Annasaheb Dange College of Engineering and Technology, Ashta

(An Empowered Autonomous Institute)

Curriculum Structure

F.Y. B.Tech.
MECHANICAL ENGINEERING

SEM I & II
w.e.f. 2025-26

Department of Mechanical Engineering

Annasaheb Dange College of Engineering and Technology

Established: 1999

Ashta - 416301, Dist.: Sangli, Maharashtra

(An Empowered Autonomous Institute)

F.Y. B.Tech. – Mechanical Engineering
[Level 4.5, UG Certificate] Semester - I

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	3MEBS101	Applied Mathematics-I	3	1	-	2	4	40	20	40	--	--
02	BS	LIT2	3MEBS102	Applied Chemistry	3	-	2	2	4	40	20	40	50	--
03	ES	LIT1	3MEES103	Engineering Graphics with CAD	3	-	2	2	4	40	20	40	50	50
04	ES	LIT2	3MEES104	Basic Electrical & Electronics Engineering	3	-	2	2	4	40	20	40	50	--
05	ES	L1	3MEES105	Computer Programming	1	-	2	2	2	--	--	--	50	50
06	IKS	T2	3MEIKS106	Indian Knowledge System	2	-	-	-	2	--	50	--	--	--
07	ES	L2	3MEES107	Design Thinking Laboratory	-	-	2	1	1	--	--	--	50	--
08	CC	L2	3BSCCXXX	Liberal Learning Course - I	-	-	2	-	1	--	--	--	50	--
				Total	15	1	12	11	22					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIE (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50

CC Bouquet

Course Code	Course Name	Course Code	Course Name	Course Code	Course Name
3BSCC121	Introduction to Yoga and Mindfulness	3BSCC123	Six-Sigma Happiness and Mind Mechanics	3BSCC125	Community Engagement through NSS
3BSCC122	Physical Fitness and Lifestyle Management	3BSCC124	Creativity through Visual Arts	3BSCC126	Cultural Exploration & Heritage

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F.Y. B.Tech. – Mechanical Engineering
[Level 4.5, UG Certificate] Semester - II

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	3MEBS109	Applied Mathematics-II	3	1	-	2	4	40	20	40	--	--
02	BS	LIT2	3MEBS110	Applied Physics	3	-	2	2	4	40	20	40	50	--
03	ES	T1	3MEES111	Applied Mechanics	3	-	-	1	3	40	20	40	--	--
04	PC	LIT2	3MEPC112	Fundamentals of Mechanical Engineering	3	-	2	2	4	40	20	40	50	--
05	ES	T1	3MEES113	Introduction to Emerging Technologies	2	-	-	1	2	40	20	40	--	--
06	HS	L2	3MEHS114	Communication Skills	-	-	4	2	2	--	--	--	50	--
07	VS	L2	3MEVS115	IDEA Laboratory	1	-	2	1	2	--	--	--	50	--
08	CC	L2	3BSCCXXX	Liberal Learning Course - II	-	-	2	-	1	--	--	--	50	--
				Total	15	1	12	11	22					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory): ≥ 8 / 20	MSE + ESE (Theory): ≥ 32 / 80	TA (Theory) / CIE (Lab): ≥ 20 / 50	ESE (Lab): ≥ 20/50

CC Bouquet

Course Code	Course Name	Course Code	Course Name	Course Code	Course Name
3BSCC121	Introduction to Yoga and Mindfulness	3BSCC123	Six-Sigma Happiness and Mind Mechanics	3BSCC125	Community Engagement through NSS
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Exit after **F.Y. B.Tech. – Mechanical Engineering**

Additional Credits to qualify for UG Certificate

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
1	VS	L2	3MEVS116	Computer Aided Drafting	0	0	4	1	2	-	-	-	50	-
2	VS	L2	3MEVS117	Welding and Fabrication	0	0	4	1	2	-	-	-	50	-
3	VS	L2	3MEVS118	Machinist	0	0	4	1	2	-	-	-	50	-
4	VS	L2	3MEVS119	Pattern Making	0	0	4	1	2	-	-	-	50	-
5	VS	L2	3MEVS120	Assembly Technician	0	0	4	1	2	-	-	-	50	-
				Total	0	0	20	5	10					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory): ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIE (Lab): ≥ 20 / 50	ESE (Lab): ≥ 20/50

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Annasaheb Dange College of Engineering and Technology
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Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**3MEBS101, Applied Mathematics-I**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	1	-	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Solve systems of linear equations using analytical and numerical methods.
CO2	Compute Eigen values, Eigen vectors, powers and inverse of a square matrix using characteristic equation.
CO3	Calculate partial derivatives, Jacobians and extreme values of function of two variables using concept of partial differentiation.
CO4	Solve ordinary differential equation of order one and degree one using analytical method and numerical techniques.
CO5	Compute approximate root of algebraic and transcendental equations using numerical methods.

Syllabus:

Module	Contents	Lecture Hours
I	**Solution of System of Linear Equations:** Rank of matrix: Concept and computation using Echelon form, System of linear equations and types, Solution of non-homogeneous and Homogeneous system of linear equations by Rouché–Capelli Theorem. Solution of system of non-homogeneous linear equation by Gauss Elimination method, Gauss Jordan method, Jacobi's iteration method. Gauss-Seidal method.	8
II	**Eigen Values and Eigen Vectors:** Definition of vectors in R^n, Linear Dependence and Independence of Vectors, Characteristic Equation of Matrix, Cayley-Hamilton theorem (statement only), Applications of Cayley-Hamilton theorem, Eigen Values and Properties, Eigen Vectors and Properties.	7
III	**Partial Differentiation and Its Applications:** Functions of several variables, partial derivatives of first order, Higher order partial derivatives, Homogeneous functions, Euler's Theorem on homogeneous function: statement and verification, Jacobians and Properties, Maxima and minima of functions of two variables.	8
IV	**Ordinary Differential Equation of first order and first degree:** Linear differential equation, exact differential equation, reducible to exact differential equation, reducible to linear differential equation, Applications of engineering (branch oriented)	8
V	**Numerical Solution of Ordinary differential equation of First Order & First Degree:** Euler's method, Modified Euler's method, Runge–Kutta third order, Runge-Kutta Method of order four, Taylor Series method.	7
VI	**Numerical Solution of Algebraic and Transcendental Equations:** Introduction, solution of equations by Bisection method, False Position (Regula Falsi) method, Newton-Raphson method, Secant Method, Fixed point iteration method.	7
	Total Lecture Hours	45

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List of Tutorial with CO Mapping		
S. No	**Title of Tutorial**	**CO Mapped**
1	Solution of System of Linear Equations by analytical method	1
2	Solution of System of Linear Equations by Numerical method	1
3	Eigen Value, Eigen vectors and Properties	2
4	Cayley-Hamilton theorem and Applications	2
5	Partial Differentiation and Its Applications	3
6	Exact and Reducible to exact differential equations	4
7	Linear and Non-linear differential equations	4
8	Euler's and Modified Euler's Methods for Solving Initial Value Problems	4
9	Runge-Kutta Methods and Taylor Series Method	4
10	Solution of algebraic and Transcendental equations	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das, Advanced Engineering Mathematics, 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal, Numerical Methods, 9th Edition, Khanna Publishers, 2010

References:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers ,2018.
2. N. P. Bali, Manish Goyal, Advanced Engineering Mathematics, 7th Edition, Infinity science press ,2010.
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi GrihaPrakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.

Online Learning Resources

1. NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course on Mathematics-III, by Prof. Durga C Dalal, Dr. M. Guru Prem Prasad, IIT Guwahati https://nptel.ac.in/courses/122103012

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Department of Mechanical Engineering

Course Information:

Class, Semester	FY. B. Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**3MEBS102, Applied Chemistry**					**Type**	**LIT2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Explain the properties and applications of engineering materials for industrial and societal use based on their chemical compositions.
CO2	Discuss methods for preventing corrosion in metals by relating them to corrosion types and environmental conditions using basic chemical principles.
CO3	Solve the domestic and industrial problems related to water quality parameters using theoretical knowledge and laboratory experiments.
CO4	Apply the principles of analytical instruments in the analysis of samples with help of foundational practical chemistry knowledge.
CO5	Compute the calorific values of fuels for domestic and industrial applications using standard fundamental chemical equations.

Syllabus:

Module	Contents	Lecture Hours
I	**Water Technology and Management:** Introduction, impurities in natural water and it's removal, **Water Testing:** Acidity, alkalinity, chlorides and hardness of water (definition, causes and significance), WHO Standards. Scales and sludges: Formation in boilers and removal, Disinfection of water, Waste water treatment. **Treatment of hard water by:** Ion- exchange process, Zeolite process, Desalination of brackish water by Reverse Osmosis (RO), Numericals on temporary, permanent and total hardness of water.	8
II	**Chemical and Analytical Techniques:** Chemical analysis, its types, Different ways to express concentration of solution. Numerical problems. A) **p^H-metry:** Introduction, pH measurement using glass electrode and it's applications. B) **Spectrometry**: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's laws). Instrumentation and applications of UV-Visible spectrophotometer. C) **Chromatography**: Introduction, principle, instrumentation and applications of Thin-Layer chromatography (TLC) and Gas-Liquid chromatography (GLC).	8
III	**Polymers and Composites for Engineering Applications:** A) **Polymers**: Introduction, Polymerization and its types, Plastics: Thermo-softening and thermosetting plastics, industrially important plastics like PVC, PTFE (Teflon), ABS, urea-formaldehyde, Conducting polymers, Biodegradable polymers, Molecular weights of a polymer. B) **Composites:** Introduction, Constituents, Fibre-reinforced plastics (FRP) and Glass reinforced plastics (GRP), Metal matrix composites.	7

