

Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

NAAC Accredited with A+ Grade / ISO 21001:2018



DEPARTMENT OF MECHANICAL ENGINEERING

Curriculum Structure and Syllabus of F.Y. B. Tech. - Mechanical Engineering

(With effect from - Academic Year 2024- 25)

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 the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

DEPARTMENT OF MECHANICAL ENGINEERING

- PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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.

DEPARTMENT OF MECHANICAL ENGINEERING

LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course
PEC	Programme 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
TH	Theory
Tut	Tutorial
TW	Term Work
OR	Oral
PR	Practical

DEPARTMENT OF MECHANICAL ENGINEERING

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

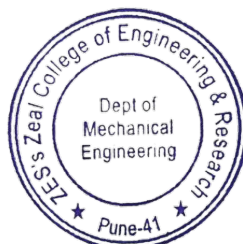
Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
MEBS101	BSC	Engineering Mathematics - I	3	-	-	3	3	-	3	40	60	-	-	-	100
MEBS102	BSC	Engineering Physics	2	2	-	4	2	1	3	40	60	25	-	-	125
MEES101	ESC	Engineering Drawing and Drafting	3	2	-	5	3	1	4	40	60	50	-	25	175
MEES102	ESC	Fundamentals of Mechanical Engineering	2	2	-	4	2	1	3	40	60	50	-	-	150
MEVS101	VSEC	IT Proficiency	-	4	-	4	-	2	2	-	-	25	-	-	25
MECC101	CC	Professional Development - I	-	4	-	4	-	2	2	-	-	50	-	-	50
MECC102	CC	Liberal Learning – I*	-	2	-	2	-	1	1	-	-	25	-	-	25
MEIK101	HSSM-IKS	Indian Knowledge System & Financial Literacy	2	-	-	2	2	-	2	-	-	50	-	-	50
Total			12	16	-	28	12	08	20	160	240	275	-	25	700

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

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



BoS Chairman




Director

ZES's Zeal College of Engineering & Research
Narhe, Pune - 411041.

DEPARTMENT OF MECHANICAL ENGINEERING

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

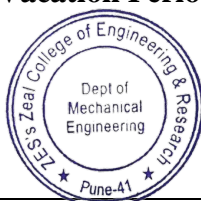
Course Code	Course Type	Course Name	Teaching Scheme(hrs/Week)						Evaluation Scheme							
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total	
							TH	PR/Tut	Total							
MEBS203	BSC	Engineering Mathematics - II	3	-	-	3	3	-	3	40	60	-	-	-	100	
MEBS204	BSC	Engineering Chemistry	2	2	-	4	2	1	3	40	60	25	-	-	125	
MEES203	ESC	Engineering Mechanics	3	-	-	3	3	-	3	40	60	-	-	-	100	
MEES204	ESC	Fundamentals of Electrical & Electronics Engineering	2	2	-	4	2	1	3	40	60	25	-	-	125	
MEPC201	PCC	Manufacturing Technology	3	-	-	3	3	-	3	40	60	-	-	-	100	
MEVS202	VSEC	Computer Aided Engineering Drawing	-	2	-	2	-	1	1	-	-	-	25	-	25	
MEVS203	VSEC	Basic Manufacturing Laboratory	-	2	-	2	-	1	1	-	-	25	-	-	25	
MECC203	CC	Professional Development – II	-	4	-	4	-	2	2	-	-	25	-	-	25	
MECC204	CC	Liberal Learning – II*	-	2	-	2	-	1	1	-	-	25	-	-	25	
MEAE201	HSSM – MC	Quality Management System – I	-	4	-	4	-	2	2	-	-	25	-	-	25	
MEIN201	ELC – INT	Internship – I#	5 Week				2			2	-	-	25	-	-	25
Total			13	18	-	31	13	11	24	200	300	175	25	-	700	

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

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

Internship I: After Semester II during Vacation Period.


BoS Chairman




Director

ZES's Zeal College of Engineering & Research
Narhe, Pune - 411041.

DEPARTMENT OF MECHANICAL ENGINEERING

INDEX

Sr. No.	Course Code	Course Name	Page No.
First Year B. Tech Mechanical Engineering : Semester - I			
1	MEBS101	Engineering Mathematics - I	8
2	MEBS102	Engineering Physics	10
3	MEES101	Engineering Drawing and Drafting	14
4	MEES102	Fundamentals of Mechanical Engineering	17
5	MEVS101	IT Proficiency	20
6	MECC101	Professional Development - I	22
7	MECC102	Liberal Learning – I	23-32
8	MEIK101	Indian Knowledge System & Financial Literacy	33
First Year B. Tech Mechanical Engineering : Semester - II			
9	MEBS203	Engineering Mathematics - II	36
10	MEBS204	Engineering Chemistry	38
11	MEES203	Engineering Mechanics	41
12	MEES204	Fundamentals of Electrical & Electronics Engineering	43
13	MEPC201	Manufacturing Technology	46
14	MEVS202	Computer Aided Engineering Drawing	48
15	MEVS203	Basic Manufacturing Laboratory	51
16	MECC203	Professional Development – II	53
17	MECC204	Liberal Learning – II	54-63
18	MEAE201	Quality Management System – I	64
19	MEIN201	Internship – I	65



DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS
SEMESTER - I

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: Engineering Mathematics - I							Code: MEBS101			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	EET	TW	OR	PR	Total	
03	-	-	03	40	60	-	-	-	100	
Prerequisites:										
Basic concept of Differentiation, Integration, Maxima and Minima, Matrices and Determinants.										
Course Objectives:										
<ol style="list-style-type: none"> 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	
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		

DEPARTMENT OF MECHANICAL ENGINEERING

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=PLU6SqdyYsfLuIJdHwY92aGBg5-uRHBOb&index=1>

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I		
Course: Engineering Physics							Code: MEBS102		
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	25	-	-	125
Prerequisites:									
Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.									
Course Objectives:									
<ol style="list-style-type: none"> 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
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 fibers- Propagation of light - Acceptance angle, Acceptance cone, Numerical aperture, Fractional Refractive Index Change (Simple numerical). Types of optical fibers, Advantages of optical fiber communication, Applications of optical fiber in Medical, Communication, Entertainment, Data Security.								5

DEPARTMENT OF MECHANICAL ENGINEERING

3.	<p>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.</p>	4
4.	<p>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).</p>	5
5.	<p>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.</p>	4
6.	<p>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.</p>	5
TOTAL		28

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).

DEPARTMENT OF MECHANICAL ENGINEERING

- To determine Hall coefficient and charge carrier density.
- Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer.
- An experiment based on optical fiber. (To determine the numerical aperture acceptance angle acceptance cone of optical fiber of laser diode.
- Experiment based on semiconductor (To determine the temperature dependence characteristics of semiconductor).
- To determine the unknown wavelength by using plane diffraction grating.
- Study visit to research laboratory/ facility and submit report (**Compulsory**).

Text Books:

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

Reference Books:

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

E-Resources:

- NPTEL Course:
 - NPTEL lecture based on interference of polarized light by IIT Roorkee - https://youtu.be/e-4QK_JVsdU?si=gWIBt41dDgeABO8Y
 - NPTEL lecture based on Introduction of Polarization by IIT Roorkee- <https://youtu.be/fIVlzKB4bBQ?si=meWFP5matsopCABi>
 - NPTEL lecture based on Malus Law by IIT Roorkee <https://youtu.be/iFG82I3nFA0?si=JClN6fJqGNw6ix5U>
 - NPTEL lecture based on Double Refraction by IIT Roorkee <https://youtu.be/Pt5wvYyguq0?si=4mowxORZQXGXNxmW>
 - NPTEL lecture based on Semiconductor Physics by IIT Roorkee - <https://youtu.be/q7VIITSysMs?si=62lAMoJ2tMHKRiDH>
 - NPTEL lecture based on Introduction to superconductivity <https://youtu.be/hGPA1g8fKug?si=FdYfJju6bf6u2zRe>
 - NPTEL lecture based on Meissner Effect- <https://youtu.be/EkNnxBakJMs?si=qRnSvPID2NTE4rf->
- Feynman lecture series: <https://www.feynmanlectures.caltech.edu/>
- Concepts of Modern Physics, Arthur Beiser: - https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf
- Lectures by Walter Lewin: <https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw>



DEPARTMENT OF MECHANICAL ENGINEERING

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>

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: Engineering Drawing and Drafting							Code: MEES101			
Teaching Scheme				Evaluation Scheme						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
03	02	-	04	40	60	50	-	25	175	
Prerequisites:										
Shapes, Mathematics, Geometry and geometry construction, skills for handling drawing instruments.										
Course Objectives:										
<ol style="list-style-type: none"> 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 angle projections, methods of obtaining orthographic views by First angle method,								7	

DEPARTMENT OF MECHANICAL ENGINEERING

	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
List of Assignments:		
<ol style="list-style-type: none"> 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) 		
Text Books:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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 		



DEPARTMENT OF MECHANICAL ENGINEERING

4. Prof. Avalokita Agrawal, IIT, Roorkee, NPTEL Course, “Engineering/Architectural Graphics Part-1 and 2”, Link-
https://www.youtube.com/watch?v=VrU73IwRyc4&list=PLLy_2iUCG87Bw9XPfEF3r3EW5UIAOv8iz
5. Prof. Anupam saxena, IIT Kanpur, NPTEL Course, “Mechanical Engineering Drawing”, Link-
https://www.youtube.com/watch?v=ZIZyQbCX30E&list=PLbMVogVj5nJRgBjyxu0Pfh3Ucdq_mDo4o

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: Fundamentals of Mechanical Engineering							Code: MEES102			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
02	02	-	03	40	60	50	-	-	150	
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	

DEPARTMENT OF MECHANICAL ENGINEERING

4.	<p>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.</p>	5
5.	<p>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</p>	4
6.	<p>Manufacturing: Introduction to Casting, Forming, Machining and Joining Processes. Introduction to advanced manufacturing process. Introduction to smart manufacturing.</p>	4
TOTAL		28
List of Experiments:		
<p>Any 8 experiment from the following</p> <ol style="list-style-type: none"> 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. 		
Text Books:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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. 		



