and leveraging AI tools.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Create and format professional documents using MS Word.								
CO2	Organize and analyze data using Excel’s features.								
CO3	Apply advanced Excel functions, pivot tables, charts, and macros to analyze and secure data.								
CO4	Create effective presentations using MS PowerPoint features.								
CO5	Create Professional Documents Using LaTeX.								
CO6	Apply ethical practices in using internet resources and AI tools.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Basics of Computer and MS Word: Awareness of computer Basics MS-Word: Text Basics, Text Formatting and saving file, Working with objects, Header & footers, Working with bullets and numbered lists, Tables, Styles and Content, Merging documents, Sharing and maintaining document, Proofing the document, Printing.								07
2.	MS-Excel: Introduction to Excel, Formatting excel work book, Perform calculations with functions, Sort and Filter data with Excel, Create effective 2D and 3D charts to Present data visually.								08
3.	Advance MS-Excel: Analyze data using pivot tables and pivot charts, Protecting and sharing the work book, Use Macros to automate tasks, Proofing and Printing, More useful functions in excel, Goal seek and scenario features, V-lookup and H-lookup functions, Advanced sort and filter in excel.								07
4.	MS-PowerPoint: Setting up PowerPoint environment, Creating slides and applying themes, Working with bullets and numbering, Working with objects, Hyperlinks and action buttons, Working with movies and sounds, Using SmartArt and Tables, Animation and slide								07

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	transition, Using slide master, Slide show option, Proofing and Printing.	
5	Introduction to Latex: Installation of the software LaTeX , Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables. Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments, Table of contents, Generating new commands, Figure handling, Numbering, List of figures, List of tables, Generating index. Packages - Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Classes: article, book, report, beamer, slides. IEEtran. Applications - Writing Resume, Writing articles/ research papers, project report.	07
6	Internet Ethics & AI tools: Working with Internet and-mail, Using the Internet, Internet Ethics and Safety, Social Media, AI Tools: Jasper, GitHub Copilot, Synthesia, Writesonic.	06
TOTAL		42

List of Experiments:

1. Create a collaborative document project where multiple users contribute to a document using MS Word's track changes and commenting features.
2. To analyze and visualize data effectively using Excel's functions and charts, aiming to create insightful and dynamic data visualizations.
3. Develop a financial modeling project using Excel, incorporating advanced functions like goal seek, scenario analysis, and pivot tables. Build automation using macros for repetitive tasks.
4. Create an interactive multimedia presentation on a complex topic of interest. Incorporate animations, transitions, embedded videos, and interactive elements like hyperlinks and action buttons.
5. Design and implement a digital marketing campaign for a fictitious product or service. Create email newsletters, social media posts, and analyze campaign performance metrics.
6. Prepare research article using Latex.

Text Books:

1. Banerjee Snigdha, “MS Word 2000”, New Age International.
2. Quentin Docter, Q., et al., "CompTIA IT Fundamentals Study Guide: Exam FC0-U61", Wiley, USA.
3. Lambert, J., Frye, C., et al., "Microsoft Office 2019 Step by Step", Microsoft Press, USA.

Reference Books:

1. Walkenbach John, “Excel 2013 Bible”, Wiley Publishing House.
2. Wempen Faithe, “Microsoft PowerPoint 2010 Bible”, Wiley Publishing House.
3. Miller, M., "Internet Basics Absolute Beginner's Guide", Que Publishing, USA.
4. Miller, M., "Computer Basics Absolute Beginner's Guide", Que Publishing, USA.

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E-Resources:

1. Microsoft Office Support provides tutorials and guides for MS Office applications.
<https://support.microsoft.com/en-us/training>
2. Digital Skilling by NPTEL - <https://elearn.nptel.ac.in/shop/nptel/digital-skilling/?v=c86ee0d9d7ed>

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Program: B. Tech. (Mechanical Engineering)						Semester: I			
Course: Professional Development – I						Code: 26MECC101			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
01	02	-	02	-	-	50	-	-	50
Course Objectives:									
1. To introduce students on professional development skills and its importance in building personal and professional life.									
2. To inculcate soft skills like goal setting, time management, emotional intelligence, leadership etc required in today’s professional environment.									
3. To make students aware of employability skills like workplace communication, correspondence at work, team work and workplace etiquette to imbibe better employability maturity.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Know their own values, significance of discipline, self-grooming applied effectively in career, personal life, at workplace, society and professional world.								
CO2	Understand the importance of necessity of various soft skills required in today’s professional workplace environment for better growth and leadership perspective.								
CO3	Aware of significance of emotional intelligence at workplace and tapping leadership opportunities at engineering and technological organizations.								
Course Contents:									
Unit	Description							Duration (Hrs.)	
1.	Values: Types of Values, Internal and External Stakeholders, SWOT analysis Self-discipline: Self-discipline impact in your life and society, Techniques to build self-discipline, Self-review and actions. Self-Grooming: Meaning and significance of self-grooming at personal, organizations, social and professional Level.							14	
2.	Soft Skills basics (Personal orientation): Soft Skills and hard skills, soft skills cultivation techniques. Attitude: positive self-talk, self-esteem, adaptability Goal Setting: SMART goals, guidelines for goal setting types of goals, goals at workplace, cascading goals Time Management: Prioritization, time stressors, time stealers time management matrix productivity pyramid							14	
3.	Soft Skills Advanced (Professional and Social orientation) Emotional Intelligence: enhancing your emotional awareness, change and stress, crisis management Leadership: Leadership and assertiveness, problem solving and brain storming, leader attributes, types of leaders, leader features in a professional environment Social Consciousness.: Social awareness and civic responsibility, social							14	

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	intelligence, social inclusion, social entrepreneurship sustainable development and conversation of resources	
TOTAL		42
Text Books:		
1. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals" 2. Sabina Pillai, Agna Fernandez, "Soft Skills and Employability Skills" Cambridge Press 3. Sanjay Kumar & Pushpa Latta, communication skills "Oxford higher education 4. Minakshi Raman & Sangita Sharma, "Technical Communication, Principal & Practices", Oxfords Press.		
Reference Books:		
1. Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989. 2. Jack Canfield, "The Success Principles", HarperCollins, 2005. 3. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952.		
E-Resources:		
1. Coursera: "The Science of Well-Being" by Yale University, - https://www.coursera.org/learn/the-science-of-well-being 2. Udemy: "Self-Care: Take Care of Yourself to Better Take Care of Others" by Jessica Rogers https://www.udemy.com/course/caring-self/?couponCode=UPGRADE02223		

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**LIBERAL LEARNING
COURSES - I**

**(Select any one course from the given Liberal
Learning Courses)**

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Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Guitar)							Code: 26MECC102A		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To build a strong foundation in Indian classical dance through mastering basic technique rhythms, expressions, and repertoire, culminating in a performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Illustrate the fundamental aspects of Guitar instrument.								
CO2	Demonstrate the performance of Guitar Instrument.								
CO3	Apply different types Chords.								
CO4	Apply basic outline through various prescribed ragas practically.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to the Guitar								2
2.	Understanding standard tuning								2
3.	Introduction to tablature and note reading								2
4.	Introduction to basic music theory concepts								2
5.	Understanding scale, intervals, and chords								2
6.	Learning more open chords: D major, D minor, C major, G major								2
7.	Understanding power chords and their shapes								2
8.	Understanding barre chord shapes: F major, B minor								2
9.	Finding Chords by Ear								2
10.	Chord Progressions								2
11.	Advanced Chord Types								2
12.	Transposing Chord								2
13.	Review and Practice								2
14.	Introduction to Scales								2
TOTAL								28	
Text Books:									
1. David Hodge, “Guitar Theory”, DK Publishing.									
Reference Books:									
1. Russ Shipton, “The Complete Guitar Player”, Published by Wise.									
2. Vincent Ong, Alfred Khp,” Classical Guitar Advanced Studies Repertoires”, Dynamic Publication.									
E-Resources:									
1. https://www.youtube.com/watch?v=BBz-Jyr23M4									

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Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Singing)							Code: 26MECC102B		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To offer students’ knowledge of the basic concepts of Singing in a very easy to understand manner with their practical applicability.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Illustrate the fundamental aspects of Singing.								
CO2	Demonstrate the performance of Singing.								
CO3	Apply basic outline through various prescribed ragas practically.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Voice Culture in Indian Semi Classical Singing.								2
2.	Basics of Singing o Introduction to semi classical singing.								2
3.	Basics of Indian Semi Classical Music.								2
4.	Learning Basic Ragas.								2
5.	Music Theory Basics.								2
6.	Vocal Warm-ups.								2
7.	Introduction to Ear Training.								2
8.	Breathe Control.								2
9.	Resonance and Tone Production.								2
10.	Diction and Articulation.								2
11.	Dynamics and Expression.								2
12.	Introduction to Repertoire.								2
13.	Practice Techniques.								2
14.	Interpretation and Expression.								2
TOTAL								28	
Text Books:									
1. Dr. Theodore Dimon, “Anatomy of the Voice, This Is a Voice”.									
Reference Books:									
1. Richard Miller, “The Structure of Singing”, Schirmer Books, London.									
2. Jennifer Hamady, “The Art of Singing”, Published by Hal Leonard.									
E-Resources:									
1. https://www.youtube.com/watch?v=4hNq9qykOyE									
2. https://www.youtube.com/watch?v=b14gkmECz-Y									

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Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Cinematography)							Code: 26MECC102C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.									
Course Objectives:									
1. To make students effectively use their camera's components, study fundamental photography techniques and apply basic to advanced editing skills.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Illustrate the fundamental aspects of camera equipment.								
CO2	Demonstrate the performance of camera equipment								
CO3	Ability to translate creative concepts into visually engaging and coherent film or video projects.								
CO4	Mastery in crafting compelling visual narratives through camera angles, lighting, and composition								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Photography								2
2.	Understanding camera components (lens, shutter, sensor)								2
3.	Exposure Triangle								2
4.	Introduction to the rule of thirds, leading lines, and framing								2
5.	Understanding autofocus vs. manual focus								2
6.	Introduction to natural and artificial lighting								2
7.	White Balance and Color Theory								2
8.	Motion and Long Exposure								2
9.	Basics of portrait photography								2
10.	Basics of landscape photography								2
11.	Overview of post-processing software (e.g., Adobe Light room, Photoshop)								2
12.	Introduction to advanced editing tools								2
13.	Organizing and Storing Photos								2
14.	Final Project Presentation and Review								2
TOTAL								28	
Text Books:									
1. Tania Hoser, “Introduction to Cinematography”, Taylor & Francis.									
Reference Books:									
1. Anat Pick, “Screening Nature”, Berghahn Books.									
2. Blain Brown, “Cinematography: Theory and Practice”, Taylor & Francis.									
E-Resources:									
1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRBxK0m									
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU									