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IV	**Energy Technology:** **A) Batteries:** Introduction, Types of batteries, battery characteristics, Lithium- ion batteries (LIBs), Sodium- ion batteries (Instrumentation, advantages, disadvantages and applications). **B) Fuels:** Introduction, classification, characteristics of good fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numericals on Bomb and Boy's calorimeter. **Advanced Energy Systems:** Introduction, Fuel cells, Hydrogen cells, Solar cells.	7
V	**Corrosion & it's Prevention:** **Corrosion:** Introduction, causes, types of corrosion, Electrochemical corrosion (hydrogen evolution and oxygen absorption mechanisms), Factors affecting rate of corrosion. **Prevention of corrosion:** Introduction, Hot dipping process (Galvanizing and tinning), Cathodic protection methods, Electroplating process, Metal cladding, prevention by organic coatings (Paints and varnishes).	8
VI	**Engineering Materials and Green Chemistry:** Introduction, classification of engineering materials. **Alloys:** Types of alloys, purposes of making alloys, Ferrous alloys: Plain carbon steels (mild, medium and high). Nonferrous alloys: Aluminum alloy (Duralumin and Alnico), Nickel alloy (Nichrome), Tin alloys (Solders). **Green Chemistry:** Definition, Twelve principles of green chemistry, Research and industrial applications, Greenhouse effect and it's remedies.	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Determination of acidity of water sample. (Neutralization Titration)	3
2	Determination of alkalinity of water sample. (Acid- Base Titration).	3
3	Determination of chloride content of water by Mohr's method. (Precipitation Titration).	3
4	Determination of total hardness of water sample by EDTA method.	3
5	Preparation of Urea-formaldehyde resin.	1
6	Preparation of Phenol-formaldehyde resin.	1
7	Determination of rate of corrosion of Aluminium in acidic and basic medium	2
8	Estimation of copper in brass solution (Displacement Titration)	1
9	Estimation of zinc in brass solution (Displacement Titration)	1
10	Determination of pH of industrial waste water by using pH meter	4
11	Demonstration of bomb calorimeter to calculate calorific value of fuels.	5
12	Demonstration of Photo-colorimeter.	4
13	Determination of strength of acid/base by using conductivity meter.	4
Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books:

1. S. S. Dara, A Text Book of Engineering Chemistry, 11th Edition, S. Chand & Co. New Delhi, 2008.
2. Shashi Chawala, A Text book of Engineering Chemistry 3rd Edition, Dhanpat Rai Publishing Co. New Delhi, 2007
3. Ziyauddin D. Sande, Vijayalaxmi M. Vairat, Pratapsingh V. Gaikwad, A Text book of Applied Chemistry,1st Edition, Wiley Publications, 2018

References:

1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Co., New Delhi., 2015.

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2.	Wiley India, Engineering Chemistry, 1st Edition Wiley India Pvt. Ltd., New Delhi, 2012.
3.	Chatwal and Anand, Instrumental Methods of Chemical Analysis, 5th Edition, Himalaya Publishing House, Mumbai, 2005
4.	B. K. Sharma, Industrial Chemistry, 10th Edition, Goel publication (P) Ltd., 1999
5.	S. K. Singh, Fundamentals of Engineering Chemistry, 1st, New Age International (P) Ltd, New Delhi, 2009

Online Learning Resources:

1. Water Technology-- https://youtu.be/dKWJzp_rrlE
2. For lithium-ion batteries (LIBs): https://www.youtube.com/watch?v=DBLHaLhyo2w
3. Wikipedia - Composite materials: **https://en.wikipedia.org/wiki/Composite_material**

Experiments that may be performed through virtual labs:

S. No.	Experiment Name	Experiments Links
1.	Water analysis-Determination of Chemical parameters	https://inoc-amrt.vlabs.ac.in/exp/water-analysis-chemical-parameters/index.html
2.	Demonstration of Photo-colorimeter	https://pcv-amrt.vlabs.ac.in/exp/spectrophotometry/index.html

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Department of Mechanical Engineering

Established: 1999

Course Information:							
Class, Semester	FY. B. Tech, Semester - I					**Category**	**ES**
Course Code, Course Title	**3MEES103, Engineering Graphics with CAD**					**Type**	**LIT1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	3	-	2	2		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Construct projections of straight lines in various positions with reference planes, by variation in inclination, grade, bearing, and initial conditions.
CO2	Complete the projection of planes and Solids in various positions relative to reference planes, considering variations in initial conditions and inclination, to achieve an accurate shape in inclined positions.
CO3	Draw the three orthographic views for a given three-dimensional pictorial view, concerning the direction of viewing in first-angle projection, explaining the sectional view, hidden object and dimensions with CAD.
CO4	Develop a 3-dimensional isometric view converted from two or three orthogonal views to illuminate a 3D object.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of Engineering Graphics and Projections of Lines** **Fundamentals of Engineering Graphics:** Introduction to Drawing instruments and their uses. Different types of lines used in drawing practice, Dimensioning system as per BSI, Introduction to Auto CAD. **Projections of Lines:** Introduction to First angle and third angle methods of projection. Projections of points on regular and auxiliary reference planes. Projections of lines (horizontal, frontal, oblique and Profile lines) on regular and auxiliary reference planes. True length of a line, Point View of a line, angles made by the line with reference planes. Projections of intersecting lines, Parallel lines, perpendicular lines, and skew lines. Grade and Bearing of a line.	9
II	**Projections of Planes** Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes), Edge view and True shape of a Plane. Angles made by the plane with Principal reference planes. Projections of plane figures inclined to both the planes. (Circle & regular polygon up to hexagon).	6
III	**Projections of Solids** Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes. (Excluding Frustum and Sphere)	7
IV	**Introduction to Computer Aided Drafting** Introduction to CAD & Graphical user interface of the CAD software, Draw Commands, Drafting Aids (Limits, layer, Dimensioning, Object snap, Zoom), Modify Commands.	8
V	**Orthographic Projections** Lines used, selection of views, spacing of views, dimensioning and sections. Drawing required views from given pictorial views (conversion of pictorial views in to orthographic views), including sectional orthographic views.	8

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VI	**Isometric Projections** Introduction to isometric. Isometric scale, Isometric projections and Isometric views /drawings. Circles in isometric view. Isometric views of simple solids and objects.	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Introduction to Engineering Drawing	1
2	Introduction to Auto CAD	2
3	Projection of Line	1
4	Projection of Plane	2
5	Projection of Solid	2
6	Orthographic Projection	3
7	Orthographic Projection with Auto CAD	3
8	Isometric Projection	4
9	Isometric Projection with Auto CAD	4
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. W. J. Luzadder, Fundamentals of Engineering drawing, Revised Edition, Prentice Hall of India, 1999.
2. N. D. Bhatt, Machine Drawing, 15th Edition, Charotar Publishing House Pvt. Ltd.-Anand, 2007.
3. Jhole, Dhananjay, Engineering Drawing, Revised Edition, Tata McGraw-Hill, 2011.
4. M.L. Mathur, Engineering Drawing & Graphics, Revised Edition, Jain brothers, 1999.

References:

1. K. Venugopal, Engineering Drawing and Graphics, 5th Edition, New Age Publication, 2004.
2. R. K. Dhawan, A textbook of Engineering Drawing, Revised Edition, S. Chand and Co, 2008.
3. N. B. Shaha and B. C. Rana, Engineering Drawing, 2nd Edition, Person Education, 2012.
4. K. L. Narayana, Machine Drawing, New Age Publication

Online Learning Resources

1. NPTEL Course on Engineering Drawing, by Prof. P. S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. NPTEL Course on Engineering/ Architectural Graphics- Part I- Orthographic Projection, by Prof. Avlokita Agarwal, IIT Roorkee https://nptel.ac.in/courses/124107157
3. NPTEL Course on Engineering Graphics and Design, by Prof. Naresh Datla, Prof. S. R. Kale, IIT Delhi https://nptel.ac.in/courses/112102304
4. NPTEL Course on Engineering Drawing and computer graphics, by Prof. Rajaram Lakkaraju, IIT Kharagpur

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Department of Mechanical Engineering

Established:

Course Information:							
Class, Semester	FY. B. Tech, Semester - I					**Category**	**ES**
Course Code, Course Title	**3MEES104, Basic Electrical & Electronics Engineering**					**Type**	**LIT2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	--

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Solve the electrical circuits using fundamental laws and network theorem to find electrical parameters.
CO2	Determine voltage, current and power using phasor concepts and sinusoidal waveform parameters of AC circuit.
CO3	Describe electrical installations and explain the working of AC DC machines, and transformer.
CO4	Interpret characteristics and working of semiconductor devices, rectifiers and transducers in various applications.
CO5	Apply number systems and logic gate operation to implement basic digital circuits.

Syllabus:

Module	Contents	Lecture Hours
I	**DC Circuits:** Introduction to basic electrical quantities, Ohm's Law, Equivalent Resistance, Kirchhoff's current Law, Kirchhoff's voltage law, Mesh analysis, Nodal analysis, Superposition Theorem.	7
II	**AC Circuits:** Generation of Sinusoidal Voltage, Waveform, Cycle, Frequency, Time Period, Instantaneous value, RMS Value, Average Value, Form Factor, and Peak factor, Phasor Representation of sinusoidal waveforms, real, reactive and apparent power, power factor, Analysis of single-phase ac circuits. (R, L and C), Basics of three phase circuits, star and delta configuration, voltage and current relation.	8
III	**Electrical Installation:** Protecting devices – HRC fuse, MCB, Earthing – plate and pipe wiring circuits – simple, stair case and godown wiring. **Electrical Machine:** Principle, Construction and working of DC motor and generator, single-phase induction motor and single-phase Transformer and its applications.	8
IV	**Semiconductor devices and its applications**: Introduction to PN junction and Zener diode, half wave and full wave rectifier, bipolar junction transistors & its input output characteristics – CE, CC, CB configuration	7
V	**Digital Electronics:** Difference between analog and digital signal, number conversion system, introduction to logic gates, Boolean algebra and theorems, introduction to sequential circuits SR and JK flip flop.	7
VI	**Transducer and Application:** Transducers for displacement, level, temperature, pressure and speed measurement, applications of transducers in digital thermometer, washing machine, microwave oven, weighing machine and mobile handset.	8
	Total Lecture Hours	45

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List of Experiments with CO Mapping				
Sr. No	**Title / Topic of the Experiment**			**CO Mapped**
1	Study of Basic Electrical Components, Equipment and their symbols, and safety precautions in Electrical Engineering			1
2	Experimental Verification of Kirchhoff's Laws.			1
3	Measurement of Power and Power Factor in a Single-phase Circuit.			2
4	Load Test on Single Phase Transformer.			3
5	Demonstration of wiring circuits.			3
6	Experimental verification of Semiconductor Diode Characteristics.			4
7	Experimental verification of Zener Diode Characteristics.			4
8	Characteristics of Single-Phase Half-wave and Full-wave rectifiers.			4
9	Verification of truth tables of basic logic gates.			5
10	Implementation of basic logic gates using universal gates.			5
11	To understand working principle of LVDT.			4
12	To understand working principle of Thermocouple.			4
Total Practical Sessions		**15**	**Total Practical Hours**	**30**

Text Books

1. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering, 4th Tata McGraw Hill, 2019
2. D. C. Kulshreshtha, Basic Electrical Engineering, 2nd, McGraw Hill.2020
3. D. P. Kothari, Basic Electrical & Electronics Engineering, 2nd, TMH New Delhi ,2020
4. D. Patranabi, Sensors and transducers, 1st, PHI learning Pvt. Ltd.2003

References:

1. Millman and Halkias, Integrated Electronics,2nd, McGraw Hill,2010.
2. A.K. Thereja and B.L. Thereja, Electrical Technology volume II,2nd, S. Chand & Co. Publications,2007.
3. L. Bakshi and A. Bakshi, Basic Electrical Engineering,1st, Technical Publications, Pune,2005.
4. Albert Malvin, David Bates, Electronic Principles, 7th, McGraw Hill Education,2017.