DEPARTMENT OF MECHANICAL ENGINEERING

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/

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: IT Proficiency							Code: MEVS101			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
-	04	-	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	Analyze and visualize complex data with pivot tables and charts.									
CO4	Analyze advanced Excel functions, pivot tables, macros, and data protection techniques.									
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.								08	
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.								10	
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.								10	
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 transition, Using slide master, Slide show option, Proofing and Printing.								10	

DEPARTMENT OF MECHANICAL ENGINEERING

5	<p>Introduction to Latex: Installation of the software LaTeX , Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables.</p> <p>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.</p> <p>Packages - Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Classes: article, book, report, beamer, slides. IEEtran.</p> <p>Applications - Writing Resume, Writing articles/ research papers, project report.</p>	10
6	<p>Internet Ethics & AI tools: Working with Internet and-mail, Using the Internet, Internet Ethics and Safety, Social Media,</p> <p>AI Tools: Jasper, GitHub Copilot, Synthesia, Writesonic.</p>	08
TOTAL		56
List of Experiments:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 2. Banerjee Snigdha, “MS Word 2000”, New Age International. 3. Quentin Docter, Q., et al., "CompTIA IT Fundamentals Study Guide: Exam FC0-U61", Wiley, USA. 4. Lambert, J., Frye, C., et al., "Microsoft Office 2019 Step by Step", Microsoft Press, USA. 		
Reference Books:		
<ol style="list-style-type: none"> 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. 		
E-Resources:		
<ol style="list-style-type: none"> 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 		

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: Professional Development – I							Code: MECC101			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
-	04	-	02	-	-	50	-	-	50	
Course Objectives:										
<ol style="list-style-type: none"> To introduce students on professional development skills and its importance in building personal and professional life. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society. 										
Course Outcomes: After completion of this course, students will be able to -										
CO1	Know their own values and how to use in their career and personal life.									
CO2	Understand the importance of self-discipline and how it can empower individuals to take control of their actions and decision in any situation.									
CO3	Know the importance of self-grooming to maintain good health and self-confidence.									
Course Contents:										
Unit	Description								Duration (Hrs.)	
1.	Values: Understand, Know, Define and Use of your Values, Types of Values, Internal and External Stakeholders, What is SWOT analysis and how to do, Action planning and execution, Self-review.								24	
2.	Self-discipline: Definition, Self-discipline impact in your life and society, Techniques to build self-discipline, Self-review and actions.								16	
3.	Self-grooming: What is personal grooming and its importance, Making Self-care guide and practice, Self-care for health and well-being.								16	
TOTAL								56		
Text Books:										
<ol style="list-style-type: none"> R. Srinivasan, "Strategic Management: Text and Cases", PHI Publication. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals". 										
Reference Books:										
<ol style="list-style-type: none"> Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989. Jack Canfield, "The Success Principles", HarperCollins, 2005. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952. 										
E-Resources:										
<ol style="list-style-type: none"> Coursera: "The Science of Well-Being" by Yale University, - https://www.coursera.org/learn/the-science-of-well-being 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 										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Guitar)							Code: MECC102A			
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 techniques, 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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Singing)							Code: MECC102B			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Cinematography)							Code: MECC102C			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Dance)							Code: MECC102D			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Synthesizer/Keyboard)							Code: MECC102E			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Basketball)							Code: MECC102F			
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.	Introduction to Basketball								2	
2.	Basic Skills – Dribbling								2	
3.	Basic Skills- Passing								2	
4.	Basic Skills- Shooting								2	
5.	Defensive Fundamentals								2	
6.	Rebounding Basics								2	
7.	Ball Handling & Control								2	
8.	Shooting Mechanics								2	
9.	Offensive Strategies								2	
10.	Defensive Strategies								2	
11.	Transition Play								2	
12.	Gameplay & Scrimmage								2	
13.	Game Rules , Refree Gestures								2	
14.	Practical								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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Cricket)							Code: MECC102G			
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 and Fundamentals.								2	
2.	Basic Techniques.								2	
3.	Introduction to Game Scenarios.								2	
4.	Physical Fitness and Match Simulations.								2	
5.	Advanced Batting Techniques								2	
6.	Advanced Bowling Techniques								2	
7.	Specialized Fielding and Wicket keeping								2	
8.	Tactical Understanding								2	
9.	Refining Batting Techniques								2	
10.	Refining Bowling Techniques								2	
11.	Fielding Under Pressure								2	
12.	Strength and Conditioning								2	
13.	Targeted Skill Improvement								2	
14.	Mid-Season Assessment								2	
TOTAL								28		
Text Books:										
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan										
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press										
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/										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Rifle and Pistol Shooting)							Code: MECC102H			
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 and advanced 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 about shooting game								2	
2.	Basic technical knowledge								2	
3.	Technique Refinement(aiming, breathing and triggering)								2	
4.	Learning about live shooting and technics								2	
5.	Practicing standard Positional rifle Shooting								2	
6.	Mental Preparation and Focus								2	
7.	Practice and learning session of live shooting(rifle)								2	
8.	Learning about pistol shooting(pistol)								2	
9.	Introduction of pistol positions and dry practice								2	
10.	Practical Shooting Drills (basic)								2	
11.	Learning about live shooting and technics(standing position)								2	
12.	Learning of Concentration, breathing and relaxing exercise for shooting								2	
13.	Introduction of competition level and practice								2	
14.	Final test and oral (rifle and pistol match)								2	
TOTAL								28		
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Volleyball)							Code: MECC102I			
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								2	
2.	Basic Skills - Serving								2	
3.	Basic Skills- Passing								2	
4.	Basic Skills- Setting								2	
5.	Spiking Basics								2	
6.	Blocking Basics								2	
7.	Digging Basics								2	
8.	Serve Receive								2	
9.	Offensive Strategies								2	
10.	Defensive Strategies								2	
11.	Transition Play								2	
12.	Gameplay & Scrimmage								2	
13.	Game Rules , Refree Gestures								2	
14.	Practical								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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: I			
Course: Liberal Learning – I (Football)							Code: MECC102J			
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 and Basic Skills.								2	
2.	Ball Control and Movement.								2	
3.	Advanced Dribbling and Passing.								2	
4.	Shooting and Finishing.								2	
5.	Offensive Tactics.								2	
6.	Defensive Tactics.								2	
7.	Set Pieces (Offensive and Defensive).								2	
8.	Team Chemistry and Communication.								2	
9.	Midfield Dominance.								2	
10.	Forward Play and Creativity.								2	
11.	Defense Organization.								2	
12.	Goalkeeper Training.								2	
13.	Speed and Agility.								2	
14.	Simulation Matches.								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. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: I			
Course: Indian Knowledge System and Financial Literacy							Code: MEIK101			
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:										
<ol style="list-style-type: none"> 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	
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	