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)						Semester: I			
Course: Liberal Learning – I (Dance)						Code: 26MECC102D			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand the fundamental postures, hand gestures and basic steps of Indian classical dance.								
CO2	Understand and perform dance sequences to various rhythmic cycles (Tala) with confidence.								
CO3	Convey emotions and stories through facial expressions (Abhinaya) and body language.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Overview of Indian Classical Dance								2
2.	Fundamental Postures and Hand Gestures (Hasta Mudras)								2
3.	Introduction to Basic Steps (Adavus or Tatkars)								2
4.	Rhythmic Patterns and Clapping (Tala)								2
5.	Advanced Basic Steps								2
6.	Strength and Conditioning								2
7.	Introduction to Basic Expressions (Abhinaya)								2
8.	Integrating Steps and Expressions								2
9.	Intermediate Rhythmic Patterns								2
10.	Improvisation and Creative Movement								2
11.	Introduction to Advanced Movements								2
12.	Review and Feedback								2
13.	Learning a Simple Dance Piece - Part 1								2
14.	Learning a Simple Dance Piece - Part 2								2
TOTAL								28	
Text Books:									
1. Padma Subrahmanyam, “Indian Classical Dance: A Beginner’s Manual”, Abhinav Publications.									
Reference Books:									
1. Dr. Aditi Sriram, “Indian Classical Dance: A Guide”, Vikas Publishing House.									
E-Resources:									
1. https://youtu.be/5apCTHzvkWI?si=p11CR_4XxPocTbjO									
2. https://youtu.be/OIKOHzePJCA?si=7pnPZKuvfT5EIWhf									

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Synthesizer/Keyboard)							Code: 26MECC102E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To offer students’ knowledge of the basic concepts of playing Keyboard in a very easy to understand manner with their practical applicability.									
Course Outcomes:									
CO1	Illustrate the fundamental aspects of Keyboard instrument.								
CO2	Demonstrate the performance of Keyboard Instrument.								
CO3	Apply different types of Chords.								
CO4	Apply basic outline through various prescribed ragas practically.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to the Keyboard								2
2.	Understanding Notes and Keys								2
3.	Basic Music Theory								2
4.	Introduction to the C major scale								2
5.	Learning to play simple melodies in C major								2
6.	Introduction to Chords								2
7.	Combining Melodies and Chords								2
8.	Review and practice melodies and chords								2
9.	Introduction to Minor Scales								2
10.	Introduction to additional chords (D major, E minor)								2
11.	Understanding chord progressions (e.g., I-IV-V)								2
12.	Review scales, chords, and progressions								2
13.	Introduction to Arpeggios								2
14.	Dynamics and Expression								2
TOTAL								28	
Text Books:									
1. Chuan C. Chang, “Fundamentals of Piano Practice”, Create space Independent Publishing Platform.									
Reference Books:									
1. Michael Rodman, “Keyboard for the Absolute Beginners”, Alfred Publishing.									
2. Davis Dorrough, “Piano Scales”.									
E-Resources:									
1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH									
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb									

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)						Semester: I			
Course: Liberal Learning – I (Basketball)						Code: 26MECC102F			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop foundational basketball skills, including dribbling, passing, shooting, and defense, while understanding game rules and strategies through practical gameplay and scrimmage.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.								
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.								
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	History & Introduction to Basketball: History & introduction to the game, equipment, safety. Understand the basic rules.								2
2.	Terminology & Dimensions: Terms used in basketball and measurements of the court.								2
3.	Warmup & Cooldown: Basics of warmup & cooldown for preventing stiffness and injury and speedy recovery.								2
4.	Player Stance & Ball Holding: Learn the ready position and correct way to hold the basketball. Demonstrate proper stance and secure ball control.								2
5.	Passing & Receiving (Chest): Practice accurate chest passing and receiving techniques. Perform chest pass with proper technique and accuracy.								2
6.	Passing & Receiving (Bounce): Learn bounce passing and receiving while stationary. Execute bounce passes confidently.								2
7.	Assessment – I								2
8.	Dribbling (Stationary): Practice basic dribbling using both hands. Control the basketball while stationary.								2
9.	Dribbling (Movement-Walk/Jog/Run): Develop dribbling while walking and changing direction maintain ball control while moving.								2
10.	Shooting (Technique & Set Shot): Learn the basic shooting technique. Perform a set shot with correct body mechanics.								2
11.	Shooting (Lay-Up): Practice right- and left-hand lay-up technique. Execute basic lay-up shots effectively.								2
12.	Rebounding: Learn positioning and timing for offensive and defensive rebounds. Demonstrate correct rebounding technique.								2
13.	Individual Defense: Practice defensive stance and movement. Apply basic								2

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	individual defensive skills.	
14.	Assessment – II	2
TOTAL		28
Text Books:		
1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications.		
Reference Books:		
1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan.		
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher.		
E-Resources:		
1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406		

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Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Cricket)							Code: 26MECC102G		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance cricket skills from basics to advanced techniques, focusing on tactics, fitness, and specialized fielding and wicket keeping through targeted practice and match simulations.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Master fundamental and advanced cricket techniques, including batting, bowling, and specialized fielding and wicket keeping.								
CO2	Demonstrate an understanding of game scenarios and tactical strategies, applying them effectively during match simulations and pressure situations.								
CO3	Improve physical fitness, strength, and conditioning, with targeted skill enhancement and mid season assessments to track progress.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Cricket, History & Evolution: Understand the Origin, Formats, and Growth of Cricket								2
2.	Laws of Cricket & Spirit of the Game: Learn MCC Laws and Fair Play								2
3.	Cricket Ground, Pitch & Equipment: Identify Dimensions and Equipment								2
4.	Warm-Up, Stretching & Physical Fitness: Develop basic fitness routines								2
5.	Grip, Stance & Ready Position: Learn Correct Batting Fundamentals								2
6.	Front Foot/ Back Foot Batting Techniques: Practice defensive and attacking strokes/ execute pull, cut, and back-foot defence								2
7.	Assessment - I								2
8.	Bowling Grip & Run-Up: Learn bowling basics								2
9.	Pace Bowling Fundamentals: Develop seam and swing basics								2
10.	Spin Bowling Fundamentals: Learn finger and wrist spin techniques								2
11.	Fielding Basics: Catching, throwing, and ground fielding								2
12.	Wicket keeping Fundamentals: Basic stance, catching, and footwork								2
13.	Mini Match Practice: Apply learned skills								2
14.	Assessment - II								2
TOTAL								28	
Text Books:									
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan									
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press									

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Reference Books:
1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India
E-Resources:
1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Rifle and Pistol Shooting)							Code: 26MECC102H		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop fundamental skills in rifle and pistol shooting through technical knowledge, practical drills, and mental preparation for competitive performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Master fundamental shooting techniques for both rifle and pistol, including aiming, breathing, and triggering.								
CO2	Develop strong mental focus and relaxation techniques essential for high-performance shooting and competition readiness.								
CO3	Gain hands-on experience in live shooting drills and positional shooting, preparing them for competitive shooting scenarios.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Shooting Sports and Course Orientation: History of shooting, information about guns.								2
2.	Safety Rules, Range Etiquette and ISSF rules: Rules that should be followed on range and during competitive matches.								2
3.	Events (Rifle & Pistol): Information about all different events.								2
4.	Parts and Functions of gun: Knowledge about all the parts and how it works								2
5.	Shooting Equipment and Accessories: Information about equipment’s and it work								2
6.	Range Commands and Safe Handling: Regulations followed during rifle and pistol shooting competition. Maintaining discipline, following safety instructions, handling rifle responsibly.								2
7.	Assessment - I -(Theory and Practical): Evaluation based on history of game, safety rules and ISSF rules.								2
8.	Shooting Stance: Upright posture where the shooters balance the body while supporting the rifle steadily								2
9.	Grip Techniques: Proper grip and its techniques								2
10.	Sight Alignment: How to align sight with target								2
11.	Sight Picture: Sight picture definition and its visualization								2
12.	Breathing Control: Breathing techniques								2
13.	Trigger Control: Proper triggering and its steps								2
14.	Follow-Through: Importance of follow through and its process								2
TOTAL								28	

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Reference Books:
1. David Watson, “ABCs of Rifle Shooting”, Gun Digest (Imprint of KP Books), 2014
E-Resources:
1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

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Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Volleyball)							Code: 26MECC102I		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop foundational volleyball skills, including serving, passing, setting, spiking, and blocking, while mastering game rules and strategies through practical gameplay and scrimmage.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate proficiency in basic volleyball skills such as serving, passing, setting, spiking, and blocking.								
CO2	Apply offensive and defensive strategies effectively, including serve receive and transition play, during gameplay.								
CO3	Understand and implement volleyball rules and referee gestures, applying them accurately during practical gameplay and scrimmages.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Volleyball, History: Introduction to volleyball, origin and development of the game, inventor (William G. Morgan), evolution of volleyball at national and international levels, governing bodies (FIVB, VFI), importance and benefits of volleyball, basic objectives of the game.								2
2.	Terminology: Basic volleyball terminology: rally, serve, receive, pass, set, spike, dig, block, libero, rotation, substitution, attack line, service zone, front row, back row, side-out, fault, ace, rally point system, timeout and other common terms.								2
3.	Rules, Court Dimensions: Volleyball court dimensions (18 m × 9 m), attack line, service zone, free zone, net height (Men: 2.43 m, Women: 2.24 m), ball specifications, team composition, scoring system, rotation rules, basic violations and referee signals.								2
4.	Fundamental Stance and Movement: Ready position, defensive and offensive stance, body balance, footwork techniques, forward, backward, lateral and crossover movement, movement efficiency, maintaining proper posture during play.								2
5.	Ball Familiarization and Hand-Eye Coordination: Ball handling exercises, ball bouncing, self-tossing, partner toss, catching drills, wall passing, coordination drills, reaction exercises and confidence-building with the volleyball.								2
6.	Passing Skill (Dig Pass): Underhand pass (forearm pass): body position, platform formation, foot placement, contact point, follow-through, partner passing drills, movement before contact, common mistakes and corrective exercises.								2
7.	Assessment - I								2