Online Learning Resources

1. https://onlinecourses.nptel.ac.in/noc25_ee91/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee92/preview

Experiments that may be performed through virtual labs:

Sr. No	Experiment Name	Experiments Links
1.	To understand working principle of LVDT	https://sl-coep.vlabs.ac.in/exp/lvdt/
2.	To understand working principle of Thermocouple	https://sl-coep.vlabs.ac.in/exp/temperature-sensor/
3.	Experimental Verification of Kirchhoff's Laws.	https://bes-iitr.vlabs.ac.in/exp/kirchhoff-law/

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Annasaheb Dange College of Engineering and Technology
Ashta – 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	F.Y. B. Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**3MEES105, Computer Programming**					**Type**	**L1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	1	--	2	2	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	50

Course Outcomes (Cos):
Upon successful completion of this course, the student will be able to:

CO1	Demonstrate basic syntax and structure of a C++ program.
CO2	Apply selection control structures to implement decision-making logic in programs.
CO3	Apply user-defined functions and arrays to develop structured programs and solve engineering problems involving calculations such as stress and transformation matrices.
CO4	Make use of object-oriented programming concepts such as classes, objects, constructors, destructors, and encapsulation to design modular and maintainable C++ programs.
CO5	Implement advanced C++ features such as inheritance, polymorphism, pointers, structures, and file handling to design efficient, modular, and data-driven applications.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of Programming and C++ Basics** Introduction to Programming Languages, History and Features of C++, Structure of a C++ Program, Writing and Executing a Simple Program, Basic Input/Output using cin and cout, Variables, Constants, and Data Types, Operators and Expressions, Type Conversion and Casting, Comments and Coding Standards	3
II	**Control Structures and Looping** Decision Making: if, if-else, nested if, switch Looping: for, while, do-while loops break, continue, and go to statements	2
III	**Functions and Arrays** Defining and Calling Functions, Parameter Passing: Call by Value vs. Call by Reference, Function Overloading, Arrays: 1D and 2D Arrays, Array applications in engineering calculations (e.g., stress matrix, transformation matrix)	2
IV	**Object-Oriented Programming Concepts** Classes and Objects, Data Abstraction and Encapsulation, Constructors and Destructors, this Pointer, Friend Functions, Static Members, Arrays of Objects	3
V	**Inheritance and Polymorphism** Inheritance: Single, Multilevel, Hierarchical, Base and Derived Class, Access Specifiers: public, private, protected, Function Overriding and Virtual Functions, Runtime Polymorphism, Abstract Classes	3
VI	**Pointers, Structures, and File Handling** Pointers and Pointer Arithmetic, Dynamic Memory Allocation: new and delete, Structures and Unions, File Handling: Read/Write Operations	2
	Total Lecture Hours	15

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List of Experiments with CO Mapping		
S. No	**Title / Topic of the Experiment**	**CO Mapped**
1	Write a simple C++ program to display "Hello, World!" and demonstrate the basic structure of a C++ program.	1
2	Develop a C++ program to perform arithmetic operations and demonstrate the use of variables, constants, data types, and type casting.	1
3	Create a program to take user input using cin and display output using cout. Use comments and follow coding standards.	1
4	Write a program to find the greatest among three numbers using if, if-else, and nested if statements.	1
5	Develop a menu-driven calculator using the switch statement.	2
6	Write a program to print the multiplication table of a number using for, while, and do-while loops.	2
7	Demonstrate the use of break, continue, and goto statements in loop control.	2
8	Create a program to calculate factorial using user-defined functions with call by value and call by reference.	3
9	Write a program to overload a function for calculating the area of different shapes (circle, rectangle and triangle).	3
10	Implement a program using 1D and 2D arrays to perform matrix addition and multiplication.	3
11	Solve an engineering problem using arrays (e.g., stress or transformation matrix calculation).	3
12	Write a program to create a class with data members and member functions. Demonstrate object creation and method calling.	4
13	Demonstrate the use of constructors and destructors with proper messages during object creation and destruction. Include this pointer and friend function.	4
14	Create a program demonstrating different types of inheritance: single, multilevel, and hierarchical using base and derived classes with access specifies.	5
15	Implement runtime polymorphism using function overriding and virtual functions. Also show abstract class implementation.	5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. Herbert Schildt, C++: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2010.
2. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, AT&T, 2013.
3. E. Balagurusammy, Programming with C++, 4th Edition, TMGH, 2010.
4. Rajesh K Shukla, Object Oriented Programming in C++, 1st Edition, Wiley, 2008.

References:

1. Robert Lafore, Object Oriented Programming in Turbo C++, 4th Edition, Galgotia, 2010.
2. John Thomas Berry, C++ Programming, 2nd Edition, PHI, 1992.
3. D. Ravichandran, Programming with C++, 3rd Edition, TMGH, 2011.
4. Yashwant Kanetkar, Test your C++ Skills, 1st Edition, BPB, 2010.

Online Learning Resources

1. NPTEL Course on An Introduction to Programming Through C++, by Prof. Abhiram Ranade, IIT Bombay https://nptel.ac.in/courses/106101208

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Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – I					**Category**	**HS**
Course Code, Course Title	**3MEIKS106, Indian Knowledge System**					**Type**	**T2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	2	-	-	-	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

CO1	Explain the historical context and evolution of the Indian Knowledge System (IKS) and its relevance to modern engineering.
CO2	Analyze ancient Indian mathematical, astronomical, and technological methodologies and compare them with contemporary engineering practices.
CO3	Apply concepts from Ayurveda and ancient biological sciences to modern problem-solving in healthcare and related fields.
CO4	Evaluate traditional Indian architecture, materials, and construction principles as early forms of sustainable engineering design.
CO5	Integrate philosophical and scientific logic from Indian thought into ethical decision-making and sustainable engineering practices.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction & Historical Context** 1. Overview of the Indian Knowledge System: Philosophy and Scope 2. Historical timelines and key epochs 3. Geographical and cultural influences on ancient Indian science 4. Interdisciplinary approaches in ancient India. 5. Comparative analysis with other ancient civilizations	5
II	**Mathematics & Astronomy in Ancient India** 1. Foundations of Vedic Mathematics and its modern applications 2. Concepts of zero, decimal system, and number theory 3. Astronomical instruments and observational techniques 4. Calendrical systems and time measurement in ancient India 5. Engineering parallels in algorithmic design and computational thinking	5
III	**Ayurveda and Life Sciences** 1. Introduction to Ayurveda: Philosophy, doctrines, and methodologies 2. Medicinal systems and their chemical/pharmacological principles 3. Human physiology and surgical techniques in ancient texts (e.g., Sushruta Samhita) 4. Integrating traditional knowledge with modern biomedical engineering 5. Innovations in material sciences: Natural polymers and biocompatible materials	5
IV	**Architectural Knowledge & Engineering Innovations** 1. Ancient Indian architecture: Principles, materials, and techniques 2. Urban planning and infrastructure in historical Indian kingdoms 3. Structural innovations: Temples, forts, and water management systems 4. Engineering analysis of construction techniques from a modern perspective 5. Case studies: Earthquake-resistant designs in ancient constructions	5

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V	**Philosophy, Science & Ethics** 1. Indian philosophical schools and their perspectives on science 2. The concept of Rta (cosmic order) and its engineering analogies 3. Early scientific inquiry and epistemology in classical texts 4. Ethics, sustainability, and social responsibility in engineering 5. Integration of moral values and technical rigor in project design	5
VI	**Contemporary Relevance & Innovation** 1. Bridging ancient wisdom with modern technology 2. Case studies: Reviving lost techniques to inspire modern engineering solutions 3. Workshops on innovation and design thinking using Indian Knowledge System principles 4. Integration of cultural heritage in sustainable product design	5
	Total Lecture Hours	30

Text Books

1. Indian Knowledge Systems: An Introduction by Dr. Vivek Ramaswamy, Oxford University Press,2nd, 2005.
2. Traditions of Indian Science: A Textbook by Dr. Shyam R. Jha, Cambridge University Press, 1st, 2010.
3. Contemporary Perspectives on Ancient Indian Wisdom by Dr. Arvind Sharma, Routledge, 1st, 2013.
4. Foundations of the Indian Knowledge System by Dr. Meera Nair, Sage Publications, 3rd, 2015.
5. Indian Thought and Science: Bridging the Past and Present by Dr. Ram Prasad, Springer, 2nd, 2008.

References:

1. Encyclopedia of Indian Intellectual Heritage by Dr. Anil Kumar, Oxford University Press, 1st, 2012.
2. Indian Philosophy and Science: A Reference Guide by Dr. Lalit Singh, Cambridge University Press, 2nd, 2014.
3. The Vedic and Post-Vedic Traditions: A Reference Book by Dr. Pradeep Kumar, Routledge, 1st, 2003.
4. Handbook of Indian Knowledge Systems by Dr. Sunita Reddy, Sage Publications, 1st, 2016.
5. Traditional Indian Sciences: An Annotated Bibliography by Dr. Kavita Menon, Springer, 1st, 2020.

Online Learning Resources

1. https:// https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

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Established: 1999

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Ashta - 416301, Dist.: Sangli, Maharashtra
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Department of Mechanical Engineering

Course Information:

Class, Semester	F.Y. B. Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**3MEES107, Design Thinking Laboratory**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	1	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Explain the principles and process of Design Thinking and its application in problem-solving.
CO2	Identify and define real-world problems using user-centric observation and empathy techniques.
CO3	Conduct user research through surveys, interviews, and persona building to derive user needs and insights.
CO4	Apply ideation techniques to generate innovative and feasible solutions for identified problems.
CO5	Develop and present prototypes and communicate their solutions effectively using charts, posters, and model presentations.

Syllabus:

Module	Contents
I	Introduction to Design Thinking, Design Thinking Process
II	Empathize Phase: Empathy and Ethics, User Perspective, Activities – Empathy Map, Planning, Persona building.
III	Customer Journey Mapping, Observation of stakeholders, Defining and Conceptualization of problem
IV	Ideation, Activities – 5 Whys & 1 How, Story boarding, Brainstorming.
V	Prototype – Types, Mindsets, Tools.
VI	Testing – Scenario, Methods, Refinements & Recommendations.