DEPARTMENT OF MECHANICAL ENGINEERING

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, Barrowing, Loans / Debts, Types of loans, Terms of barrowing, 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 Filing, 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:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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. 		
E-Resources:		
<ol style="list-style-type: none"> 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 		



DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS
SEMESTER - II

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Engineering Mathematics - II							Code: MEBS203			
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:										
<ol style="list-style-type: none"> 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	

DEPARTMENT OF MECHANICAL ENGINEERING

6.	Applications of Multiple Integral: Applications to find Area, Volume, Mass, Centre of gravity and Moment of inertia.	7
TOTAL		42
Text Books:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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=9CHfHuFBT8&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_dwxAQf8li6VC54 6. Double Integration - Change of Order of Integration Cartesian & Polar https://www.youtube.com/watch?v=fXMyLYwBB3s&list=PLU6SqdYcYsfLoKyzF_dwxAQf8li6VC54&index=4 		

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Engineering Chemistry							Code: MEBS204			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
02	02	-	03	40	60	25	-	-	125	
Prerequisites:										
Basic knowledge of volumetric analysis, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.										
Course Objectives:										
<ol style="list-style-type: none"> 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 versus Strong base), Conductometry (Titration of Strong acid versus 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 dipping, Electroplating.								4	

DEPARTMENT OF MECHANICAL ENGINEERING

4.	<p>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.</p>	5
5.	<p>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.</p>	5
6.	<p>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.</p>	4
TOTAL		28
List of Experiments:		
A. Lab Experiments (Any Seven)		
<ol style="list-style-type: none"> 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 $\text{CuSO}_4/\text{FeSO}_4/\text{KMnO}_4$, 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)		
<ol style="list-style-type: none"> 10. Demonstration of effect of environmental conditions on metal by weight loss method. 11. Synthesis of oxide nanoparticles. 		
C. Mandatory visit to chemical industry/research laboratory/water treatment plant.		
Text Books:		
<ol style="list-style-type: none"> 1. O.G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. 2. Dara S. S., Umare S. A., "Textbook of Engineering Chemistry", 12th Ed, S. Chand & Com Ltd. 3. Jain and Jain, "Engineering Chemistry", 16th Ed, Dhanpat Rai and Co. (Pvt.) Ltd., Delhi. 		

DEPARTMENT OF MECHANICAL ENGINEERING

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; 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. 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.