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8.	Passing Skill (Volleypass): Hand position, finger contact, body alignment, extension of arms and legs, partner setting drills, wall setting, accuracy exercises, common errors and corrections.	2
9.	Underhand Service: Grip, stance, ball toss, arm swing, point of contact, follow-through, target serving, serving consistency drills and correction of common faults.	2
10.	Overhand Service: Proper toss, striking technique, body mechanics, weight transfer, accuracy, power generation, target practice, introduction to float serve, error correction.	2
11.	Revision and Integrated Skill: Revision of all previously learned skills, combining passing, setting and serving in continuous drills, partner and group activities, communication, teamwork and basic game situations.	2
12.	Hitting Mechanics: Introduction to attacking technique: approach steps, arm swing, jump mechanics, body coordination, and timing, landing technique, hitting drills without net and with controlled tosses.	2
13.	Introduction to Spiking: Basic spiking technique: 3-step/4-step approach, take-off, arm action, ball contact, follow-through, landing safely, simple attacking drills and introduction to offensive play.	2
14.	Assessment - II	2
TOTAL		28
Text Books:		
1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher		
Reference Books:		
1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication		
E-Resources:		
1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004		

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I		
Course: Liberal Learning – I (Football)							Code: 26MECC102J		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	To identify and describe the fundamental skills and strategies involved in football, including ball control, dribbling techniques, basic offensive and defensive tactics.								
CO2	To apply advanced dribbling and passing techniques during practice sessions.								
CO3	To design and execute a cohesive game plan that integrates set pieces, team chemistry, and communication, evaluating its effectiveness through simulation matches.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Football: History & Development: Understand the history, origin, and global development of football, including its evolution into the world's most popular sport.								2
2.	Laws of the Game: Understand and apply the fundamental Laws of the Game, including rules, fouls, player positions, and match procedures.								2
3.	Football Field, Equipment & Safety: Identify the dimensions of a football field, use essential equipment correctly, and follow key safety practices to ensure safe participation in football.								2
4.	Warm-up, Cool-down & Injury Prevention: Demonstrate proper warm-up and cool-down techniques and apply injury prevention practices to enhance performance and reduce the risk of injuries.								2
5.	Physical Fitness for Football: Develop the physical fitness components—strength, speed, endurance, agility, flexibility, and coordination—required for effective football performance.								2
6.	Ball Familiarization: Develop confidence and control by performing basic ball familiarization exercises using both feet to improve touch, coordination, and ball control.								2
7.	Assessment - I								2
8.	Long Passing & Lofted Pass: Execute accurate long and lofted passes with proper technique, power, and precision to effectively switch play and create attacking opportunities.								2

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9.	Receiving and First Touch: Demonstrate effective receiving and first-touch techniques to control the ball quickly and prepare for the next action in play.	2
10.	Dribbling Fundamentals: Demonstrate fundamental dribbling techniques to maintain close ball control while moving with speed, balance, and confidence.	2
11.	Turning & Shielding the Ball: Demonstrate effective turning and shielding techniques to protect the ball, maintain possession, and evade opponents under pressure.	2
12.	Heading Techniques: Demonstrate correct heading techniques using proper timing, body position, and contact to effectively control, clear, and direct the ball.	2
13.	Small-Sided Game (5v5): Apply football skills, decision-making, teamwork, and tactical principles effectively in a 5v5 small-sided game environment.	2
14.	Assessment-II	2
TOTAL		28
Text Books:		
1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.		
Reference Books:		
1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.		
E-Resources:		
1. Udemmy – Soccer Courses - https://www.udemy.com/topic/soccer/		

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Indian Knowledge System and Financial Literacy							Code: 26MEIK101		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	-	-	50	-	-	50
Prerequisites:									
Basic knowledge of algebra and mathematical operations.									
Course Objectives:									
1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System.									
2. To make students proficient in fundamental financial concepts essential for managing personal finances effectively.									
3. To equip students with practical budgeting skills to empower them to achieve financial independence.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand IKS fundamentals, Indian numeral system, and key contributions in mathematics and measurement.								
CO2	Recognize metal working techniques, Vastushastra principles, historical engineering and architecture practices.								
CO3	Understand financial concepts, money types, bank accounts, and essential financial terms for practical application.								
CO4	Manage budgets, credit, loans, and develop financial plans for career and education goals.								
CO5	Understand various investments, risk management, insurance types, and develop retirement planning strategies.								
CO6	Comprehend tax forms, compliance, fraud protection, and financial considerations for investments and business.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Foundations of Indian Knowledge System: Definition and scope of IKS, Historical development and significance. Number System and Units for Measurement: Salient features of the Indian numeral system, The discovery of zero and its importance, Decimal Systems, Measurement of time, distance and weight. Mathematics: Unique aspects of Indian mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, binary mathematics.								5

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2.	Application of Indian Knowledge System: Metals and Metal Working: Mining and ore extraction, Extraction of iron from Biotite by indigenous techniques, Lost wax casting of idols and artefacts, Architecture and Structures: Vastushastra, Unitary buildings and Town planning, Temple architecture. Physical structures in India, Irrigation and water management	5
3.	Finance: Importance of Financial Literacy for Engineers, Understanding Money, Types of Money- Cash, Cheque, UPI Payment, Digital Currency, etc Types of bank accounts - saving, salary, current, loan, etc., Basic financial Terms- Income, Expenditure, Balance, saving, loan, interest rates, compound interest rate, credit, Investment, Taxes	4
4.	Financial Planning: Personal budgeting, Understanding debit and credit card, credit score, Types of credit card, credit card payment cycle, Borrowing, Loans / Debts, Types of loans, Terms of borrowing, Loan, Interest rate, Principal, EMI, EMI Calculation, Repayment of loan/debt strategy, Financial Planning for Career Development, Higher studies,	5
5.	Investment and Wealth Management: Basics of Investing, Effect of compounding, Types of Investment (fixed deposit, recurring deposits, Insurance policies, Bonds, Mutual Funds, Stocks, real estate, etc.) Risk and Return, Concept of SIP, STP and SWP, Stock Market, Stock Exchanges, reading of stock market indices, Life insurance, healthcare insurance, vehicle insurance, Importance of early retirement planning, Investment strategy, Pension Plan, Portfolio management,	5
6.	Finance Compliance: Types of Taxes, Types of Income Tax return form and Filling, Taxes and reforms, Impact of taxation policy on Investment, Scams and Frauds, Protection of personal information, Financial consideration for starting business, Real estate and purchase	4
TOTAL		28

Text Books:

1. B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pawana R. N., "Introduction to Indian Knowledge System – Concepts and Applications", PHI Learning Pvt. Ltd., New Delhi.
2. Dr. Babu V., Mr. Mohammed Umair, "Financial Literacy", Himalaya Publishing House, First Edition.

Reference Books:

1. A. K. Bag, "History of Technology in India", Vol. I, Indian National Science Academy, New Delhi.
2. Dr. S. Gurusamy, "Indian Financial System", Tata McGraww-Hill Education Pvt. Ltd 2nd Edition.
3. D.N. Bose, S.N. Sen and B. V. Subbarayappa, "A Concise History of Science in India", Indian National Science Academy, New Delhi.

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E-Resources:

1. SWAYAM - “Indian Knowledge System(IKS): Concepts and Applications in Engineering”, Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore.
https://onlinecourses.swayam2.ac.in/imb23_mg53/preview
2. SWAYAM - “Introduction to Banking and Financial Markets”, Indian Institute of Management Bangalore (IIMB), - https://onlinecourses.swayam2.ac.in/imb23_mg14/preview
3. Online free course on “Financial Literacy” by Khan Academy.
<https://www.khanacademy.org/college-careers-more/financial-literacy/xa6995ea67a8e9fdd:welcome-to-financial-literacy>

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SYLLABUS
SEMESTER - II

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Engineering Mathematics - II							Code: 26MEBS203		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic concept of Differentiation, Integration and Vector.									
Course Objectives:									
1. To introduce student some methods to find the solution of first order & first degree ordinary differential equations with its applications.									
2. To make students familiar with vector differentiation.									
3. To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Solve first order ordinary differential equation.								
CO2	Apply differential equation in engineering applications.								
CO3	Determine the velocity vector, gradient, divergence, curl.								
CO4	Evaluate improper integrals.								
CO5	Demonstrate multiple integrals for regions in the plane.								
CO6	Use of multiple integrals to find area bounded by curves & volume bounded by surfaces.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	First Order Ordinary Differential Equation: Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form and Bernoulli's equation.								7
2.	Applications of Differential Equations: Applications of differential equations to orthogonal trajectories, Newton's law of cooling, Kirchhoff's law of electrical circuits, Rectilinear motion, Simple harmonic motion, One dimensional conduction of heat.								7
3.	Vector Differential Calculus: Velocity vector, acceleration vector, tangential and normal component of acceleration, Vector differential operator, gradient, directional derivatives, angle between surfaces, Divergence and curl, solenoidal and irrotational field.								7
4.	Integral Calculus: Reduction formulae, Beta and Gamma functions, Differentiation under integral sign and Error functions.								7
5.	Multiple Integrals: Double integration in cartesian & polar coordinates, Change of order of integration, Triple integral in cartesian & polar coordinates.								7

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6.	Applications of Multiple Integral: Applications to find Area, Volume, Mass, Centre of gravity and Moment of inertia.	7
TOTAL		42
Text Books:		
1. B. V. Ramana, “Higher Engineering Mathematics”, Tata McGraw Hill. 2. B. S. Grewal , “Higher Engineering Mathematics” , Khanna Publication 3. H.K.Dass, “Higher Engineering Mathematics”, S.Chand Publication 4. C.Ray Wylie & L.Barrett, “Advanced Engineering Mathematics”, McGraw Hill Publications.		
Reference Books:		
1. Erwin Kreyszig , “Advanced Engineering Mathematics” , Wiley Eastern Ltd. 2. M. D. Greenberg , “Advanced Engineering Mathematics” , Pearson Education 3. Peter V. O’Neil , “Advanced Engineering Mathematics” , Thomson Learning 4. P. N. Wartikar and J. N. Wartikar , “Applied Mathematics (Vol. I & Vol. II)” , Vidyarthi Griha Prakashan, Pune. 5. Ron Larson and David C. Falvo, “Elementary Linear Algebra” , Houghton Mifflin Harcourt Publishing Company		
E-Resources:		
1. A NPTEL Course on “Engineering Mathematics-II” IIT Khargpur - https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG 2. Applications of Differential Equations Orthogonal Trajectories - https://www.youtube.com/watch?v=Ziu0y2kWTcM&list=PLT3bOBUU3L9juyFTI3lpeXXhIetVB00cr 3. “Applications of Differential Equations Newton's law of Cooling –“ https://www.youtube.com/watch?v=gJSvcf9_Duc 4. Dr. Gajendra Purohit, “Gradient of a Scalar Field & Directional Derivative Normal Vector” https://www.youtube.com/watch?v=9CHfHuFBTw8&list=PLU6SqDYcYsfJz9FAzbgocIjlkW4NXAar-&index=2 5. Dr. Gajendra Purohit, “Double Integral & Area By Double Integration Multiple Integral” https://www.youtube.com/watch?v=db7d_a0wiUg&list=PLU6SqDYcYsfLoKyzF_dwxAQf8Ili6VC54 6. Double Integration - Change of Order of Integration Cartesian & Polar https://www.youtube.com/watch?v=fXMyLYwBB3s&list=PLU6SqDYcYsfLoKyzF_dwxAQf8Ili6VC54&index=4		