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	**Introduction to Design Thinking** **Activity:** Make a group of 2-4 students. Give each group a simple, relatable problem (e.g., "Long queues at the campus canteen" or "Difficulty in finding parking on campus"). Ask them to: Empathize: Identify users and their pain points. Define: Write a clear problem statement. Ideate: Brainstorm possible solutions. Sketch: Draw their proposed solution on chart paper. Present: Each group will present their idea briefly.	1,2
2	**Identification of Problems** **Activity 1: Present case** study (in group) how companies like **Airbnb, Apple, IDEO, Netflix, Samsung, Toyota** used Design Thinking to drive innovation. **Activity 2: User Interviews** – The student or group should walk around the campus or their locality to observe and identify **at least three (per student) real-**	1,2

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	life problems faced by users (students, faculty, staff, and community). Conduct interviews to gather qualitative insights. Steps: 1. **Observation:** Note down pain points using observation and informal interviews. 2. **Listing:** Write a list of problems identified. 3. **Shortlisting:** Apply criteria like relevance, feasibility, user impact, and alignment with SDGs to shortlist **one problem** to work on for further Design Thinking phases.	
3	**Selection of Problems** **Activity:** Students will present (PPT) their selected problem, why they chose it, who the users are, and the evidence collected.	1,2
4	**Designing of Empathy Map** **Activity: Prepare Empathy Map** – Visualize what users say, do, think, and feel.	1,3
5	**Customer Survey and Analysis** **Activity:** Students create a structured survey (MCQ, likert scale, open ended questions etc.) using google forms and prepare charts (bar, pie etc) and do the analysis.	1,3
6	**Persona Building** **Activity:** Based on findings from **Observations and interviews, Customer Survey and Analysis** from previous experiments, identify pattern i.e. common characteristics, behaviors, needs, pain points, and goals among users and create persona template.	1,3
7	**Customer Journey Map** **Activity:** Select the persona created in the previous experiment, define the Scenario, List Stages/Phases of the Journey, Map User Actions, Identify User Emotions, Identify Touchpoints, Identify Pain Points and opportunities for Improvement.	1,3
8	**Defining the problem** **Activities:** • **Observation of Stakeholders** – Note behaviors and pain points. • **5 Whys Method (Drill Down)** – Uncover root causes behind a problem. • **Root Cause Mapping** – Visual diagram connecting symptoms to core issues. **Refine Problem Statement** – Create a focused, actionable problem definition.	1,3
9	**Poster Presentation** **Activity:** Use A2/A1 sheet and draw charts, diagrams, sketches, and minimal text to represent experiment no 1-8.	1, 2, 3
10	**Ideation** **Activities:** • **SCAMPER Model** – Modify existing ideas by Substituting, Combining, Adapting, etc. • **Brainstorming (Crazy 8 Method)** – Rapid sketching of 8 ideas in 8 minutes. • **Mind Mapping** – Visually connect ideas around a central problem/theme. Use the suitable and best one activity from above.	1, 4
11	**Prototype Building** **Activities:** • **Storyboarding** – Sketch out user scenarios and interactions. • **Prototyping** – Build a working model or prototype or model.	1,5

12	**Testing** **Activities:** • **Scenario-Based Testing** – Test ideas in realistic user scenarios. **Peer Testing** – Get feedback from other participants or teams.	1,5
13	**Refinement & Recommendation** **Activities:** • **Final Presentation** – Showcase prototype or working model. • **Documentation of Learnings** – Reflect on the process, improvements, and impact (Make a report). Apply for IPR/Incubation/Research Grant/Paper Publication.	1, 5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. E Balaguruswamy, Developing Thinking Skills (The way to Success), First Edition, Khanna Book Publishing Company, 2023
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Harvard Business Review, 2008
3. R T Krishnan & V Dabholkar, 8 steps to Innovation, First Edition, Collins Publishing, 2013

References:

1. Nigel Cross, Design Thinking, First Edition, Bloomsbury, 2011
2. Idris Mootee, Design Thinking for Strategic Innovation, First Edition, Wiley, 2013

Online Learning Resources

1. NPTEL Design Thinking - A Primer
   https://youtu.be/AamBSYPJlcA?si=wJDNT4L9q1NB-6T9
2. Design Thinking and Innovation
   https://www.coursera.org/learn/designthinkingandinnovation

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Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	F. Y. B. Tech, Semester - II					**Category**	**BS**
Course Code, Course Title	**3MEBS109, Applied Mathematics-II**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	1	-	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Determine equation of a curve and compute statistical measures to analyze data using statistical techniques
CO2	Determine unknown values from tabulated data using finite difference and interpolation techniques.
CO3	Express functions in series form using Maclaurins and Taylor's expansion
CO4	Choose appropriate methods to solve improper integrals using special functions
CO5	Compute Area and Mass of a region using multiple integrals

Syllabus:

Module	Contents	Lecture Hours
I	**Curve fitting and Regression:** Method of Least Squares, Fitting of Straight Line, Fitting of Parabola, Fitting of exponential curves, Lines of Regression.	7
II	**Finite Differences and Interpolation:** Finite differences, Forward and Backward Difference Newton's forward Interpolation formula, Newton's backward Interpolation formula, Stirling Interpolation formula, Newton's Divided Difference, Lagrange's interpolation formula.	8
III	**Expansion of Functions and Indeterminate Forms:** Maclaurin's series Taylor's series, Standard expansions, Expansion of function using Standard series, Indeterminate forms.	7
IV	**Statistical Measures:** Introduction, Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Partition values: Quartiles, Deciles and Percentiles, Concept of dispersion, Range, Quartile Deviation, Mean Deviation, Mean Square Deviation, Variance and Standard Deviation.	8
V	**Special Functions:** Proper and improper integrals, Gamma function, Properties of Gamma function, Beta function, Properties of Beta function, Relation between Beta and Gamma functions, error function and its properties.	7
VI	**Multiple Integral and Its Applications:** Double Integrals, Triple integral, Evolution of double integral over given region, Change of Order of Integration, Change to polar coordinates, Applications to Area and Mass of plane lamina.	8
	Total Lecture Hours	45

List of Tutorial with CO Mapping

S. No	Title of Tutorial	CO Mapped
1	Fitting of straight line and Second-degree parabola	1
2	Fitting of exponential curves and lines of regression	1
3	Interpolation with equal intervals	2
4	Interpolation for unequal intervals	2
5	Expansions of functions using Maclaurins and Taylor series	3

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6	Measures of dispersion	1
7	Measures of Central tendency	1
8	Gamma function	4
9	Beta function	4
10	Evaluation of Multiple integrals	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das, Advanced Engineering Mathematics, 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal, Numerical Methods, 9th Edition, Khanna Publishers., 2010

References:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers ,2018.
2. N. P. Bali, Manish Goyal, Advanced Engineering Mathematics, 7th Edition, Infinity science press ,2010.
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi GrihaPrakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.
5. S. C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics, 10th Edition Sultan Chand and Sons Publisher,2000.

Online Learning Resources

1. NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course Business Statistics, by Prof. Mukesh Kumar Barua, IIT Roorkee https://nptel.ac.in/courses/110107114

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Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester - II					**Category**	**BS**
Course Code, Course Title	**3MEBS110, Applied Physics**					**Type**	**LIT2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	3	-	2	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Describe the basic principles of nanotechnology for nanomaterial production using appropriate synthesis methods and microscopy techniques.
CO2	Use the principles of magnetism and semiconductor physics to select suitable materials for engineering applications.
CO3	Apply optics concepts to analyze diffraction, polarization, lasers, and fiber optic transmission in engineering contexts.
CO4	Apply theoretical and practical knowledge to solve engineering problems inarchitectural acoustics and ultrasonic using appropriate formulas and experimental methods.
CO5	Interpret crystal structures and X-ray diffraction results to determine lattice parameters and interplanar spacing using Bragg's law and Miller indices.

Syllabus:

Module	Contents	Lecture Hours
I	**Interference, Diffraction & Polarization**: **Interference** -Introduction, Constructive and destructive interference, Newton's rings. **Diffraction** - Introduction, Diffraction grating, Plane diffraction grating –construction and theory, Determination of wavelength of light using plane diffraction grating, Resolving power of grating, Numerical. **Polarization:** - Introduction, Polarization of light, Polarization by double refraction, Positive and Negative crystals, Laurent's half shade Polarimeter, Numerical.	7
II	**Laser and Fiber Optics:** **Laser**: Introduction, Principle of laser, Pumping and Population inversion, Characteristics of laser, Ruby Laser, Applications of laser in mechanical engineering. **Optical fibre**: Introduction, Total internal reflection, Structure of optical fibre, Propagation mechanism of optical fibre, Numerical aperture, Acceptance angle, Skip distance, Attenuation, Types of optical fibre, Applications of optical fibre in mechanical engineering.	7
III	**Acoustics and Ultrasonic:** **Acoustics:** Introduction, sound wave, properties of sound wave, Classification of sound waves, Basic requirements for acoustically good hall, Reverberation, Reverberation time, Sabine's formula (Conceptual discussion), Absorption coefficient, Factors affecting the architectural acoustics and their remedies. **Ultrasonic:** Ultrasonic waves, Magnetostriction effect and Oscillator, Determination of wavelength and velocity of ultrasonic waves, Detection of ultrasonic waves, applications of ultrasonic waves in field of mechanical engineering, Numerical.	8
IV	**Crystallography:** Unit cell, Space lattice, seven crystal system, Bravais space lattices, Properties of cubic unit cell, Relation between lattice constant and density, Interplanner spacing for cubic system, Miller indices, Symmetry elements in cubic crystal, X-ray diffraction, Bragg's law, Braggs X-ray spectrometer, X-ray spectra (Continuous and characteristics), Numericals.	7

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V	**Introduction to Materials:** **Magnetic materials**: Origin of magnetism, magnetization, types of magnetic materials, Domain theory of ferromagnetism, hysteresis effect, Soft and hard magnetic materials, applications in mechanical engineering. **Semiconductor** - Introduction, types of Semiconductor (Intrinsic & Extrinsic), Band theory of semiconductor, Fermi energy and its location in semiconductor, conductivity of semiconductor, Hall effect.	9
VI	**Nanophysics:** Introduction, Nanotechnology, nano-materials, Top-down and Bottom-up synthesis approach, Ball milling method, Sol-gel synthesis method, Carbon nanotubes, Properties and applications of carbon nanotubes, Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM), Properties and applications of nano-materials in mechanical engineering.	7
	Total Lecture Hours	45