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/>

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/

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Engineering Mechanics							Code: MEES203			
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	
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		



DEPARTMENT OF MECHANICAL ENGINEERING

Text Books:

1. Timoshenko and Younge, Engineering Mechanics, McGraw Hill Publications
2. Meriam J.L. and Kraige L.G., “Engineering Mechanics: Statics”, 6th Edition, John Willey and Son’s
3. Meriam J.L., and Kraige L.G., “Engineering Mechanics: Dynamics”, 6th 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,
3. I. H. Shames, Engineering Mechanics: Statics and Dynamics, 4th Edition, PHI, 2002.
4. 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/>

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)						Semester: II			
Course: Fundamentals of Electrical and Electronics Engineering						Code: MEES204			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)					
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total
02	02	-	03	40	60	25	-	-	125
Prerequisites:									
Basic Physics and Mathematics, Semiconductor Physics, Electric charges and fields, Coulomb's laws.									
Course Objectives:									
<ol style="list-style-type: none"> 1. To understand passive electronic components, semiconductor devices, and their applications in basic circuits. 2. To learn the fundamentals of digital electronics, including number systems, Boolean laws, and logic gates. 3. To grasp basic electrical and electromagnetism principles, including Ohm's and Kirchhoff's laws, and transformer operation. 4. To explore DC machines and three-phase induction motors, their working principles, characteristics, and industrial applications. 									
Course Outcomes: After completion of this course, students will be able to -									
CO1	Understanding basic of Electronic Circuits Utilizing Active and Passive Components								
CO2	Apply Knowledge of Diode Characteristics and Configurations in Circuit Design.								
CO3	Demonstrate understanding of basic digital logic gates and logic circuits.								
CO4	Understand electrical fundamentals, including electromagnetism and AC circuit principles.								
CO5	Learn the construction, principles, and operation of transformers and DC machines, including their types, losses, efficiency, and key performance characteristics.								
CO6	Examine the construction, working principles, and performance characteristics of three-phase induction motors.								
Course Contents:									
Unit	Description								Duration (Hrs.)
1.	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.								5
2.	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.								5

DEPARTMENT OF MECHANICAL ENGINEERING

3.	<p>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.</p>	4
4.	<p>Basic Electrical Fundamentals: Concept of electrical current, electromotive force and electrical resistance, ohm's law and Kirchoff's laws (KCL and KVL), resistances in series & parallel circuits. Power and energy in electrical circuits, Introduction to magnetic field, flux, magnetic field intensity, flux density and mmf. (No Illustrative Examples on D.C. Circuits & Magnetism). Electromagnetism: Faraday's laws, Lenz's law. Fleming's left and right hand rule, concept of dynamically induced e.m.f, statically induced e.m.f.s., concept of self and mutual inductance.</p>	4
5.	<p>Transformer and DC Machines: Part A) Construction, principle, working, e.m.f. equation of transformer, ideal and practical transformer, losses, types of transformers (step up and step down transformer), concept of voltage regulation and efficiency (numerical). Part B) Construction, working principle, and applications of DC generator and motor, voltage expression of generator and motor (derivation not expected), concept of back-emf, Equation of armature torque and shaft torque (derivation not expected), Characteristics of DC shunt motor, speed control methods for DC shunt motor (field flux control and armature voltage control), Braking in DC motor (Regenerative braking only in DC- shunt motor).</p>	5
6.	<p>Three Phase Induction Motor: Constructional features, working principle of three phase induction motor, types (squirrel cage and slip ring), concept of synchronous speed, rotor speed, slip, frequency of rotor current, effect on magnitude of rotor induced emf, effect on rotor resistance and reactance, rotor current and rotor power factor, power stages in three phase induction motor, relationship between rotor input power and rotor copper loss, torque equation of three phase induction motor, torque-slip characteristics, speed control methods of three phase induction motor (v/f control and variable frequency drive), industrial applications of induction motor.</p>	5
TOTAL		28

List of Experiments:

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
 - b) Measure Voltage, Resistance using digital Millimeter. Also use Millimeter to check diode, BJT.

DEPARTMENT OF MECHANICAL ENGINEERING

3. Test and verify the truth tables of:
 - a) Basic and Universal Gates (Study the datasheet of respective ICs)
 - b) Half & Full Adder 8
4. Case Study of any one electronics appliance with block diagram, specification etc.

Electrical Experiments:

1. To determine efficiency and regulation of transformer by direct loading test of a single-phase transformer.
2. Speed control of D.C. Shunt motor (field flux control and armature voltage control).
3. Brake test on D.C. Shunt motor
4. Load test on 3-phase induction motor.

A. Lab Experiments (Any Seven)

B. Demonstration (virtual) (Any One)

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

Text Books:

1. Thomas. L. Floyd, "Electronics Devices", Pearson.
2. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
3. B.L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology - Volume I: Basic Electrical Engineering", S Chand Publication.
4. V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S. Chand and Company Private Ltd.

Reference Books:

1. J. Schiller, "Mobile Communication", 2nd Edition, Pearson
2. C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited
3. S K Bhattacharya, "Electrical Machines", McGraw Hill Education, 2nd edition, 2008.
4. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press.
5. Donald A. Neamen, "Semiconductor Physics and Devices".
6. Paul Horowitz and Winfield Hill, "The Art of Electronics".
7. P.S. Bhimbra, "Power Electronics".
8. D. Patrnabis, "Sensors and Transducers", PHI.
9. Kennedy & Davis, "Electronic Communication Systems", Tata McGraw Hill.
10. M. Schwartz, "Mobile Wireless communication", Cambridge University Press.