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Engineering Chemistry							Code: 26MEBS204		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	-	-	02	40	60	-	-	-	100
Prerequisites:									
Basic knowledge of volumetric analysis, structure property relationship, classification and properties of Polymers, electromagnetic radiation, electrochemical series.									
Course Objectives:									
1. To familiarize the students with the basic phenomenon/concepts of chemistry and its applications in various fields of Engineering. 2. To impart knowledge of technologies involved in water analysis to improve water quality. 3. To learn significance science of corrosion and preventive methods used for minimizing corrosion. 4. To understand structure, properties and applications of speciality polymers and nanomaterials.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Analyze water softening parameters.								
CO2	Utilize different analytical methods for analysis of various chemical compounds.								
CO3	Understand the mechanism of destruction of metals (corrosion) and effective preventive measures.								
CO4	Explore the knowledge of advanced engineering materials for various engineering applications.								
CO5	Analyze fuel and suggest use of alternative fuels.								
CO6	Familiarize with classification, properties and applications of nanomaterials.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Water Technology: Introduction, Chemical Analysis of Water- Hardness; Temporary and Permanent, Alkalinity (Hydroxide, Carbonate and Bicarbonate), Softening Methods: Zeolite and Demineralization Process, Water Purification: Reverse Osmosis. Simple Numerical on Hardness Determination and Alkalinity Calculation.								5
2.	Instrumental Methods of Analysis: Types of analysis: Quantitative and Qualitative analysis Introduction, Instrumentation and Applications of following methods: Colorimetry, PHmetry (Titration of Strong acid v/s Strong base), Conductometry (Titration of Strong acid v/s Strong base)								5
3.	Corrosion Science: Introduction, Types of Corrosion-Dry and Wet corrosion, Wet Corrosion Mechanism: Hydrogen Evolution and Oxygen Absorption, Factors affecting rate of corrosion. Methods of prevention of corrosion: Cathodic Protection (Sacrificial Anode), Anodic Protection (Anodizing), Methods to apply Metallic Coatings-Hot								4

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	dipping, Electroplating.	
4.	Engineering Polymers: Polymers: Introduction, Definition of Polymer, Monomer and Functionality of monomers Speciality Polymers: Introduction, Preparation, Properties and Applications of the following polymers: 1. Engineering Thermoplastic: Polycarbonate 2. Conducting Polymer: Polyacetylene Polymer Composites: Introduction, Constituents of composite, Advantages over conventional materials, Applications, Fiber Reinforced Plastic (FRP)-Glass reinforced and Carbon reinforced.	5
5.	Fuels and Combustion: Introduction, Calorific value - Definition, Gross and Net calorific value, Determination of Calorific value: Principle, Construction and Working of Bomb Calorimeter (Simple Numerical), Solid fuel: Coal: Analysis of Coal-Proximate (Simple Numerical). Alternate fuels: Biodiesel and Power alcohol. Hydrogen as future fuel: Production, Advantages, Storage and Applications in Hydrogen fuel cell.	5
6.	Nanomaterials: Introduction, Classification of Nanomaterials Based on Dimensions, Nanoscale materials: Structure, Properties and Applications of Graphene and Quantum dots (semiconductor nanoparticles), Importance of Nanotechnology in engineering applications.	4
TOTAL		28
Text Books:		
1. O.G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. 2. Dara S. S., Umare S. A., "Textbook of Engineering Chemistry", 12 th Ed, S. Chand & Com Ltd. 3. Jain and Jain, "Engineering Chemistry", 16 th Ed, Dhanpat Rai and Co. (Pvt.) Ltd., Delhi.		
Reference Books:		
1. G. R. Chatwal & S. K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House. 2. Dr. Sunita Rattan; A Textbook of Engineering Chemistry; 3 rd Ed, S. K. Kataria & Sons, New Delhi 3. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science", Wiley Eastern Limited. 4. Billmeyer F. W., "Textbook of polymer science", John Wiley and Sons. 5. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Education Publishing company Limited. 6. G. L. Hornyak, J. J. Moone, H. F. Tihale, J. Dutta "Fundamentals of Nanotechnology", CRC press.		

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E-Resources:

MOOC / NPTEL/YouTube Links:

1. NPTEL Course on Corrosion, IISc Bangalore : <http://nptel.ac.in/courses/113108051/>
2. NPTEL Course on Polymer, IIT Kharagpur: <http://nptel.ac.in/courses/104105039/>,
<http://nptel.ac.in/courses/104103071/40>
3. NPTEL Course on Water Technology, IIT Kanpur: <http://nptel.ac.in/courses/105104102/>
4. NPTEL Course on UV-Visible Spectroscopy: <http://nptel.ac.in/courses/102103044/4>
5. NPTEL Course on Energy Sources: <http://nptel.ac.in/courses/103105110/4>
6. NPTEL Course on “Engineering Chemistry-I, <https://nptel.ac.in/courses/122/106/122106028/>
7. NPTEL Course on “Fundamentals of Spectroscopy”, NCL,IISER Pune
<https://nptel.ac.in/courses/104/106/104106122/>

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Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Engineering Chemistry Lab							Code: 26MEBS204P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Basic knowledge of volumetric analysis, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.									
Course Objectives:									
1. To develop practical skills in quantitative chemical analysis of water samples for hardness and alkalinity. 2. To familiarize students with instrumental techniques such as pH metry, conductometry, and spectrophotometry. 3. To enable students to verify Beer’s law and determine unknown concentrations using absorption spectroscopy. 4. To provide hands-on experience in the preparation of polymeric resins and determination of molecular weight of polymers.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply instrumental techniques such as pH metry, conductometry, and spectrophotometry to determine acid strength, verify Beer’s law, and find unknown concentrations.								
CO2	Demonstrate understanding of corrosion behaviour and nanoparticle synthesis through observation and analysis of demonstration experiments.								
List of Experiments:									
A. Lab Experiments (Any Seven)									
1. Determination of hardness of water by EDTA method. 2. Determination of alkalinity of water. 3. Determination of strength of strong acid using pH meter. 4. Determination of maximum wavelength of absorption of CuSO4/FeSO4/KMnO4, verify Beer’s law and find unknown concentration of given sample. 5. Titration of a mixture of strong acid with strong base using Conductometer. 6. Preparation of phenol-formaldehyde/urea-formaldehyde resin. 7. Proximate analysis of coal. 8. Coating of copper or zinc on iron plate using electroplating. 9. Determination of the molecular weight of a polymer by using Ostwald’s Viscometer.									
B. Demonstration (virtual) (Any One)									
10. Demonstration of effect of environmental conditions on metal by weight loss method. 11. Synthesis of oxide nanoparticles									
Reference Books:									
1. G. R. Chatwal& S. K. Anand, “Instrumental Methods of Chemical Analysis”, Himalaya Publishing House.									

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2. Dr. Sunita Rattan; A Textbook of Engineering Chemistry; 3rd Ed, S. K. Kataria & Sons, New Delhi
3. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, “Polymer Science”, Wiley Eastern Limited.
4. Billmeyer F. W., “Textbook of polymer science”, John Wiley and Sons.
5. Sivasankar, “Engineering Chemistry”, Tata Mcgraw-Hill Education Publishing company Limited.
6. G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta “Fundamentals of Nanotechnology”, CRC press.

E-Resources:

Virtual Labs:

1. PICT Pune: <http://chemistryvl.pict.edu/#/>
2. NITK Surathkal: Hardness of water: <https://ee1-nitk.vlabs.ac.in/exp/determination-of-hardness/simulation.html#>
3. NITK Surathkal: Alkalinity of water: <https://ee1-nitk.vlabs.ac.in/exp/determination-of-alkalinity/simulation.html>
4. IIT Hyderabad: Colorimeter, verification of Beer's law, <https://mas-iiith.vlabs.ac.in/exp/beer-law/simulation.html>
5. IIT Kanpur: Preparation of phenol-formaldehyde resin, <http://ebootathon.com/labs/beta/chemistry/EngineeringChemistryLab/exp1/simulation.html>
6. Amrita University: Determination of viscosity average molecular weight polymer, https://pcv-au.vlabs.ac.in/physicalchemistry/Determination_of_ViscosityAverageMolecularWeightofPolymer/

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Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Engineering Mechanics							Code: 26MEES203		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic of Physics and Mathematics									
Course Objectives:									
1. To empower engineering students to analyze basic mechanics problems in real-world scenarios									
Course Outcomes: At the end of course the students will be able to -									
CO1	Apply concepts of statics to solve problems in two-dimensional force systems								
CO2	Analyze various types of structures and understand the concept of virtual work								
CO3	Apply and analyze different types of friction in engineering problems								
CO4	Apply transfer theorems to determine moments of inertia.								
CO5	Apply kinematic principles to analyze the motion of particles and rigid bodies								
CO6	Apply appropriate techniques to analyze the kinetics of both particles and rigid bodies.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Basics of Statics: Introduction to Engineering Mechanics, Concepts of particles and rigid bodies, Force systems, Resultant of Force systems, Free body diagram, Equilibrium of rigid bodies, Moments and Couples.								7
2.	Analysis of structures: Introduction, Types of Truss, cables and Frames, Analysis of forces by method of joints and method of sections. Introduction to Virtual work and Energy relations.								7
3.	Friction: Friction, Laws of Friction, Types of friction, Friction angle and Angle of repose, ladder friction, belt friction, wedge friction, rolling resistance.								7
4.	Centroids and Moments of Inertia: Centroid, First moment of area, Second moment of area, Moment and product of inertia of plane areas, Transfer Theorems, Polar moment of inertia, Principal axes, Mass moment of inertia. MI of standard shapes (I, C, T), MI of composite figures.								7
5.	Kinematics: Basic Concepts, Rectilinear Motion, Curvilinear Motion, Relative Motion, Introduction to Motion in Polar Coordinates, Cylindrical and Spherical Coordinates, Introduction to Rotational motion and General motion, Introduction to Kinematics of Rigid Bodies								7