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Plane Diffraction Grating- Determine the wavelength of light using plane diffraction grating.	3
2	Laurent's Half shade Polarimeter - Determination of specific rotation of optically active material.	3
3	Laser - Determination of wavelength of He-Ne laser light using diffraction grating.	3
4	Laser - Determination of divergence of He-Ne laser light	3
5	Numerical aperture of optical fibre: To calculate NA of optical fibre by laser diode.	3
6	Inverse Square Law- Verify inverse square law.	3
7	Band gap energy: To determine band gap energy of given semiconductor.	2
8	Ultrasonic interferometer- To determine the velocity of ultrasonic waves in given liquid and to determine the compressibility of the liquid	4
9	Kund's tube for determination of velocity of sound	4
10	Newton's Rings-To determine the wavelength of the given monochromatic source of light by Newton's ring method	3
11	BH Curve Tracer	3
12	Hall Effect	3
13	Determination of Miller Indices of a given plane and models	5
14	Crystal Symmetry-23 Symmetries in cubic crystal	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. M.N. Avadhanulu& P. G. Kshirsagar, A Text Book of Engineering Physics,12th Edition, S. Chand Publication,2018
2. P. K. Palanisamy, Engineering Physics, 2nd Edition, Sci Tech pub. (P) Ltd.2018
3. G Vijayakumari, Engineering Physics, 3rd Edition, Vikas Pub. House (P) Ltd ,2009
4. K.K.Chattopadhyay and A.N. Banerjee, Introduction to Nano Science and Nanotechnology,3rd, PHI Learning,2009

References:

1. David Halliday, Robert Resnick & Jearl Walker, Fundamentals of Physics,12th Edition,2021.
2. ResnickHalliday, Krane, Engineering Physics,8th Edition, John Wiley & Sons Pub.,2008.
3. R. K. Gaur & Gupta S. L, Engineering Physics,8th Edition, Dhanapat Rai Publication,2008
4. Sulbha K. Kulkarni, Nanotechnology Principles and Practices, 4th Edition, Springer,2007
5. Charles Kittle, Introduction to Solid State Physics, 7th Edition, Wiley India Pvt. Ltd,2008
6. V. Raghvan, Materials Science and Engineering,5th Edition, PHI Learning,2006.

Online Learning Resources

1.For optics- https://nptel.ac.in/courses/122/107/122107035/

2.For Quantum Physics -https://nptel.ac.in/courses/122/106/122106034/

3.For Ultrasonic -- https://freevideolectures.com/course/3531/engineering-physics-i/8

4. For Solid State Physics - https://nptel.ac.in/courses/115/105/115105099/

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Experiments that may be performed through virtual labs:		
S. No	Experiment Name	Experiments Links
1.	Photoelectric Effect	https://mp-amrt.vlabs.ac.in/exp/photoelectric-effect/index.html
2.	Numerical Aperture of Optical Fiber	https://lo-amrt.vlabs.ac.in/exp/numerical-aperture-optical-fiber/
3.	LASER Beam divergence and spot size	https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/

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Course Information:

Class, Semester	FY. B. Tech, Semester - II					**Category**	**ES**
Course Code, Course Title	**3MEES111, Applied Mechanics**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	-	1	3		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Interpret the resultant force for a force system using resolution and composition.
CO2	Sketch shear force and bending moment diagram for beam under different conditions.
CO3	Calculate the forces in members of roof truss under point load by using analytical methods.
CO4	Compute centroid and moment of inertia for a composite plane lamina by using parallel and perpendicular axis theorem.
CO5	Apply the concept of dynamic equilibrium to analyze rigid bodies using equations of motion..

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Engineering mechanics:** Basic concept - Particle, rigid body, force system, types of force system, law of transmissibility of force, resolution of a force, composition of forces, resultant force, moment of force, Varignon's theorem.	7
II	**Beam in Equilibrium:** Concept of Equilibrium equations of equilibrium of coplanar force system Beam: Types of beams, types of support for beam, types of load acting on beam, reactions at support, shear force, bending moment, relation between load, shear force and bending moment, shear force and bending moment diagram for statistically determinate beam (simply supported, cantilever, overhanging beam) subjected to different loading conditions.	8
III	**Analysis of Truss** Introduction of truss, types of trusses, determinacy of a truss, assumption for analysis of truss, Analysis of truss using method of joint and method of section.	7
IV	**Centroid and Moment of Inertia:** Introduction to centroid and center of gravity, centroid of plain lamina, moment of inertia of standard shapes from first principle, parallel and perpendicular axis theorem, Moment of inertia of composite section, radius of gyration.	8
V	**Kinematics of linear and circular motion:** Introduction to dynamics, kinematics of linear motion, Newton's 2nd law of motion, motion under gravity, motion under variable acceleration, kinematics of circular motion, angular motion, relation between linear motion and angular motion.	7
VI	**Kinetics of linear and circular motion:** Kinetics of linear motion, D'Alembert's principle and its applications in plane motion and connected bodies, work energy principle, work done by spring, impulse momentum principle, friction force, torque, Newton's law for rotary motion, power, mass moment of inertia, angular momentum.	8
	Total Lecture Hours	45

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Text Books
1. S. Ramamrutham, "Engineering Mechanics," 9th Edition, Dhanpat Rai Publishing Company (P). Ltd, 2010. 2. R. K. Bansal and Sanjay Bansal, "Engineering Mechanics," 6th Edition, Laxmi Publications Pvt. Ltd., 2013. 3. K. L. Kumar, "Engineering Mechanics," 4th Edition, Tata McGraw Hill Education, 2012. 4. S. B. Junnarkar, "Engineering Mechanics," 16th Edition, Charotar Publications, 2011. 5. S.S. Bhavikatti, "Engineering Mechanics," 4th Edition, New Age International Pvt. Ltd., 2012.
References:
1. S. P. Timoshenko and D. H. Young, "Engineering Mechanics," 3rd Edition, McGraw Hill Publishers, 2006. 2. F. P. Beer and E. R. Johnson, "Vector Mechanics for Engineers Vol.-I and II," 6th Edition, Tata McGraw Hill Education, 2011. 3. Ferdinand Singer, "Engineering Mechanics: Statics & Dynamics," 9th Edition, Harper and Row Publications, 2009. 4. S. Rajasekaran, "Fundamentals of Engineering Mechanics," 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005. 5. Irving H. Shames, "Engineering Mechanics," 5th Edition, Prentice Hall of India, New Delhi, 2011.
Online Learning Resources
1. NPTEL, "Engineering Mechanics," Prof. U.K. Saha, IIT Guwahati, NPTEL, 2015. https://nptel.ac.in/courses/112103108
2. NPTEL, "Engineering Mechanics," Prof. U.K. Saha, IIT Guwahati, NPTEL, 2015. https://nptel.ac.in/courses/112103108
3. MIT Open Course Ware, "Statics and Materials," Prof. Simona Socrate, MIT, 2007. https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004/pages/lecture-notes/
4. Skyciv Software: https://skyciv.com/free-beam-calculator/ , https://skyciv.com/free-truss-calculator/

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	F.Y. B. Tech, Semester - II					**Category**	**BS**	
Course Code, Course Title	**3MEPC112 Fundamental of Mechanical Engineering**					**Type**	**LIT2**	
Prerequisites	--							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**			
	3	-	2	2	4			
Examination Scheme (Marks)	**Theory**				**Practical**		**CIA**	**ESE**
	MSE	**TA**	**ESE**				50	--
	40	20	40					

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamentals of thermodynamics, power transmission, manufacturing processes and lubrication for a given system using basic mechanical engineering principles.
CO2	Select the manufacturing processes for a given job with the help of basics of manufacturing engineering.
CO3	Calculate the thermodynamic properties / performance of a given system using fundamentals of thermodynamics.
CO4	Solve the numerical on power transmission using given data with the help of basics of power transmission.

Syllabus:

Module	Contents	Lecture Hours
I	**Manufacturing Processes: -** Introduction to manufacturing processes, fundamentals of Casting, advantages, disadvantages and limitations of casting, sand casting, mold, patterns, core, gating system, runners and risers, chills, permanent mold casting, investment casting, continuous casting. Various metal forming operations, hot and cold working of metals such as forging, rolling, extrusion, wire drawing. Overview and classification of joining processes, welding process, Soldering, Brazing, riveted and bolted joints	8
II	**Machine Tools:** Metal removing processes and their applications Lathe: Principle, types, operations, turret/capstan, semi/automatic, various lathe operations. Milling - classification of milling machines, construction and working of column and knee type milling machine, milling operations Drilling - Classifications, construction & working of Radial drilling machine, Various operations on drilling machines, Geometry of twist drill.	7
III	**Mechanical Power Transmission and Energy conversion devices** Type of Belt and belt drives, chain drive, Types of gears and gear Trains, Types of Coupling, Types of Bearings, Types, Construction, working and applications of Pumps, compressor and Hydraulic Turbines.	8
IV	**Thermodynamics** Thermodynamic State, Process, Cycle, Thermodynamic System, Heat, work, Internal Energy, First Law of Thermodynamics, Application of First Law to steady Flow and Non-Flow processes, Limitations of First Law Statements of Second Law of Thermodynamics.	7
V	**Introduction to I C Engine** Air standard cycles- Carnot Cycle, Joule Cycle, Otto Cycle, Air Standard efficiency. Carnot Engine, Construction and Working of C.I. and S.I., Two stroke, Four Stroke engines.	8
VI	**Introduction to Refrigeration and Air Conditioning** Carnot refrigerator, Refrigerant types and properties, Vapor compression and vapor absorption system, solar refrigeration, Window Air Conditioning, Psychometric properties of moisture, Applications of refrigeration and air conditioning.	7
	Total Lecture Hours	45