E-Resources:

1. Prof. Chitrlekha 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. Sudip Misra, IIT Kharagpur, Introduction to Internet of Things,
<https://archive.nptel.ac.in/courses/106/105/106105166/>
4. Prof. Debapriya Das, IIT Kharagpur, Fundamentals of Electrical Engineering,
<https://nptel.ac.in/courses/108105112>

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Manufacturing Technology							Code: MEPC201			
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:										
<ol style="list-style-type: none"> 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 magnetic forming processes.								6	

DEPARTMENT OF MECHANICAL ENGINEERING

3.	<p>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.</p>	6
4.	<p>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.</p>	6
5.	<p>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.</p>	8
6.	<p>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.</p>	8
TOTAL		42
Text Books:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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) 4. Prof. D.K. Dwivedi, IIT Roorkee, Joining Technologies –Metal properties and weldability, NPTEL : NOC:Joining Technologies for Metals (Mechanical Engineering) (digimat.in) 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 		

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. Mechanical Engineering							Semester: II			
Course: Computer Aided Engineering Drawing							Code: MEVS202			
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:										
<ol style="list-style-type: none"> 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.									
Course Contents:										
Unit	Description								Duration (Hrs.)	
1.	Introduction to CAD and Basic Drawing Commands: Introduction to CAD and CAD Software, Overview of CAD and its applications, Introduction to various CAD software tools. Understanding the CAD Interface, Workspace, ribbon, command line, and toolbars, Navigating the CAD interface. Units and Measurement, setting up units, Understanding measurement systems in CAD. Basic Drawing Commands, Line, Circle, Arc, Rectangle, Polygon. Editing Commands, Erase, Move, Copy, Mirror, Rotate.								4	
2.	Object Selection and Layer Management: Object Selection Methods, Selecting objects: Select, Window, Crossing, Fence, Using selection filters and quick select. Using Layers and Properties, creating layers, assigning colors, line types, and line weights, Managing layer properties and visibility.								4	
3.	Advanced Drawing Commands and Precision Techniques: Advanced Drawing Commands, Polyline, Spline, Ellipse, Hatch, Region. Working with Blocks and Attributes, Creating, inserting, and editing blocks, Understanding and using attributes. Precision Drawing Techniques, Polar tracking, Object snaps, Ortho mode.								4	

DEPARTMENT OF MECHANICAL ENGINEERING

4.	<p>Modifying Tools and Dimensioning: Introduction to Modifying Tools, Stretch, Scale, Trim, Extend, Inquiry Commands, Distance, Area, ID, List. Dimensioning Basics, Linear dimensions, aligned dimensions, Radius and Diameter dimensions, Annotation Tools, Text, Multiline Text, Leaders, Adding and managing annotations.</p>	4
5.	<p>Advanced Editing and 3D Modeling: Advanced Editing Commands, Offset, Fillet, Chamfer, Array. Advanced Modification Tools, Advanced use of Stretch, Scale, Rotate, Mirror. Introduction to 3D Modeling, Basics of Wireframe, Surface, and Solid modeling, Creating and Editing 3D Objects, Extrude, Revolve, Sweep. Applying materials and textures, Rendering and Visualization, Introduction to rendering techniques, Visualization and presentation of 3D models.</p>	6
6.	<p>Project Work, Customization, and Standards: Project Work, designing a simple mechanical or architectural component, Adding dimensions, annotations, and detailing. Customization in CAD, Workspace customization, Creating and using shortcut keys and tool palettes. Plotting and Printing, Preparing drawings for output, Plotting and printing techniques. Review and Assessment, Review of the CAD project, Assessment and feedback.</p>	6
TOTAL		28

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 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.



DEPARTMENT OF MECHANICAL ENGINEERING

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

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Basic Manufacturing Laboratory							Code: MEVS203			
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:										
<ol style="list-style-type: none"> 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.									
Course Contents:										
Unit	Description								Duration (Hrs.)	
1.	Carpentry: Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, One job any basic joint using various hand tools.								4	
2.	Fitting: Introduction to marking, cutting and sawing, sizing of metal, shearing, Concept of fits and interchangeability, selection of datum and measurements, one job involving fitting to size, male-female fitting with different types of files, drilling and tapping operation on Mild Steel plate.								4	
3.	Sheet Metal Work: Types of sheet metals and their applications, Sheet metal tools and equipment (shears, brakes, rollers), Basic sheet metal operations (cutting, bending, forming), Joining techniques (riveting, soldering, brazing), Fabrication of simple sheet metal products (tray, enclosures, storage for pen/pencils, etc)								4	