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6.	Kinetics: Basic Concepts, Newton's second law of motion, equation of motion, D'Alembert's Method, work- energy method, impulse- momentum method, Impact of elastic bodies, Introduction to Kinetics of Rigid Bodies, Lagrange's equation	7
TOTAL		42
Text Books:		
1. Timoshenko and Younge, Engineering Mechanics, McGraw Hill Publications 2. Meriam J.L. and Kraige L.G., "Engineering Mechanics: Statics", 6 th Edition, John Willey and Son's 3. Meriam J.L., and Kraige L.G., "Engineering Mechanics: Dynamics", 6 th Edition, John Willey and Son's 4. S.S. Bhavikatti, Engineering Mechanics, New Age International (P) Ltd. Publishers		
Reference Books:		
1. Beer F.P. and Johnston E.R., Vector Mechanics for Engineers - Volume I - Statics, Volume II - Dynamics, McGraw Hill, New York. 2. Shames L.H., Engineering Mechanics, Prentice Hall, 2. I. H. Shames, Engineering Mechanics: Statics and Dynamics, 4 th Edition, PHI, 2002. 3. R. C. Hibbeler, Engineering Mechanics - Statics", Prentice Hall Publishers 4. Anil V. Rao, Dynamics of Particles and Rigid Bodies: A Systematic Approach, Cambridge University Press		
E-Resources:		
1. https://nptel.ac.in/courses/112103108 2. https://archive.nptel.ac.in/courses/112/106/112106286/		

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Fundamentals of Electrical and Electronics Engineering							Code: 26MEES204		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Basic Physics and Mathematics, Semiconductor Physics, Electric charges and fields, Coulomb’s laws.									
Course Objectives:									
1. To introduce the fundamental concepts of voltage, current, power, energy and basic laws governing DC circuits.									
2. To develop an understanding of magnetic circuits, electromagnetic induction and related fundamental principles.									
3. To understand passive electronic components, semiconductor devices, and their applications in basic circuits.									
4. To learn the fundamentals of digital electronics, including number systems, Boolean laws, and logic gates.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply fundamental laws and network reduction techniques to analyze DC circuits.								
CO2	Explain the concepts of magnetic circuits and electromagnetic induction.								
CO3	Analyze single-phase AC circuits and determine power, impedance and power factor.								
CO4	Identify and explain the working of basic passive and semiconductor electronic components.								
CO5	Analyze the characteristics and applications of P-N junction diode and special purpose diodes.								
CO6	Apply number systems, Boolean algebra and logic gates to design basic digital circuits.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	D.C Circuits: Basic concepts of voltage, current, power, energy and relationship between them, definition of resistance, resistivity, and conductivity, effect of temperature on resistance of different materials, temperature coefficient of resistance, series and parallel circuits, Star-Delta transformation, Ohm’s law, types of sources, current division and voltage division rule, Kirchhoff’s laws.								7
2.	Magnetic Circuit: Concept of Magnetic flux, Flux density, MMF, reluctance, magnetic field intensity, permeability and their relationship, leakage and fringing of flux, magnetization curve, hysteresis loop, series and parallel magnetic circuits. Faraday’s laws of electromagnetic induction, Fleming’s left and right -hand rule.								7

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3.	A.C. Fundamentals & Single-Phase Circuits: A.C. Fundamentals: Generation of alternating voltages, mathematical and graphical representation of sinusoidal voltage and current, concept of cycle, period, frequency, instantaneous, peak, average, and RMS values (Derivations), peak factor, form factor, phase difference, lagging, leading and in phase quantities and phasor representation, rectangular and polar representation of phasors. Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage and current phasor diagrams, voltage, current and power waveforms. A.C. Single Phase Circuits: Study of series R-L, R-C, R-L-C circuits, concept of impedance and admittance, waveform and voltage current phasor diagrams. Concept of active, reactive, apparent power and power factor.	7
4.	Introduction to Electronics Components: Introduction to passive components: Resistors, Capacitors, Inductors, construction working principle, Series and parallel combination, Semiconductor devices (diodes and transistors) Basic Electronics Concepts- Voltage, current, resistance, Ohm's Law and its applications Semiconductor materials: P-type and N-type Semiconductors, Current in semiconductors: Diffusion and Drift Current.	7
5.	P-N Junction Diode: Construction, working in forward and reverse bias, V-I characteristics, Diode applications: Diode as a switch, Half Wave Rectifier, Full wave and Bridge Rectifier Special purpose diodes- Zener diode, Light Emitting Diode (LED), and photodiode. Thyristor Family- SCR, Triac, Diac characteristics and applications.	7
6.	Introduction to Digital Electronics: Introduction to number system (Decimal, Binary, Octal, Hexadecimal), Boolean Laws, Memory units like (Bit, Byte, MB,KB,GB). Overview of logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Logic gate symbols and truth tables, Combinational and sequential logic circuits, multiplexers, demultiplexers, Flip-flops: SR, JK, D, T flip-flops.	7
TOTAL		42

Text Books:

1. V. N. Mittle and A. Mittal, 2nd Edition, Basic Electrical Engineering, McGraw Hill Education (India) Pvt. Ltd.
2. D. C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw-Hill (India) Pvt. Ltd.
3. Thomas. L. Floyd, "Electronics Devices", Pearson.
4. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.

Reference Books:

1. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited
2. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press.
3. Donald A. Neamen, "Semiconductor Physics and Devices".

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4. Paul Horowitz and Winfield Hill, “The Art of Electronics”.
5. P.S. Bhimbra, “Power Electronics”.

E-Resources:

1. Fundamentals of Electrical Engineering, by Prof. Debapriya Das, IIT Kharagpur, <https://nptel.ac.in/courses/108105112>
2. Basic Electrical Technology, IISc Bangalore, Prof. L. Umanand, <https://nptel.ac.in/courses/108108076>
3. Prof. Chitralekha Mahanta, IIT Guwahati, Basic Electronics, <https://nptel.ac.in/courses/117103063>
4. Prof. Anil Mahanta, Prof. Roy Paily Palanthinkal, IIT Guwahati, Digital Circuits, <https://nptel.ac.in/courses/117103064>
5. Prof. Sudip Misra, IIT Kharagpur, Introduction to Internet of Things, <https://archive.nptel.ac.in/courses/106/105/106105166/>

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Fundamentals of Electrical and Electronics Engineering Lab							Code: 26MEES204P		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	-	25	-	100
Prerequisites:									
Basic Physics and Mathematics, Semiconductor Physics, Electric charges and fields, Coulomb's laws.									
Course Objectives:									
1. To provide practical knowledge of fundamental electrical laws, magnetic circuits and AC circuit behaviour through hands-on experiments.									
2. To familiarize students with basic electronic components, measuring instruments and digital logic circuits.									
3. To develop skills in identifying, testing and using electrical and electronic components and protection devices.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Verify fundamental electrical laws and analyze magnetic and AC circuit behaviour through experiments.								
CO2	Identify, test and use basic electrical protection devices and electronic components with appropriate measuring instruments.								
CO3	Verify the operation of logic gates and combinational circuits and prepare a case study of an electronic appliance.								
List of Experiments:									
Electrical Experiments:									
1. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.									
2. To plot the B-H Curve for the magnetic circuit.									
3. To analyse R – L – C series circuit.									
4. To identify various components of LT Switchgear in electrical engineering.									
Electronics Experiment:									
1. Electronic Components: Study of Active and Passive components									
a) Resistors (Fixed & Variable), Calculation of resistor value using color code.									
b) Capacitors (Fixed & Variable)									
c) Inductors, Calculation of inductor value using color code.									
d) Devices such as Diode, BJT, MOSFET, various IC packages									
e) Switches & Relays									
2. Measurements using various measuring instruments:									
a) Setup CRO and function generator for measurement of AC & DC voltages and frequency									
3. Measure Voltage, Resistance using digital Millimeter. Also use Millimeter to check diode, BJT.									
4. Test and verify the truth tables of:									
a) Basic and Universal Gates (Study the datasheet of respective ICs)									
b) Half & Full Adder 8									
5. Case Study of any one electronics appliance with block diagram, specification etc.									

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A. Lab Experiments (Any Seven)

B. Demonstration (virtual) (Any One)

C. Open Ended Experiments (Study visit to research laboratory/ industry)

Reference Books:

1. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited
2. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press
3. Donald A. Neamen, "Semiconductor Physics and Devices".
4. Paul Horowitz and Winfield Hill, "The Art of Electronics".
5. P.S. Bhimbra, "Power Electronics"
6. D. Patrnabis, "Sensors and Transducers", PHI.
7. Kennedy & Davis, "Electronic Communication Systems", Tata McGraw Hill.
8. M. Schwartz, "Mobile Wireless communication", Cambridge University Press.

E-Resources:

1. Prof. Chitralekha Mahanta, IIT Guwahati, Basic Electronics, <https://nptel.ac.in/courses/117103063>
2. Prof. Anil Mahanta, Prof. Roy Paily Palanthinkal, IIT Guwahati, Digital Circuits, <https://nptel.ac.in/courses/117103064>
3. Prof. Debapriya Das, IIT Kharagpur, Fundamentals of Electrical Engineering, <https://nptel.ac.in/courses/108105112>

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DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Manufacturing Technology							Code: 26MEPC201		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
03	-	-	03	40	60	-	-	-	100
Prerequisites:									
Engineering Physics, Workshop Practice, Basic Material Science									
Course Objectives:									
1. To understand basic and modern casting processes, including patterns, moulding, core making, and casting defects. 2. To learn metal forming technologies, stress-strain diagrams, rolling, forging, extrusion, and high-energy forming methods. 3. To master metal cutting and joining processes, tool geometry, cutting operations, welding techniques, and defect remedies.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understand sand molding process and various element’s related to foundry.								
CO2	Understand and apply various plastic deformation techniques to applications in an automobile Industry.								
CO3	Demonstrate and apply the mechanics of metal cutting operations.								
CO4	Apply principles involved in metal melting and joining processes with an appropriate characteristics.								
CO5	Select appropriate polymer manufacturing technique for given end application.								
CO6	Understand Smart Manufacturing, NC technology, 3D printing, IoT, and Augmented Reality principles and applications.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to Foundry Technology: Basic casting process, Patterns: types of pattern, allowances, Moulding sand, Properties of moulding sands, Core making, Melting practices and furnaces, Pouring and Gating system cleaning and Finishing of casting, Defects and remedies, Principle and equipment’s of Permanent mould casting, Investment casting, Centrifugal casting, Continuous casting. An introduction to modern casting process frozen mould, high pressure moulding, impact moulding; explosion moulding								8
2.	Metal Forming Technology: Stress-strain diagram for different materials, Hot and Cold working, plastic deformation, Concept of Forming Limit diagram, Rolling Process, Forging, Extrusion, Wire and Tube Drawing, defects and remedies of above. Special forming methods such as high energy forming: explosive forming, electrohydraulic and								6