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List of Experiments with CO Mapping		
S. No	**Title / Topic of the Experiment**	**CO Mapped**
1	Introduction to Industrial Safety, Fire Hazards, Case of Accident, Safety Precautions While Working in shop, Safety Equipment & their Use.	1
2	Prepare a male–female component using suitable operations such as marking, cutting, drilling, and filing.	2
3	Prepare a component using sheet metal operations.	2
4	Significance & Relevant of Lubrication Properties & System	1
5	Determine the cloud point and pour point of a given oil or fuel	1
6	Measure the cone penetration of a specified lubricating grease.	1
7	Evaluate the efficiency of an internal combustion (IC) 4 Stroke engine.	3
8	Determine the Coefficient of Performance (COP) of a refrigeration	3
9	Determine the performance of a pump.	3
10	Determine the performance of a hydraulic turbine.	3
11	Trail on power transmission System (Belt, Chain & Gear Drive)	4
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books
1. Elements Of Workshop Technology [Vol - 1,2] S.K. Hajra Choudhury & Nirjhar Roy 17th 2016.
2. Design of Machine Elements V. B. Bhandari Mc Graw Hill 10th reprint 2000
3. Engineering Thermodynamics R. Joel the English Language Book. 5th 1999
4. Engineering Thermodynamics Achultan Prentice Hall of India.Society 2nd 2011
5. Thermal Engineering R. K. Rajput Laxmi Publication, Delhi. 8th 2010
6. Elements of Heat Engine (Vol. I, II, III) Patel and Karamchandani Acharya Book Depot
References:
1. Thermal Engineering P. L. Ballaney Khanna Publication 22nd 2000
2. Refrigeration and Air Conditioning, C.P. Arora & Domkunwar Dhanpat Rai Publication 8th Revised 2009
3. Fluid Mechanics and Machinery Modi Seth Standard Book House 1st 1973
4. Theory of Machines Khurmi & Gupta S. Chand 14th 2012
5. Engineering Thermodynamics P.K. Nag Tata Mc-Graw Hill 4th 2012 Reprint
6. Energy Technology, S. Rao and Dr. B. B. Parulekar Khanna Publication 3rd 2012
7. Internal Combustion Engine R. Ganeshan Tata Mc-Graw Hill 4th 2012
8. Internal Combustion Engine R. K. Rajput Laxmi Publication 2nd 2008
Online Learning Resources
1. NPTEL Course on Basic Mechanical Engineering by Prof. H.K. Dass, IIT Delhi https://nptel.ac.in/courses/111105035

Experiments that may be performed through virtual labs:

Sr.No	Experiment Name	Experiments Links
1.	Study Hydraulic ram demonstration	Basic Mechanical Laboratory

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Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering

Course Information:

Class, Semester	F.Y. B. Tech – Semester II					**Category**	**ES**
Course Code, Course Title	**3MEES112, Introduction to Emerging Technologies**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	2	-	-	1	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		--	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Describe the key characteristics of emerging technologies such as AI, IoT, AR/VR, Quantum Computing, and Blockchain
CO2	Apply the concepts of AI, IoT, CPS, and Blockchain to real-world case studies to identify their disruptive impact on digital transformation initiatives
CO3	Explain the role of robotics, additive manufacturing, and green technologies in supporting sustainability and ethical technology deployment
CO4	Implement innovative solutions using autonomous systems and green technologies to address sustainability challenges

Syllabus:

Module	Contents	Lecture Hours
I	**Foundations of Emerging Technologies and Innovation Ecosystem** Emerging technologies characteristics and disruptive impact, Indian innovation ecosystem: Digital India, Startup India, AIM, India Stack, National Education Policy and interdisciplinary learning, Case studies: Smart Cities, Aadhaar, UPI, Digital Health Mission.	5
II	**Artificial Intelligence, Machine Learning & Data Science** AI basics: history, goals, types of AI (Narrow, General, Super AI), Machine learning: supervised, unsupervised, reinforcement learning, Introduction to data science: lifecycle, Big Data (5Vs), visualization, Human-centered AI and ethical concerns: bias, privacy, responsible AI.	5
III	**IoT, Cyber-Physical Systems, Edge Computing & Cybersecurity** IoT: architecture, sensors, communication, cloud, Cyber-physical systems: smart grid, autonomous vehicles, industrial automation, Edge & fog computing: real-time applications and use cases, Cybersecurity basics: CIA triad, malware, phishing, digital hygiene.	5
IV	**AR/VR, Quantum Technologies and Blockchain** AR/VR/XR: definitions, tools, applications in gaming, education, healthcare, Metaverse and immersive computing, Introduction to quantum computing: qubits, entanglement, potential impact. Quantum AI. Blockchain, Smart Contracts, DApps, DeFi, NFTs,	5
V	**Robotics, Autonomous Systems & Additive Manufacturing** Robotics: types, sensors, actuators, applications in healthcare, defense, logistics, Autonomous systems: drones, driverless vehicles, swarm robotics, 3D/4D printing: additive manufacturing, materials, future directions, Design thinking for innovation in robotics & manufacturing.	5
VI	**Green Technologies, Sustainability & Tech Ethics** Emerging technologies for solving climate/environmental challenges, Smart grids, clean energy systems, climate tech, e-waste, Sustainable design and SDGs: tech for social good, Tech ethics: inclusivity, equity, digital divide, societal impact.	5
	Total Lecture Hours	**30**

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Ashta - 416301, Dist.: Sangli, Maharashtra
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Department of Mechanical Engineering

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Course Information:

Class, Semester	FY. B. Tech, Semester - II					**Category**	**HS**
Course Code, Course Title	**3MEHS114, Communication Skills**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	--	4	2	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Demonstrate the Listening, Speaking, Reading and Writing (LSRW) skills considering the frame of English language rules accurately for effective and sound communication in academic and profession contexts.
CO2	Exhibit their portfolio and career choices confidently, considering corporate expectations by using digital tools convincingly.
CO3	Write letters, reports, Emails and Blogs proficiently by following required techniques that help in getting acquainted with professional correspondence.
CO4	Attain professional skill while convincingly presenting on allotted topics using MS PowerPoint and AI techniques.
CO5	Justify own role in communicative events in well-organized manner with balanced zeal.

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	1
2	SWOT Analysis	1
3	Basics of English Pronunciation	1
4	Rapid Review of Grammar	1
5	Diagnosing Listening and Speaking Skills	1
6	Diagnosing Reading and Writing Skills	1
7	Introduction to MS Office (Word, Excel, PPT)	1,4
8	Presenting my career choices	1,2
9	Preparing Portfolio	1,2
10	Describing Technical Charts, Image, and Processes	1,4
11	Using Language Learning Apps and Tools	1,4
12	Presenting Portfolio	1,2
13	Effective Presentation Skills	1,4
14	Delivering Power Point Presentation	1,4,5
15	Job Application and Resume Writing	1,3
16	Email Writing	1,3
17	Group Discussion	1,5
18	Public Speaking	1,5
19	Report Writing	1,3
20	Organizing an Event	1,5
21	Technical Writing	1,3
22	Blog Writing	1,3
23	Mock Interview	1,2,5
24	Achievement Test	1
Total Practical Sessions	**30**	**Total Practical Hours** **60**

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Text Books
1. The Professional: Defining the New Standard of Excellence at Work Subroto Bagchi Penguin Books India Pvt. Ltd. Revised Edition,2011.
2. Cambridge Guide to IELTS. Pauline Cullen, Amanda French, Cambridge University Press, Reprint, 2017.
3. A Practical Course in Effective English-Speaking Skills. J. K. Gangal, PHI Learning Private Limited, New Delhi, Print, 2012
4. English For Engineers. Dr. Shyamaji Dubey, Dr. Manish Kumar. Vikas Publication House Pvt. Ltd. New Delhi, Print, 2020.
5. Personality Development and Soft Skills. Barun K. Mitra, Oxford University Press, New Delhi, 7th impression, 2012.
References:
1. High-school English Grammar and Composition. Wren and Martin, S. Chand and Co., New Delhi, 1st edition, 2015.
2. The Ace of Soft Skills. Ajai Chowdry, Bala Balchandran, Pearson Publication, Delhi, 8th edition, 2017.
3. Effective Technical Communication. M. Ashraf Rizvi, McGraw Hill Education, Chennai,2nd edition, 2017.
4. Business Communication. Hory Sankar Mukerjee, Oxford University Press, New Delhi, 2nd edition, 2013.
5. Communicative English for Engineers and Professionals. Nitin Bhatnagar, Mamta Bhatnagar, Pearson Publication, Delhi, 1st edition, 2013.
Online Learning Resources
1. Software: Pronunciation apps (e.g., ELSA Speak, Speak English), grammar checkers (e.g., Grammarly).
2. Online Platform Coursera (for basic English courses), Duolingo, BBC Learning English.

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Course Information:

Class, Semester	F.Y. B. Tech, Semester - II					**Category**	**VS**
Course Code, Course Title	**3MEVS115, IDEA Laboratory**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**	**Self Study**	**Credits**	
	1	-		2	1	2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :

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

CO1	Operate basic workshop tools for material processing and assembly
CO2	Make simple 2D and 3D designs using CAD software and prepare them using 3D printing, laser cutting, or CNC machining
CO3	Build basic electronic circuits using sensors, LEDs, motors, and microcontrollers
CO4	Apply fundamental programming concepts in embedded C (Arduino IDE) for controlling hardware and automating simple tasks.
CO5	Integrate mechanical parts and electronics to design and build working models or prototypes.

Syllabus:

Module	Contents	Lecture Hours
I	**Overview of IDEA Lab** Introduction to the IDEA Lab: Vision, objectives, **National Innovation Ecosystem** (IIC, Atal Innovation Mission, NISP), Importance of multi-disciplinary, project-based learning Inspirational case studies from IDEA Labs, Safety protocols, Do & Don'ts in IDEA Lab.	1
II	**Fundamentals of Design & Prototyping** **Design Thinking Basics**: Problem identification, ideation, prototyping, testing, and iteration, **Introduction to CAD Software**: Concepts of 2D and 3D modeling for various applications, File Formats for Fabrication: Understanding STL, DXF, G-Code, SVG, and their uses, Tolerances, fits, and design constraints for manufacturing.	2
III	**Digital Fabrication Technologies** **3D Printing**: Principles, types of 3D printers, materials, slicing software, and applications. **Laser Cutting & Engraving**: Principles, types of lasers, materials, design considerations, and safety. **CNC Router**: Introduction to CNC Router and Mini Desktop Lathe cum Milling operations, G-code fundamentals, material removal processes. **3D Scanning**: Principles of 3D scanning, applications in reverse engineering and quality control. **PCB Fabrication:** Introduction to PCB Milling Machine and PCB Prototype Machine for custom circuit boards.	3
IV	**Fundamentals of Embedded Systems & IoT** **Basic Electrical and Electronic Concepts:** Voltage, current, resistance, Ohm's Law, and fundamental components (resistors, capacitors, diodes, LEDs, sensors, actuators), Measuring Instruments **Overview of microcontrollers**: Overview of Arduino, ESP32, NodeMCU, and their applications in controlling hardware. Circuit simulation using Tinker CAD or Proteus. **IoT Basics**: Basic networking (Bluetooth/Wi-Fi/Ethernet), cloud integration	3

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Annasaheb Dange College of Engineering & Tech. ASHTA 416 301

V	**Programming for automation** **Arduino IDE and Embedded C Programming**: Setup, basic syntax (setup(), loop()), digital and analog I/O control. **Basic Control Systems:** Concepts of open-loop and closed-loop control with simple examples. **Introduction to Python.**	3
VI	**Project Planning and IPR** **Innovation Process:** From idea generation to concept validation **Project Planning & Management:** Defining scope, setting timelines, budgeting, and resource allocation. **Documentation and Presentation:** Writing a concept note, creating innovation posters, and effective pitching techniques. **Intellectual Property Rights (IPR):** Basics of Patents, Copyrights, and Trademarks relevant to innovation.	3
	Total Lecture Hours	15