DEPARTMENT OF MECHANICAL ENGINEERING

4.	Machining Basics: Introduction to basic machining processes, Operation of manual lathes or milling machines, Basic turning, facing, drilling or milling operations, Demonstration on lathe / milling machine to produce simple part	4
5.	Welding: Types of Joints, Edge preparation, Arc Welding Set up, Arc Welding Practice, One sample joint by Arc welding	4
6.	Digital Manufacturing: 3D Printing: 3D Printer components, working and demonstration of 3D printer, Concept of laminated 3D Printing CNC Laser Cutting: Over view of CNC laser cutting machines, Key components (laser source, CNC controller, cutting bed, assist gas system), Demonstration of laser cutting operation for simple contour. CNC Router Operation: Key components of a CNC router (spindle, gantry, control system), working principles of CNC routers, Demonstration of CNC Router operation to develop simple component	8
TOTAL		28

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.
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>

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Professional Development - II							Code: MECC203			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
-	04	-	02	-	-	25	-	-	25	
Course Objectives:										
<ol style="list-style-type: none"> 1. To introduce students on professional development skills and its importance in building personal and professional life. 2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society. 										
Course Outcomes: After completion of this course, students will be able to -										
CO1	Understand the interpersonal skills importance and finding skill gaps for development.									
CO2	Know how to be effective in managing our time with application of simple tools & techniques.									
CO3	Know the effective components of teamwork and how to be effective in our role for team performance and goals.									
Course Contents:										
Unit	Description								Duration (Hrs.)	
1.	Interpersonal Skills: Understanding on IP skills; Essentials of IP; How to develop IP skills.								24	
2.	Time management: What is time management? Time study and mapping; Knowing the time management tools & techniques; How to apply tools & techniques for effective time management; Self-evaluation.								16	
3.	Teamwork: Team and Individual thinking; Characteristics of Teamwork; Importance at work profession; Benefits								16	
TOTAL								56		
Text Books:										
1. Dr. P. K. Sinha, "Interpersonal Skills for Managers", Sage Publications.										
Reference Books:										
1. John C. Maxwell and Les Parrott, "25 Ways to Win with People", Thomas Nelson, 2013.										
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts", Touchstone, 1986.										
3. Chris Bailey, "The Productivity Project: Accomplishing More by Managing Your Time, Attention, and Energy", Crown Business, 2016.										
4. Jon Gordon, "The Power of a Positive Team: Proven Principles and Practices that Make Great Teams Great", Wiley, 2017.										
E-Resources:										
1. Coursera - "Improving Your Interpersonal Skills", https://www.coursera.org/learn/interpersonal-skills										
2. Coursera - "Leading Teams", https://www.coursera.org/learn/leading-teams										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Guitar)							Code: MECC204A			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Singing)							Code: MECC204B			
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Cinematography)							Code: MECC204C			
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 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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Dance)							Code: MECC204D			
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 (expressional dance).									
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=YBt3RmcHxCRC2JSr										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II		
Course: Liberal Learning – II (Synthesizer/Keyboard)							Code: MECC204E		
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									