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	magnetic forming processes.	
3.	Metal Cutting Technology: Geometry of single-point cutting tool, Orthogonal and Oblique cutting processes, Chip formation, Types of chips, Chip Breakers, Introduction to metal cutting operations: Lathe, Milling, Drilling and Grinding, Special metal cutting trends like Abrasive Jet Machining, Water Jet Cutting methods.	6
4.	Metal Joining Process: Principles of metal joining processes, welding terminology and types of joints, Principles and equipment's of Single carbon arc welding, TIG, MIG, Resistance and Gas welding, Study of defects and remedies. Under-water welding process latest trends and future scope.	6
5.	Plastic Manufacturing Technology: Thermoplastics Vs Thermosetting plastics, Processing of polymers, Thermoforming, Moulding and Extrusion of Plastic, Industrial applications tooling and equipment's of all above. Waste plastic upcycling, Study of bio-degradable and high-performance plastic.	8
6.	An Introduction to Smart Manufacturing Technology: History and evolution of NC technology, benefits over general purpose machinery, study of an architectural element's, an introduction to preparatory and miscellaneous codes. 3D Printing Technology. Internet of Things (IoT), Augmented Reality.	8
TOTAL		42
Text Books:		
1. P. C. Sharma, A Text Book of Production Technology, S. Chand Publications 2. R. K. Rajput, A Text Book of Manufacturing Technology, Laxmi Publications (p) LTD 3. Elements of Workshop Technology, Vol-II, S. K. Hajra Chaudhary, Media Promoters & Publications Pvt Ltd.		
Reference Books:		
1. P. N. Rao, A Text book of Manufacturing Technology, Metal Cutting and Machine Tools, Tata McGraw Hill Publishing Co. Ltd. 2. R. K. Jain, "Production Technology", Khanna Publishers. 3. Production Technology-HMT Handbook, Tata McGraw Hill publication. 4. P. N. Rao, "Manufacturing Technology Vol. I & II", Tata McGraw Hill Publishers. 5. P. C. Sharma, "Production Engineering", Khanna Publishers. 6. S. K. Sinha, CNC Programming using Fanuc Custom Macro B, McGraw-Hill Professional		
E-Resources:		
1. Dr. D. Benny Karunakar, IIT Roorkee, Metal Casting, Design of Gating System-1 (youtube.com) 2. Prof. Pradeep Jha, IIT Roorkee, Principles of Metal Forming Technology NPTEL : NOC:Principles of Metal Forming Technology (Mechanical Engineering) (digimat.in) 3. Prof. Asmiva Roy Chodhary IIT Kharagpur, Metal Cutting and Machine Tools, NPTEL : NOC:Metal Cutting and Machine Tools (Mechanical Engineering) (digimat.in)		

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4. Prof. D.K.Dwivedi, IIT Roorkee, Joining Technologies –Metal properties and weldability, [NPTEL : NOC:Joining Technologies for Metals \(Mechanical Engineering\) \(digimat.in\)](https://www.nptel.ac.in/courses/201712/111010101/)
5. Prof. Asmiva Roy Chodhary IIT Kharagpur, CNC of Machine Tools and Processes [NPTEL :: Mechanical Engineering - NOC: Computer numerical control \(CNC\) of machine tools and processes](https://www.nptel.ac.in/courses/201712/111010101/)

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Program: B. Tech. Mechanical Engineering							Semester: II		
Course: Computer Aided Engineering Drawing Lab							Code: 26MEVS202		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total
-	02	-	01	-	-	-	25	-	25
Prerequisites:									
Knowledge of geometry, solids, engineering drawing concepts, orthographic views, isometric views, knowledge of units and measurements, basic skills handling computer devices									
Course Objectives:									
1. To introduce students to the fundamentals of CAD software and its applications in engineering drawing. 2. To develop proficiency in using CAD software for creating, editing, and managing 2D and 3D drawings. 3. To enhance students' skills in precision drawing, dimension, and annotation using CAD tools. 4. To prepare students to undertake CAD projects and customize CAD software for specific engineering applications.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate basic CAD drawing commands and navigate the CAD interface effectively.								
CO2	Utilize object selection methods and manage layers and properties in CAD drawings.								
CO3	Apply advanced drawing commands and precision techniques to create detailed CAD drawings.								
CO4	Use modifying tools and dimensioning to edit and annotate CAD drawings accurately.								
CO5	Perform advanced editing and create 3D models using CAD software.								
CO6	Develop a CAD project, customize the workspace, and apply CAD standards and practices.								
List of Experiments:									
Minimum 6 exercises should be completed									
1. Drawing Simple Shapes: Create basic geometric shapes such as squares, circles, and triangles using line, circle, and polyline tools. 2. Generate given simple orthographic view in CAD software, using basic draw and modify command. 3. Technical Drawing Practice (at least 2 components): Present students with a technical drawing containing various mechanical parts. Instruct them to redraw the components using advanced drawing commands like arcs, splines, and ellipses. 4. Isometric Drawing (at least 2 components): Generate an isometric drawing of a simple object, using CAD's isometric snap grid and tools. 5. Editing Objects (at least two drawings): Provide students with a drawing containing various objects and ask them to practice editing commands such as move, copy, rotate, and scale to modify the objects according to given specifications.									
OR									
6. Parametric Drawing: Introduce students to parametric drawing by asking them to create a simple parametric object, such as a door or window, with adjustable dimensions using CAD parametric									

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constraints.

7. CAD Project Development: Assign a project where students have to draw the drawing of component using CAD software.

OR

8. AutoCAD Customization: Encourage students to explore AutoCAD customization options by creating custom line types, hatch patterns, and dimension styles.

Text Books:

1. Bhatt, N. D. and Panchal, V. M., (2016), “Engineering Drawing”, Charotar Publication.
2. K. Venugopal, K, (2015), “Engineering and Graphics”, New Age International.

Reference Books:

1. AUTOCAD® 2019, BEGINNING AND INTERMEDIATE, Munir M. Hamad, Autodesk Approved Instructor, Mercury Learning And Information LLC. ISBN: 978-1-683921-76-9

E-Resources:

1. AutoCAD Quick Start Guide – <https://www.autodesk.com/learn/ondemand/curated/autocad-quick-start-guide>

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Program: B. Tech. (Mechanical Engineering)						Semester: II			
Course: Basic Manufacturing Lab						Code: 26MEVS203			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Knowledge of geometry, solids, engineering drawing concepts, orthographic views, knowledge of units and measurements, basic skills handling machines									
Course Objectives:									
1. To master wood and metal joinery with precision using appropriate tools and techniques. 2. To fabricate sheet metal products and machine components using sheet metal operations. 3. To master CNC routers, including setup, CAD/CAM use, and executing routing patterns efficiently.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Select wood types and tools to construct various joints with precision and craftsmanship.								
CO2	Skilled in accurately marking, cutting, and fitting metal components using appropriate tools and techniques.								
CO3	Fabricate simple sheet metal products through proficient cutting, bending, forming, and joining techniques.								
CO4	Operate manual lathes and milling machines to produce basic machined components according to specifications.								
CO5	Understand additive manufacturing and CNC laser cutting, including machine setup, material suitability, and practical demonstrations.								
CO6	Understand CNC router components, principles, material suitability, and perform practical demonstrations to develop simple components.								
List of Experiments:									
Minimum 5 exercises should be completed									
1. One wood joint job involving basic carpentry operations in a group of 2 students. 2. One fitting job involving male-female components to be performed using hand tools in a group of 2 students. 3. One job involving sheet metal operations to produce useful storage/decorative component in group of 3 to 4 students. 4. Demonstration on Lathe / Milling Machine to produce simple component involving basic machining operations. 5. One welding joint job per student or useful fabricated component in a group of 3 to 4 students 6. Demonstration of CNC laser cutting operation to manufacture contoured component/s. 7. Demonstration of CNC router operation to manufacture simple component/s 8. Simple project in a group of 4 to 6 students to produce decorative component using laminate 3D modeling. 9. Demonstration / Simulation of fused deposition modeling technique on 3D printer.									
Text Books:									
1. Raghuwanshi B.S., “Workshop Technology Volume I & II”, Dhanpat Rai & Sons.									

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2. Kannaih P., Narayan K.L., “Workshop Manual”, 2nd Edition, Scitech Publication.

Reference Books:

1. Fundamentals of CNC Machining, A Practical guide for beginners, Desk Copy, Autodesk

E-Resources:

1. NPTEL course on “Computer numerical control CNC of machine tools and processes” by Prof. Asimava Roy Choudhury, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc19_me46/
2. Online course on “Workshop Practice” by C. S. Baladhiya & J. B. Rao.
<http://ecoursesonline.iasri.res.in/course/view.php?id=443>

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Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Professional Development - II							Code: 26MECC203		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
01	02	-	02	-	-	50	-	-	50
Course Objectives:									
1. To introduce students on employability skills and its importance in building career and professional life. 2. To inculcate prime and significant soft skills like presentation skills, communication skills etc required in today’s professional environment. 3. To make students aware of employability skills like correspondence at work, team work and workplace etiquette to imbibe better employability maturity									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Aware of change management from academic environment to corporate and industrial environment for an effective start in career, personal life, at workplace, society and professional world.								
CO2	Understand the importance of necessity of prime soft skills like employability skills, presentation skills and communication skills required in today’s professional workplace environment.								
CO3	To be aware of significance of Special skills to excel at workplace and tapping team leader opportunities at engineering and technological organizations with finest work etiquette demonstration as a ladder for better growth and leadership perspective.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Employability Skills: Preparing for employment- transition from education to employment, selection process understanding, modern cv styles based on sector of employment, core and technical skills formulation and authentication, group discuss strategies and guidelines, Stages of interview- aptitude, technical, GD and personal interview								16
2.	Prime skills at work place: Employability skills, raising your employability quotient, researching own perspective at workplace communication and organization culture, communication and interpersonal relations, significance of presentation skills in corporate world, overcoming fear of public speaking, correspondence at work								16
3.	Special skills to excel at workplace: Work correspondence: Importance and types of work correspondence, seven Cs of communication, mechanics of effective business correspondence Teamwork: understanding team behaviors, teamwork as employability skill, significance of team spirit								16