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Introduction, Lab Safety & Tool Familiarization	1
2	Handa on practice of Mechanical Workshop Tools	1
3	3D Printing of simple parts	2
4	Laser Cutting	2
5	CNC Routing/ Engraving	2
6	Basic Electronics circuit	3
7	PCB Design and Prototyping	3
8	Microcontroller Programming and Sensor Interfacing	4
9	Mini Project	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. Veeranna D.K., AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2022
2. Saji T. Chacko, Susan S. Mathew, AICTE's Prescribed Textbook: Fundamentals of Electrical and Electronics Engineering (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2024
3. Mehta S.D., Electronic Product Design Volume - I (Basics of PCB Design), 1st Edition, S Chand & Company, 2011
4. Mehta-Gupta, Y.P.Mehta, Vishal Mehta, Workshop Calculation and Science, 1st Edition, Dhanpat Rai Publications, 2020

References:

1. A. K. Maini, Nakul Maini, All-in-One Electronics Simplified, 1st Edition, Khanna Book Publishing Company, 2021
2. J.G. Joshi, Electronics Measurements & Instrumentation, 1st Edition, Khanna Book Publishing Company, 2025
3. Dr. Sabrie Soloman, 3D Printing & Design, 1st Edition, Khanna Book Publishing Company, 2020
4. Binit Kumar Jha, CNC Programming Made Easy, 1st Edition, S Chand & Company, 2003
5. Kaushik Kumar, Hridayjit Kalita, Workshop/Manufacturing Practices, 5th Edition, S Chand & Company, 2011

Online Learning Resources

1. NPTEL Course on 3D Printing and Design for Educators, By Dr. Sharad K. Pradhan, NITTTR Bhopal https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview
2. NPTEL Course on Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software, By Prof. Ankur Gupta, IIT Delhi https://onlinecourses.nptel.ac.in/noc24_ee127/preview

Experiments that may be performed through virtual labs:

S. No	Experiment Name	Experiments Links
1.	3D Printing Virtual Simulation Lab	https://3dp-dei.vlabs.ac.in/
2.	Digital Fabrication of Flexible Circuit board	https://fab-coep.vlabs.ac.in/exp/digital-fabrication/
3.	Embedded System Design with 8051 and PIC Microcontroller	https://esd-coep.vlabs.ac.in/

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering
Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC121, Introduction to Yoga and Mindfulness**					**Type**	**L2**
Prerequisites	--						

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	-	-	2	-	1

Examination Scheme (Marks)	**Theory**				**Practical**		
	MSE	**TA**	**ESE**		**CIA**	**ESE**
	-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Describe the significance and practical applications of yoga for holistic well-being under guided classroom sessions, ensuring coverage of physical, mental, and spiritual aspects.
CO2	Explain the role of subtle energy systems (chakras, nadis) in health enhancement using yogic practices, showing linkage to at least two health benefits.
CO3	Compare different paths of yoga (Bhakti, Jnana, Karma, Raja) through readings and discussions, citing at least one key practice and outcome for each.
CO4	Demonstrate the Eight Limbs of Yoga in practical sessions, reflecting personal integration of at least four limbs in daily habits or behavior.
CO5	Apply yoga and mindfulness techniques in real-life stress situations to improve emotional resilience, showing measurable improvement in two or more psycho-somatic areas.

Practice Session

S. No	Contents	CO Mapped
1	**Introduction to Yoga Practice and Warming Up Exercises** Overview of yoga philosophy and benefits. Practice basic stretching and warm-up routines. Introduction to breath awareness and mindfulness.	1,5
2	**Omkar, Prathana and types of Asanas, Surya Namaskar.** Practice of Chant Omkar and opening prayer for mental centering. Perform Surya Namaskar and learn its 10-step sequence. Explore basic asana types: standing, sitting, supine.	1,4
3	**Sleeping position Asanas** Practice of Setubandhasana, Pavanmuktasanan, Chakraasa SetuBandhasana, Understand the effects on back, digestion, and spine.	1, 2
4	**Opposite sleeping position** Practice of Bhujangasana, shalbasanan, Dhanurashan, Makrasanan Focus on strengthening the back and improving posture.	1, 2
5	**Seating Position** Practice of Padmaasna, Vajrasana, Gaumukhasan, Vakrasana Learn their benefits for digestion and meditation readiness.	1, 4
6	**Standing Position** Practice of Tadasana Vruksasana, Trikonaasan, Virasana. Emphasize balance, posture, and muscular endurance.	1, 4
7	**Meditation** Guided practice of breath-based (Anapan) and insight (Vipassana) meditation. Focus on observation without judgment.	4, 5
8	**Mantra meditation** Practice chanting and internal repetition of mantras. Use traditional mantras for focus and mental calm.	4, 5
9	**Yognidra** Perform deep relaxation technique (guided Yoga Nidra). Experience body awareness and mental stillness.	4, 5

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

10	**Pranayam 1** Practice Anulom Vilom (alternate nostril), Bhramari (humming bee), and Sheetali (cooling breath). Focus on breath control and emotional regulation.	2, 5
11	**Pranayam 2** Practice Sitkari and Kapalbhati. Learn their effects on metabolism, energy, and clarity.	2, 5
12	**Tratak** Perform Tratak (candle gazing) for concentration. Understand through demonstration or video.	4, 5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. Yog Jeevan. Dr. ChakoteRiya1st Editon2016
2. Yog Parchichaya Mandlik Guruji Nashik Mandlik Guruji Second Edition 2020

References:

1. Yoga for Modern Age Vethathiri Edition 16th 2023
2. Maharishi, Simplified Physical ExercisesVethathiri Edition I 2014

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Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering

Course Information:

Class, Semester	FY. B. Tech, Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC122, Physical Fitness and Lifestyle Management**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	-	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamentals of physical education and its role in developing holistic well-being.
CO2	Demonstrate appropriate fitness practices and techniques to improve cardiovascular endurance, strength, and flexibility.
CO3	Apply principles of wellness, including nutrition, sleep, and stress management, to maintain a healthy lifestyle.
CO4	Integrate yoga, mindfulness, and relaxation techniques to promote mental well-being and emotional balance.
CO5	Design a personalized lifestyle management plan based on fitness assessment, health goals, and behaviour change strategies.

Practice Session

S. No	Contents	CO Mapped
1	**Introduction to Physical Education** Understand the meaning and objectives of physical education. Learn its role in promoting health, fitness, and overall well-being. Explore career options and importance in daily life.	1
2	**General Warm up** Practice dynamic warm-up routines before workouts. Increase heart rate and blood circulation to muscles. Prevent injuries and improve workout performance.	2
3	**Limbering down exercises. Free hand exercises, Cooling down exercises** Perform safe cool-down techniques post activity. Reduce muscle soreness and stiffness. Bring heart rate back to normal gradually.	2
4	**Stretching exercises / Flexibility exercises** Improve range of motion in joints. Reduce muscle tension and prevent injuries. Learn static and dynamic stretching methods.	2
5	**Fitness Evaluation** 1 mile run and walk, Pushups, seat ups, Seat and reach and BMI. Assess personal fitness using 1-mile run, push-ups, sit-ups, etc. Calculate BMI to understand body composition. Set personalized fitness goals based on results.	5
6	**Aerobic activities** Perform rhythmic activities to improve cardiovascular health. Engage in exercises like jogging, skipping, or dance aerobics. Enhance lung capacity and endurance.	2
7	**Sports and games** (, Cricket, Volleyball, basketball, Kho-Kho, Kabaddi, Athletics) Play team games like Cricket, Volleyball, Kabaddi, etc. Develop teamwork, coordination, and sportsmanship. Improve motor skills and physical agility.	2
8	**Sports and games (Badminton, Table Tennis, Chess)** Participate in games like Table Tennis, Badminton, Chess. Improve reflexes, concentration, and decision-making. Promote mental sharpness and social interaction.	4
9	**Circuit Training, Strength Activities** Perform multiple exercises in a sequence (circuit). Focus on building muscular strength and stamina. Use minimal equipment for maximum benefit.	2

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10	**Agility and Coordinative activities** Practice quick movement drills to improve reflexes. Enhance body coordination and balance. Develop speed and reaction time.	2
11	**Body weight exercises** Do exercises like push-ups, squats, lunges, and planks. Improve strength using your own body resistance. No need for gym equipment.	2
12	**Functional training** Mimic real-life movement patterns (bending, lifting, reaching). Improve daily functional strength and flexibility. Prevent posture-related problems.	3

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text

1. Test, Measurement and Evaluation in Sports and Physical Education*. 5th ed., Friends Publications, 2023.
2. Rules of Games and Sports Updated version, Khel Shaitya Kendra, 2023.

References:

1. Beashel, Paul, and John Taylor. Physical Education: Essential Issues. Hodder Stoughton, 1997.
2. Sodhi, H. S., and S. K. Sidhu. *Physique and Selection of Sportsmen.* Punjab Publishing House, 1984.

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Mechanical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC123, Six Sigma Happiness and Mind Mechanics**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	-	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Analyze personal life patterns and decision-making processes using visual tools like life maps and time audits to improve self-awareness and productivity.
CO2	Identify and modify recurring behavioral or emotional challenges using root cause analysis and habit-tracking techniques
CO3	Apply reflective and psychological tools such as the Gratitude Journal, PERMA Wheel, and mindfulness meditation to enhance emotional well-being.
CO4	Utilize creative thinking and visualization techniques such as mind mapping, personal development canvas, and flow activities to enhance planning and motivation.
CO5	Formulate and monitor measurable personal goals using SMART criteria and Six Sigma strategies to construct a structured self-improvement and lifestyle plan.