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Basketball)							Code: MECC204F			
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.	Advanced Dribbling Techniques								2	
2.	Advanced Passing Techniques								2	
3.	Advanced Shooting Techniques								2	
4.	Advanced Defense Techniques								2	
5.	Position Specific Training								2	
6.	Conditioning & Strength Training								2	
7.	Mental Toughness & Focus								2	
8.	Advance Team Play								2	
9.	Complex Defensive System								2	
10.	Mixed Scenarios & Situational Drills								2	
11.	Tournament Preparation								2	
12.	Advance Game Play & Strategy								2	
13.	Mastery & Final Assessment								2	
14.	Final Scrimmage								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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Cricket)							Code: MECC204G			
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.	Batting Strategies.								2	
2.	Bowling Strategies.								2	
3.	Fielding Strategies.								2	
4.	Match Simulations and Tactical Execution.								2	
5.	Targeted Skill Improvement.								2	
6.	Mental Conditioning.								2	
7.	Intensive Match Simulations.								2	
8.	Advanced Batting Drills.								2	
9.	Advanced Bowling Drills.								2	
10.	Fielding and Wicket keeping in Game Conditions.								2	
11.	Game Analysis and Strategy Sessions.								2	
12.	Final Skill Polishing.								2	
13.	Teamwork and Communication.								2	
14.	Competitive Matches and Final Assessments.								2	
TOTAL								28		
Text Books:										
1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan										
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press										
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Rifle and Pistol Shooting)							Code: MECC204H			
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.	Understand and learning about advance rifle position								2	
2.	Advance technical knowledge								2	
3.	Advance Technique Refinement								2	
4.	Learning about advance shooting and technics for achieving score								2	
5.	Specialized Training								2	
6.	Mental Preparation and Focus								2	
7.	Peak Performance and analyses								2	
8.	Advanced Skills Development								2	
9.	Tactical Applications and working about single shoot								2	
10.	Advanced Challenges and Readiness								2	
11.	Review and Consolidation								2	
12.	Focus on technical and mental hurdles								2	
13.	Person to person attention								2	
14.	Match practice and preparation as per ISSF event								2	
TOTAL								28		
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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Volleyball)							Code: MECC204I			
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.	Advanced Serving Techniques								2	
2.	Advanced Spiking Techniques								2	
3.	Advanced Setting Techniques								2	
4.	Advanced Blocking Techniques								2	
5.	Position – Specific Training								2	
6.	Conditioning & Strength Training								2	
7.	Mental Toughness & Focus								2	
8.	Game Analysis & Feedback								2	
9.	Complex Offensive System								2	
10.	Complex Defensive System								2	
11.	Mixed Scenarios & Situational Drills								2	
12.	Advanced Gameplay & Strategies								2	
13.	Review & Reinforcement								2	
14.	Tournament Preparation								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										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech (Mechanical Engineering)							Semester: II			
Course: Liberal Learning – II (Football)							Code: MECC204J			
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 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.	Transition Play.								2	
2.	Positional Drills.								2	
3.	Endurance and Stamina.								2	
4.	Video Analysis and Feedback.								2	
5.	Advanced Tactics and Strategy.								2	
6.	High-Pressure Situations.								2	
7.	Leadership and Team Roles.								2	
8.	Refining Skills and Tactics.								2	
9.	Match Preparation.								2	
10.	Mental and Physical Preparation.								2	
11.	Game Week Routine.								2	
12.	Post Goalkeeper Training.								2	
13.	Post-Match Analysis and Recovery.								2	
14.	Simulation Matches.								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. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Quality Management System - I							Code: MEAE201			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	PR	OR	Total	
-	04	-	02	-	-	25	-	-	25	
Prerequisites:										
Interactive mind-set for practical.										
Course Objectives:										
<ol style="list-style-type: none"> 1. To acquire basic knowledge of QMS. 2. To understand the structure and requirements of a QMS. 										
Course Outcomes: After completion of this course, students will be able to -										
CO1	Know the evolution of Quality and QMS.									
CO2	Understand What is meant by Quality and its importance in an organization.									
CO3	Understand the model of QMS and its objectives.									
CO4	Know the standard requirements in QMS.									
Course Contents:										
Unit	Description								Duration (Hrs.)	
1.	Quality & Standardization: Evolution of Quality and its changes, ISO for standardization, Standardization and its benefits.								14	
2.	Introduction to QMS: Definition of Quality, Quality effect to organization, QMS & its benefits to organization, Terminologies.								14	
3.	QMS Principles: Eight principles of QMS and its benefits – Customer focus, Leadership, People involvement, Process approach, System approach to management, Continual Improvement, Fact based decisions, Supplier relationship.								28	
TOTAL								56		
Text Books:										
<ol style="list-style-type: none"> 1. S. K. Bhattacharyya, “Quality Management Systems: Theory and Practice”, PHI Learning. 2. M. S. B. Reddy, “Introduction to Quality Management”, New Age International. 										
Reference Books:										
<ol style="list-style-type: none"> 1. J.M. Juran and Joseph A. De Feo, Introduction to Quality Management, McGraw-Hill Education. 2. Janet L. Horne, ISO 9001:2015 – A Complete Guide to Quality Management Systems, Quality Press. 3. Mark A. D. Hounsell, Fundamentals of Quality Control and Improvement, Wiley Publication. 										
E-Resources:										
<ol style="list-style-type: none"> 1. ISO 9001:2015 - Quality Management System (QMS), https://alison.com/course/iso-9001-2015-quality-management-system-qms#google_vignette 2. Coursera - Quality Improvement and Management, - https://www.coursera.org/learn/quality-improvement-and-management 										

DEPARTMENT OF MECHANICAL ENGINEERING

Program: B. Tech. (Mechanical Engineering)							Semester: II			
Course: Internship – I							Code: MEIN201			
Teaching Scheme (Hrs/week)				Evaluation Scheme (Marks)						
Lecture	Practical	Tutorial	Credit	CIE	ETE	TW	OR	PR	Total	
-	-	-	02	-	-	25	-	-	25	
Preamble:										
Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.										
Course Objectives:										
<ol style="list-style-type: none"> 1. To exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry. 2. To learn to implement the technical knowledge in real industrial situations. 										
Course Outcomes: After completion of this course, students will be able to -										
CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.									
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.									
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.									
Internship Requirements										
<ol style="list-style-type: none"> 1. Internship Duration: It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW). 2. Internship Opportunities: Students can explore various opportunities for internships at: <ol style="list-style-type: none"> a. Industries b. Research labs or organizations c. Collegiate clubs d. In-house research projects e. Online internships 3. Support and Assistance: Students can seek assistance for securing internships from: <ol style="list-style-type: none"> a. The Training and Placement cell, along with departmental coordinators b. Department or institute faculty members c. Personal contacts d. Directly connecting with industries or organizations 4. Request Letter: Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the 										

DEPARTMENT OF MECHANICAL ENGINEERING

standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.