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	Workplace Etiquette: Etiquette in the modern workplace, Etiquette -global and local, gender sensitivity, Etiquette in interaction, Netiquette, non-office hours and party times business meets do and do nots, character building and careful identity creation in the organization.	
TOTAL		48
Text Books:		
1. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals" 2. Sabina Pillai, Agna Fernandez, "Soft Skills and Employability Skills" Cambridge Press 3. Sanjay Kumar & Pushpa Latta, communication skills "Oxford higher education 4. Minakshi Raman & Sangita Sharma, "Technical Communication and Principles & Practices Oxfords Press.		
Reference Books:		
1. Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989. 2. Jack Canfield, "The Success Principles", HarperCollins, 2005. 3. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952.		
E-Resources:		
1. Coursera: "The Science of Well-Being" by Yale University, - https://www.coursera.org/learn/the-science-of-well-being 2. Udemy: "Self-Care: Take Care of Yourself to Better Take Care of Others" by Jessica Rogers https://www.udemy.com/course/caring-self/?couponCode=UPGRADE02223		

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**LIBERAL LEARNING
COURSES - II**

**(Select any one course from the given Liberal
Learning Courses)**

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Program: B. Tech (Mechanical Engineering)						Semester: II			
Course: Liberal Learning – II (Guitar)						Code: 26MECC204A			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Guitar musical instrument.									
Course Objectives:									
1. To enhance guitar skills through intermediate fingerpicking, lead techniques, and genre exploration, culminating in a polished final performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Execute intermediate fingerpicking techniques with precision and rhythm.								
CO2	Apply advanced lead guitar techniques and pentatonic scales effectively.								
CO3	Perform confidently across various genres including blues, rock, folk, and classical.								
CO4	Deliver a polished final performance through focused practice and preparation.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Rhythm and Timing.								2
2.	Time Signatures.								2
3.	Understanding Basic Rhythms.								2
4.	Circle of Fifths.								2
5.	Introduction to Minor Scales.								2
6.	Advanced Chord Shapes.								2
7.	Introduction to Lead Techniques.								2
8.	Introduction to Pentatonic Scale.								2
9.	Practice and Review.								2
10.	Exploring Different Genres.								2
11.	Final Project Planning.								2
12.	Intensive Practice.								2
13.	Pre-Performance Preparation.								2
14.	Final Performance.								2
TOTAL								28	
Text Books:									
1. David Hodge, “Guitar Theory”, DK Publishing.									
Reference Books:									
1. Russ Shipton, “The Complete Guitar Player”, Published by Wise.									
2. Vincent Ong, Alfred Khp,” Classical Guitar Advanced Studies Repertoires”, Dynamic Publication.									
E-Resources:									
1. https://www.youtube.com/watch?v=BBz-Jyr23M4									

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Program: B. Tech (Mechanical Engineering)						Semester: II			
Course: Liberal Learning – II (Singing)						Code: 26MECC204B			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music in singing.									
Course Objectives:									
1. To develop advanced singing techniques and ear training through Indian classical music, focusing on repertoire selection, effective rehearsal, and performance presentation.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Master legato, staccato, and advanced vocal methods in Indian classical music.								
CO2	Improve musical ear through rigorous training and diverse classical repertoire.								
CO3	Apply effective rehearsal strategies to prepare and present a polished performance.								
CO4	Deliver a well-executed performance of selected Indian classical pieces with artistic expression								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Vibrato and Ornamentation.								2
2.	Range Extension.								2
3.	Legato and Staccato.								2
4.	Advanced Ear Training.								2
5.	Basics of Indian Semi Classical Music.								2
6.	Improvisation Techniques.								2
7.	Selecting Repertoire for Performance.								2
8.	Rehearsal Techniques.								2
9.	Dress Rehearsal.								2
10.	Final Performance.								2
11.	Performance Review.								2
12.	Exploring New Repertoire.								2
13.	Advanced Techniques and Styles.								2
14.	Course Recap and Future Directions.								2
								TOTAL	28
Text Books:									
1. Dr. Theodore Dimon, “Anatomy of the Voice, This Is a Voice”.									
Reference Books:									
1. Richard Miller, “The Structure of Singing”, Schirmer Books, London.									
2. Jennifer Hamady, “The Art of Singing”, Published by Hal Leonard.									
E-Resources:									
1. https://www.youtube.com/watch?v=4hNq9qykOyE									
2. https://www.youtube.com/watch?v=b14gkmECz-Y									

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Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Cinematography)							Code: 26MECC204C		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling									
Course Objectives:									
1. To master videography by learning camera techniques, shooting methods, and editing, culminating in a final project showcasing advanced skills in video production.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Operate camera components and techniques for steady, sharp video shooting.								
CO2	Apply rule of thirds, framing, and stabilization methods effectively.								
CO3	Use advanced editing tools and sound design for polished video projects.								
CO4	Deliver a comprehensive final video project demonstrating learned skills.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Videography								2
2.	Understanding camera components (lens, sensor, viewfinder)								2
3.	Techniques for steady shooting (tripods, handheld, gimbals)								2
4.	Understanding the rule of thirds, leading lines, and framing in video								2
5.	In-depth explanation of the exposure triangle: aperture, shutter speed, and ISO								2
6.	Importance of audio in videography								2
7.	Techniques for achieving sharp focus								2
8.	Motion and Stabilization								2
9.	Storyboarding and Planning								2
10.	Filming Techniques								2
11.	Introduction to Video Editing								2
12.	Introduction to advanced editing tools (color correction, audio editing, effects)								2
13.	Sound Design and Mixing								2
14.	Final Project Presentation and Review								2
TOTAL								28	
Text Books:									
1. Tania Hoser, “Introduction to Cinematography”, Taylor & Francis.									
Reference Books:									
1. Anat Pick, “Screening Nature”, Berghahn Books.									
2. Blain Brown, “Cinematography: Theory and Practice”, Taylor & Francis.									
E-Resources:									
1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxK0m									
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU									

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Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Dance)							Code: 26MECC204D		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.									
Course Objectives:									
1. To develop advanced dance techniques, expressive skills, and performance readiness in Indian classical dance, culminating in a final performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Develop advanced techniques in footwork, postures, and hand gestures, with a focus on fluidity and expression.								
CO2	Embody various characters and emotions through in-depth exploration of Abhinaya								
CO3	Execute learned dance pieces with precision, synchronization, and advanced rhythmic variations.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Introduction to Character Portrayal.								2
2.	Rehearsal and Feedback.								2
3.	Advanced Footwork and Postures.								2
4.	Advanced Hand Gestures and Movements.								2
5.	Rhythmic Variations and Combinations.								2
6.	Rehearsal of Dance Piece.								2
7.	Performance Techniques.								2
8.	Integrating Steps and Expressions.								2
9.	Full Dress Rehearsal.								2
10.	Improvisation and Creative Movement.								2
11.	Corrections and Adjustments.								2
12.	Mini Performance.								2
13.	Introduction to Abhinaya in Depth.								2
14.	Preparing a New Short Dance Item.								2
TOTAL								28	
Text Books:									
1. Kapila Vatsyayan, “Indian Classical Dance”, Publications Division Ministry of Information & Broadcasting.									
Reference Books:									
1. Shubhada Varadkar, “The Glimpse of Indian Classical Dance”, Krimiga Books, Krimiga Content Development Pvt. Ltd.									
E-Resources:									
1. https://youtu.be/VP2jLLk8_jA?si=zg6_muy1w7jE5mbi									
2. https://youtu.be/xZEP4XupwJA?si=YBt3RmcHxCRe2JSr									

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Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Synthesizer/Keyboard)							Code: 26MECC204E		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic knowledge of Indian classical music and Keyboard musical instrument.									
Course Objectives:									
1. To develop advanced musical skills through complex progressions, improvisation, and composition, culminating in a polished performance and mastery of selected repertoire.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Apply complex chord progressions and advanced scales effectively in performance.								
CO2	Demonstrate proficiency in improvisation and advanced chord voicings.								
CO3	Perform selected repertoire with refined technique and stage presence.								
CO4	Successfully showcase learned skills through a polished recital or performance.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	Introduction to more complex progressions (e.g., ii-V-I)								2
2.	Basics of improvisation								2
3.	Learning advanced scales (e.g., blues scale, pentatonic scale)								2
4.	Learning advanced chord voicings and inversions								2
5.	Advanced Arpeggios and Runs								2
6.	Basics of composing music								2
7.	Initial practice on selected repertoire								2
8.	Focused practice on repertoire pieces								2
9.	Understanding stage presence and performance techniques								2
10.	Final adjustments and practice on repertoire								2
11.	Attending or reviewing a masterclass								2
12.	Receiving personalized feedback on playing								2
13.	Dress rehearsal for recital or performance								2
14.	Showcasing learned skills and pieces								2
TOTAL								28 hrs.	
Text Books:									
1. Chuan C. Chang, Fundamentals of Piano Practice, Createspace Independent Publishing Platform									
Reference Books:									
1. Michael Rodman, “Keyboard for the Absolute Beginners”, Alfred Publishing.									
2. Davis Dorrough, “Piano Scales”.									
E-Resources:									
1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH									
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb									

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Program: B. Tech (Mechanical Engineering)						Semester: II			
Course: Liberal Learning – II (Basketball)						Code: 26MECC204F			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To master advanced basketball skills, strategies, and mental conditioning to excel in team play, complex scenarios, and tournament preparation.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate mastery of advanced dribbling, passing, shooting, and defensive techniques.								
CO2	Apply complex defensive systems, advanced team play, and game strategies in mixed scenarios.								
CO3	Develop the mental toughness, conditioning, and strategic insights needed for successful tournament performance								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Revision Of Fundamentals: Review all Semester I skills. Recall and perform basic techniques correctly.								2
2.	Body Technique & Footwork: Learn pivoting, stopping and changing direction. Perform basic basketball footwork correctly.								2
3.	Combined Skill Practice: Combine passing, dribbling and shooting drills. Integrate fundamental basketball skills.								2
4.	Player Stance & Ball Control: Improve balance and ball protection. Maintain proper stance during play								2
5.	Passing & Receiving Drills: Practice passing with movement. Improve passing accuracy and coordination.								2
6.	Dribble Control: Develop speed and control while dribbling. Demonstrate improved dribbling ability.								2
7.	Assessment – III								2
8.	Shooting Practice: Practice set shots and lay-ups repeatedly. Improve shooting consistency.								2
9.	Rebounding Practice: Apply rebounding techniques in drills. Secure rebounds with correct positioning.								2
10.	Individual Defence Practice: Practice one-on-one defensive drills. Defend an opponent using proper stance.								2
11.	Footwork Drills: Improve pivoting and movement efficiency. Demonstrate better balance and coordination.								2
12.	Combined Passing & Dribbling: Perform passing after dribbling. Coordinate ball								2