Practice Session

No	Contents	CO Mapped
1	**Life Process Mapping** Understand personal daily patterns. Identify meaningful and unproductive activities. Improve decision-making awareness. Build a visual blueprint of life routines.	1
2	**Time Audit Diary** Track hourly usage of time. Identify time-wasters and focus zones. Increase productivity through reflection. Learn prioritization techniques.	2
3	**Root Cause Analysis** Find root causes behind repeated problems. Use cause-effect diagrams (Fishbone). Develop problem-solving skills. Prevent recurring emotional or behavioral setbacks.	1
4	**Habit Tracker Creation** Monitor progress of personal habits. Encourage accountability and consistency. Recognize triggers and patterns. Reinforce good habits using visual tools.	3
5	**Control Chart for Habits** Apply Six Sigma's statistical approach to habits. Track habit frequency over time. Identify variation in behavior patterns Improve self-control and discipline.	3
6	**Gratitude Journal** Practice daily reflection on positive moments. Enhance emotional well-being. Reduce stress and negativity. Cultivate a habit of appreciation.	4
7	**PERMA Wheel Self-Assessment.** Evaluate happiness using 5 key pillars (Positive emotion, Engagement, Relationships, Meaning, Achievement). Identify strengths and gaps in life satisfaction. Build awareness of emotional and social well-being. Create a personalized improvement plan.	4
8	**Flow Activity Practice** Engage in high-focus enjoyable activity. Understand the "flow" mental state. Boost intrinsic motivation. Reduce distractions and increase creativity.	4
9	**Mind Mapping the Brain** Visually organize thoughts and plans. Stimulate right and left brain together. Enhance memory, planning, and clarity. Strengthen problem-solving and goal-setting.	1, 5

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10	**Guided Mindfulness Meditation** Practice breath work and awareness techniques. Reduce anxiety and mental fatigue. Increase present-moment awareness. Build emotional balance.	4
11	**Personal Development Canvas** Create a visual profile of strengths, values, and aspirations. Encourage strategic self-improvement. Connect life areas (career, personal, social). Track personal growth visually.	5
12	**SMART Goal Setting + Six Sigma** Define Specific, Measurable, Achievable, Relevant, Time-bound goals. Integrate Six Sigma process for goal monitoring. Improve consistency in self-development. Align actions with purpose and metrics.	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. S. Radhakrishnan, An Idealist View of Life, 2015, HarperCollins.
2. Yogi Kochhar, Six Sigma Happiness (English Edition).
3. An idealist way of Life – S Radhakrishnan

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Department of Mechanical Engineering
Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC124, Creativity through Visual Arts**					**Type**	**L2**
Prerequisites	--						

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	-	-	2	-	1

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Identify and apply the elements of art—line, shape, color, texture, and space—through various drawing and painting techniques.
CO2	Demonstrate creativity and technical skills in using different mediums such as pastels, pen & ink, and water-based paints.
CO3	Create original prints using simplified printmaking techniques such as relief, intaglio, and monoprint methods.
CO4	Design visually appealing digital artwork such as posters, icons, and layouts using basic digital tools.
CO5	Analyze and reflect on personal artwork and peer creations to improve visual communication and aesthetic understanding.

Practice Session

S. No	Contents	CO Mapped
1	**Fundamentals of Visual arts** Introduction to elements of art: line, shape, colour, texture, space. Practice drawing with pencil and charcoal using simple objects and shapes. Explore light and shade for 3D effects.	1
2	**Basic Graphic Design** Learn principles of alignment, contrast, hierarchy, and balance. Create a basic visual composition using text and image elements. Use sketching or digital tools for layout planning.	2
3	**Typography & Font Design** Study of typefaces: serif, sans-serif, script, decorative. Draw custom fonts and stylized letters. Create a short phrase using hand-drawn typography.	2
4	**Logo Design** Understand logo types: symbolic, text-based, combination marks. Design a logo for a fictional company or cultural event. Focus on clarity, colour choice, and relevance.	4
5	**Poster Design** Choose a theme: social message, event, awareness, culture. Develop layout and imagery using watercolor, pen & ink, or digital tools. Apply principles of visual hierarchy and focal point.	4
6	**Photography Task: Lines & Angles** Capture photographs focusing on geometric lines, angles, and symmetry. Submit 3–5 original photographs with a short description of each. Discuss visual impact and framing.	1, 5
7	**Digital Infographic Design** Choose a topic (e.g., Indian innovations, clean energy, internet safety). Create a digital infographic using free tools like Canva or PowerPoint. Combine icons, minimal text, and visuals to communicate clearly.	4
8	**Visual Metaphor Drawing** Select a concept (e.g., freedom, growth, technology) and represent it visually. Use drawing techniques to convey metaphor without text. Encourage creativity and symbolic thinking.	3,5
9	**Calligraphic strokes of Devnagari** Practice traditional and artistic Devanagari calligraphy. Use ink pens or brush pens to form characters. Create a short meaningful phrase in decorative calligraphy.	2

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10	**Collage on Innovation in India** Use newspapers, magazines, or printed material. Prepare a collage on topics like ISRO, start-ups, or digital India. Emphasize arrangement, contrast, and theme clarity.	3,5
11	**Modern Arts** Introduction and fundamental of modern art, Study abstract and modern Indian Artists Create an abstract or modern art piece using acrylics, pastels, or digital tools. Focus on expression and experimentation.	3,5
12	**Geometric Pattern Design** Create a detailed design using compass, ruler, or digital drawing. Highlight symmetry, color, and repetition	1,2

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. The New Drawing on the Right Side of the Brain.TarcherPerigee, 2012.
2. Digital Illustration: A Master Class in Creative Image-making.Rotovision, 2010.
3. A History of Indian Painting: The Modern Period.Abhinav Publications, 1994.
4. Basics of Visual Art. New Academic Publishing, 2015.

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Course Information:

Class, Semester	FY. B. Tech., Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC125, Community Engagement through NSS**					**Type**	**L2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	-	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Identify the structure and needs of the local community through direct engagement and observation.
CO2	Analyze community issues and participate in collaborative problem-solving activities.
CO3	Demonstrate social and civic responsibility by applying engineering knowledge in real-world social contexts.
CO4	Develop teamwork, leadership, and democratic values through community mobilization and shared responsibility.
CO5	Respond effectively to emergencies and promote national integration, unity, and social harmony through participation in relevant campaigns and awareness programs.

Practice Session

S. No	Contents	CO Mapped
1	**Cleanliness Drive (Swachh Bharat Abhiyan)** Conduct campus and neighborhood cleaning. Raise awareness about hygiene and waste segregation.	1,2,3
2	**Tree Plantation** Plant saplings in college or public areas. Educate the community on environmental benefits.	1,3
3	**Road Safety Campaign** Conduct rallies, skits, or poster campaigns. Spread awareness about traffic rules and safe driving.	2,3,5
4	**Health Check-up Camp** Organize basic health screening with medical professionals. Promote hygiene, nutrition, and disease prevention.	1,2,5
5	**Literacy Drive** Teach basic reading and writing to underprivileged children or adults. Distribute learning materials and encourage regular attendance.	1,3,5
6	**Voter Awareness Campaign (SVEEP)** Inform citizens about voter rights and the election process. Promote ethical voting through posters and street plays.	2,3,5
7	**Plastic-Free Campus Initiative** Educate peers on the harmful effects of plastic. Conduct collection drives and promote reusable alternatives.	2,3
8	**Cultural and Heritage Promotion** Organize folk art, dance, and storytelling sessions. Engage the community in preserving local culture.	3,5
9	**Yoga and Wellness Sessions** Conduct yoga and mindfulness sessions for students and locals. Promote physical and mental health through regular practice.	3,4
10	**Self-Defence Training for Girls** Organize practical training on basic self-defence techniques. Empower girls with safety awareness and confidence.	4,5
11	**Social Contribution Orphanage/ Old age home visit** Hold discussions or exhibitions on gender, caste, and social equality. Encourage inclusive behavior and respect for diversity.	3,4,5

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12	**Digital Literacy Program** Teach basic smartphone and internet use to the elderly or untrained groups. Promote safe and productive use of digital tools	2,3,5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, nss cell, Activities reports and its manual.

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Department of Mechanical Engineering

Course Information:

Class, Semester	FY. B. Tech., Semester – I/II					**Category**	**CC**
Course Code, Course Title	**3BSCC126, Cultural Exploration & Heritage**					**Type**	**L2**
Prerequisites	--						

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	-	-	2	-	1

Examination Scheme (Marks)	**Theory**				**Practical**		**ESE**
	MSE	**TA**	**ESE**		**CIA**		
	-	-	-		50		-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Identify and describe key elements of cultural heritage including tangible, intangible, and natural heritage with real-life examples.
CO2	Demonstrate understanding of regional and national cultural practices through participation in experiential activities.
CO3	Analyze the significance of preserving cultural heritage in the context of globalization and modernization.
CO4	Collaborate in group projects to creatively document and present cultural themes using various mediums.
CO5	Reflect critically on personal and collective cultural identities through journals, discussions, and presentations.

Practice Session

No	**Contents**	**CO Mapped**
1	**Introduction to Cultural Exploration and Heritage** Understand the meaning of tangible, intangible, and natural heritage, Discuss real-life examples of cultural elements. Reflect on how culture shape's identity.	1,5
2	**Heritage Mapping/ Case Study on a Heritage Site** Choose a local region or community. Identify and locate key cultural sites (temples, festivals, crafts). Create a visual or digital heritage map. Present findings in written or visual format	1,3,4
3	**Vaidik Tal Vadya Songs and Music tradition** Introduction to Vedic Music, Demonstration of Vaidik Tal Vadya, Listening Session of Vedic Chants & Samagana, Group Singing of a Vedic Verse or Traditional Bhajan	2, 5
4	**Folk Dance** Watch or participate in folk dance. Discuss the significance, costumes, and music of each. Compare cultural roots and evolution.	2, 4
5	**Traditional Music** Dholki, Tabala, Dhol, Lezim Listen to selected regional or classical music samples. Identify the instruments, lyrics, and cultural setting.	2, 4
6	**Traditional Instrumental** Taal, Tritaal, Tabala Observe or perform simple rhythms or melodies. Explore the cultural and ceremonial use of instruments.	1, 2
7	**Singing** Types of singing, Vocal Singing Introduction to music fundamentals	2, 4
8	**Drama** Introduction, Types, Information about acting, Stage information, Present / performance on stage	4,5
9	**Classical dance, Western dance** Introduction to classical, and western dance demonstrations. Different types	2, 4
10	**Karaoke Singing** Introduction, Types, Basic music information	2, 4

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11	**Short film** Prepare short film, Present / performance on stage, Topic concern with Indian Cultural heritage	3, 4, 5
12	**Final Showcase** Present all your work in a class exhibition. Explain the cultural significance of each project. Receive peer and teacher feedback.	4, 5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. Nruta saurabha Manjiri ShriramDev XII 2015
2. Indian Art and Culture, Nitin Singhania McGraw Hill Education IV 2022
3. The Wonder That Was India Picador India Second2004
4. The National Culture of India National Book Trust (NBT), India Second2016

References:

1. Bhattacharyya, Haridas, editor. The Cultural Heritage of India. The Ramakrishna Mission Institute of Culture, multiple volumes, revised ed.
2. Singhania, Nitin. Indian Art and Culture. 4th ed., McGraw Hill Education, 2022.
3. Basham, A. L. The Wonder That Was India. Picador India, 2004.
4. Jokilehto, Jukka. A History of Architectural Conservation. 2nd ed., Routledge, 2017.

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