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	handling with passing.	
13.	Combined Shooting Drill: Shoot after dribbling and passing. Apply shooting in simple game situations.	2
14.	Assessment - IV	2
TOTAL		28
Text Books:		
1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications		
Reference Books:		
1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan		
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher		
E-Resources:		
1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406		

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Program: B. Tech (Mechanical Engineering)						Semester: II			
Course: Liberal Learning – II (Cricket)						Code: 25MECC204G			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To develop advanced cricket skills and strategies in batting, bowling, and fielding, with a focus on mental conditioning, tactical execution, and competitive performance through intensive practice and match simulations.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate advanced techniques in batting, bowling, and fielding, including targeted drills and intensive practice.								
CO2	Apply batting and bowling strategies, and execute tactical plans during match simulations and competitive play.								
CO3	Develop strong mental conditioning and teamwork skills, preparing for high-performance in competitive matches and final assessments.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Advanced Batting Footwork: Improve movement against pace and spin								2
2.	Stroke Production: Cover drive, straight drive, sweep, lofted shots								2
3.	Batting Against Spin: Reading length and line								2
4.	Advanced Fast Bowling: Yorkers, bouncers, slower balls								2
5.	Advanced Spin Bowling: Flight, drift, turn, variations								2
6.	Fielding Techniques: Slip catching, close-in catching								2
7.	Assessment - III								2
8.	Advanced Wicket Keeping: Standing up to spinners, stumping's								2
9.	Running Between Wickets: Calling, turning, decision-making								2
10.	Team Communication: On-field coordination								2
11.	Fitness For Cricket: Agility, endurance, speed								2
12.	Match Simulation: Game scenarios								2
13.	Practical & Theory Assessment: Evaluate semester ii competencies								2
14.	Assessment - IV								2
								TOTAL	28
Text Books:									
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan									
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press									

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Reference Books:
1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India
E-Resources:
1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/preview

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Program: B. Tech (Mechanical Engineering)						Semester: II			
Course: Liberal Learning – II (Rifle and Pistol Shooting)						Code: 25MECC204H			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To achieve advanced proficiency in rifle shooting through specialized training, technical refinement, and mental preparation for competitive performance.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Master advanced rifle shooting techniques and positions to achieve higher scores.								
CO2	Develop strong mental preparation and focus techniques for peak performance and overcoming technical hurdles.								
CO3	Gain specialized training and match practice, preparing them for ISSF events and advanced shooting challenges.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Dry Fire Practice								2
2.	Live Fire Introduction: 1 st attempt of live firing								2
3.	Shot Grouping Practice: Grouping and its process								2
4.	Common Shooting Errors and Corrections								2
5.	Target Analysis: How to analyse fired target								2
6.	Zeroing: Body zero and its importance								2
7.	Assessment - III								2
8.	Standing Position Practice: To take a proper body position and balancing the body weight properly.								2
9.	Sitting Position Practice: Focusing on triggering and making close grouping								2
10.	Position Transition Drills: Knowledge about correct position and its steps								2
11.	Accuracy Improvement Drills								2
12.	Speed and Precision Shooting: To do the process in given time and releasing the shot in correct timing								2
13.	Trigger Reset Techniques: Triggering steps								2
14.	Assessment - IV								2
TOTAL								28	
Reference Books:									
1. David Watson, “ABCs of Rifle Shooting”, Gun Digest (Imprint of KP Books), 2014									

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E-Resources:
1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

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Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Volleyball)							Code: 26MECC204I		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To achieve advanced proficiency in volleyball by mastering complex techniques, strategic systems, and mental conditioning, while preparing for competitive play and tournament scenarios.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Demonstrate expertise in advanced serving, spiking, setting, and blocking techniques tailored to specific positions.								
CO2	Implement complex offensive and defensive systems and adapt to mixed scenarios through situational drills and gameplay.								
CO3	Develop mental toughness, conditioning, and strategic insights necessary for successful tournament preparation and performance.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Timing and Approach: Introduction to spiking approach, 2-step and 3-step approach, arm swing coordination, jump timing, take-off mechanics, balance, and practice drills.								2
2.	Straight Smash: Fundamentals of straight spike, correct hand contact, body positioning, jump and arm action, landing technique, target practice, and error correction.								2
3.	Basic Blocking: Ready position for blocking, footwork along the net, hand positioning, timing of the jump, blocking against different attacks, and safety precautions.								2
4.	Single Blocking Technique: Individual blocking skills, reading the attacker's movement, timing the block, penetration over the net, recovery after blocking, and practice drills.								2
5.	Rolling and Diving: Techniques of forward roll, side roll, and dive, safe landing methods, defensive recovery, floor movement drills, and injury prevention.								2
6.	Court Positioning: Player positions (1–6), offensive and defensive court coverage, movement according to ball direction, transition from attack to defence, and positional awareness.								2
7.	Assessment - III								2
8.	Rotation System: Volleyball rotation rules, clockwise rotation, serving order, positional faults, rotational movement, and practical game application.								2

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9.	Team Communication: Communication signals, calling the ball, leadership on court, teamwork, coordination during rallies, and effective communication exercises.	2
10.	Basic Offensive System (4-2): Introduction to the 4–2 offensive formation, setter responsibilities, hitter positioning, attack combinations, player movement, and tactical execution.	2
11.	Defensive Positioning: Defensive formations, court coverage, reading opponents' attacks, blocking-defense coordination, and transition from defense to offense.	2
12.	Mini Game (3 Vs 3): Modified volleyball games emphasizing teamwork, communication, rotation, offensive and defensive skills, and decision-making in small-sided play.	2
13.	Match Practice: Full-game practice following official volleyball rules, application of learned skills and tactics, referee signals, scoring system, teamwork, and sportsmanship.	2
14.	Assessment - IV	2
TOTAL		28
Text Books:		
1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher		
Reference Books:		
1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication		
E-Resources:		
1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004		

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Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Football)							Code: 26MECC204J		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Proper health, Basic knowledge of rules of the game.									
Course Objectives:									
1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Explain key concepts of transition play, positional drills, and the importance of endurance and stamina in football.								
CO2	Apply advanced tactics during simulation matches, analyze high-pressure situations.								
CO3	Students will design a game week routine that covers match preparation, mental and physical readiness, and post-match analysis, evaluating its impact on team performance and skills.								
Course Contents:									
Sr. No.	Description								Duration (Hrs.)
1.	Shooting Techniques: Demonstrate effective shooting techniques with proper body position, accuracy, power, and placement to create goal-scoring opportunities.								2
2.	Finishing in Front of Goal: Develop the ability to finish scoring opportunities in front of goal using accurate technique, quick decision-making, and composure under pressure.								2
3.	Crossing Techniques: Demonstrate effective crossing techniques with proper accuracy, timing, and delivery to create goal-scoring opportunities for teammates.								2
4.	Tackling Techniques: Demonstrate safe and effective tackling techniques using proper timing, body positioning, and decision-making to regain possession.								2
5.	Defensive Skills: Develop effective defensive skills through proper positioning, marking, interception, and teamwork to prevent attacking opportunities.								2
6.	Goalkeeping Basics: Demonstrate basic goalkeeping techniques including positioning, handling, diving, and distribution to effectively protect the goal.								2
7.	Assessment - III								2
8.	Throw-ins: Demonstrate correct throw-in techniques using proper body position, foot placement, and ball delivery to restart play effectively.								2
9.	Free Kicks & Penalty Kicks: Demonstrate proper techniques for taking free kicks and penalty kicks with accuracy, power, and decision-making to create scoring opportunities.								2
10.	Running with the Ball: Develop the ability to run with the ball using speed, control, and awareness to advance play and beat opponents effectively.								2

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11.	Communication on the Field: Develop effective on-field communication skills through clear instructions, teamwork, and coordination to improve team performance.	2
12.	Conditioning Drills: Improve football-specific fitness through conditioning drills that develop endurance, speed, agility, strength, and overall match readiness.	2
13.	Practice Match: Apply technical skills, tactical understanding, teamwork, and decision-making effectively in a practice match situation.	2
14.	Assessment - IV	2
TOTAL		28
Text Books:		
1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.		
Reference Books:		
1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.		
E-Resources:		
1. Udemmy – Soccer Courses - https://www.udemy.com/topic/soccer/		

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Program: B. Tech. (Mechanical Engineering)							Semester: II		
Course: Python & Generative AI Lab							Code: 26MEVS204		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
-	02	-	01	-	-	25	-	-	25
Prerequisites:									
Basic Mathematics, Basic Computer Literacy.									
Course Objectives:									
1. To introduce Python programming and data handling for mechanical applications. 2. To develop skills in engineering computation and data visualization. 3. To expose students to generative AI tools for design and simulation tasks.									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Select suitable Python and OOP techniques for mechanical engineering problems.								
CO2	Evaluate data visualization and numerical methods for engineering analysis.								
CO3	Recommend suitable AI tools for mechanical design, simulation, and documentation.								
List of Experiments:									
1. Program for Thermal Unit Conversion and Ideal Gas Law Calculations Using Python 2. Program for Processing Stress-Strain Data and Generating Graphs Using Python 3. Program for Modeling Mechanical Components Using Object-Oriented Programming in Python 4. Program for Implementing User-Defined Functions and Lambda Expressions in Python 5. Program for Manipulating and Processing Strings Using Python 6. Program for Determining Roots of Equations Using Bisection and Newton-Raphson Methods in Python 7. Program for Evaluating Definite Integrals Using Numerical Methods in Python 8. Program for Simulating a Prompt-Response System Using Python 9. Program for Generating Random Mechanical Design Concepts Using Python									
Reference Books:									
1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Green Tea Press, 2015 2. Wes McKinney, "Python for Data Analysis", O'Reilly Media, 2017 3. Andreas C. Müller & Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, 2016 4. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", O'Reilly Media, 2019 5. Steven C. Chapra & Raymond P. Canale, "Numerical Methods for Engineers", McGraw-Hill Education, 2020									
E-Resources:									
1. Python for Everybody – Dr. Charles Severance (Coursera)- https://www.coursera.org/specializations/python 2. Lambda Functions and String Methods – Geeks for Geeks-									

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<https://www.geeksforgeeks.org/python-lambda-anonymous-functions-filter-map-reduce/>

3. Numerical Methods with Python – MIT Open Course Ware-

<https://ocw.mit.edu/courses/mathematics/18-085-computational-science-and-engineering-i-fall-2008/>

4. Generative AI Explained – Google Cloud Skills Boost-

<https://www.cloudskillsboost.google/paths/118>

5. AI in Engineering Design – NPTEL Course- <https://nptel.ac.in/courses/112/106/112106289/>

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