K.K. Wagh Institute of Engineering Education and Research, Nashik

Curriculum

F.Y. B.Tech

Mechanical Engineering

w.e.f.: AY 2023-2024

F.Y. B.Tech Mechanical Engineering wef AY 202324															
SEM-I															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300101A	BSC	Linear Algebra	3	1	0	20	60	20	25	0	125	3	1	0	4
2300103B	BSC	Applied Physics	3	0	2	20	60	20	50	0	150	3	0	1	4
2300114A	ESC	Fundamentals of Mechanical Engineering	3	0	2	20	60	20	50	0	150	3	0	1	4
2300110A	ESC	Engineering Drawing	1	0	2	20	30	0	50	0	100	1	0	1	2
2300112A	AEC	Communication Skills	1	0	2	0	0	25	50	0	75	1	0	1	2
2300117G	VSEC	Department Specific Vocational Course	1	0	2	0	0	25	25	0	50	1	0	1	2
2300115A	CC	Liberal Learning/Sports/Yoga/Art	0	2	0	0	0	0	50	0	50	0	2	0	2
Total			12	3	10	80	210	110	300	0	170	12	3	5	20

SEM-II															
Course Code	**Course Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300102A	**BSC**	Differential Calculus	3	1	0	20	60	20	25	0	**125**	3	1	0	**4**
2300104A	**BSC**	Applied Chemistry	3	0	2	20	60	20	50	0	**150**	3	0	1	**4**
2300113A	**ESC**	Engineering Mechanics	3	0	2	20	60	20	50	0	**150**	3	0	1	**4**
2300106A	**ESC**	Basic Electrical Engineering	1	0	2	20	30	0	50	0	**100**	1	0	1	**2**
2300118G	**PCC**	Program Specific Core Course	2	0	0	20	60	20	0	0	**100**	2	0	0	**2**
2300116B	**IKS**	Introduction to India Knowledge System	0	2	0	0	0	0	50	0	**50**	0	2	0	**2**
2300111A	**VSEC**	Workshop Practice	1	0	2	0	0	25	25	0	**50**	1	0	1	**2**
2300115B	**CC**	Engineering Exploration	0	2	0	0	0	0	75	0	**75**	0	2	0	**2**
Total			**13**	**5**	**8**	**100**	**270**	**105**	**325**	**0**	**800**	**13**	**5**	**4**	**22**

Department Specific Exit Courses (To award Certificate)															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT /TW**	**PR /OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300119A	**EXIT**	Internship*	0	0	0	0	0	0	100	0	**100**	0	2	0	**2**
2300132A	**EXIT**	Exit Course-1	2	0	2	20	30	0	50	0	**100**	2	1	0	**3**
2300133A	**EXIT**	Exit Course-2	2	0	2	20	30	0	50	0	**100**	2	1	0	**3**
Total			**4**	**0**	**4**	**40**	**60**	**0**	**200**	**0**	**300**	**4**	**4**	**0**	**8**

*Internship in industry for 2-weeks
→To get certificate student should get following credits
Internship →2 credits
Exit course-1 →3 credits
Exit course-2 →3 credits
Total credits →8 credits

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. B. Tech.
Pattern 2023
2300101A: Linear Algebra

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03hrs/week **Tutorial:01hr/week**	**03** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Tutorial / Termwork: 25Marks**

Prerequisite Courses: -

Course Objectives:
To introduce concepts of Matrices and system of linear Equations, linear and orthogonal transformations.
To introduce concepts of Eigen values and Eigen Vectors.
To introduce concepts of Partial Differentiation.
To introduce concepts of Jacobians, Maxima and Minima, errors and Approximations.
To introduce fundamental concepts of probability.
To introduce computational tools for solving mathematical problems.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Interpret the concepts of Jacobians, rank, quadratic form, canonical form, transformations, Eigen values, Eigen vectors and probability.	2-Understanding
CO2	Solve problems on linear algebra, partial derivatives and probability.	3- Apply
CO3	Apply concepts of linear algebra, differential calculus and probability to engineering problems.	3- Apply
CO4	Use computational tools for solving mathematical problems.	3- Apply
CO5	Analyze the nature of quadratic forms, extreme values of the function, error and approximations.	4 -Analyze

COURSE CONTENTS

Unit I	**Matrices and Linear System of Equations**	**(07hrs+2hrsTutorial)**	**COs Mapped - CO1, CO2, CO3**

Rank of a matrix, system of linear Equations, Linear Dependence and Independence of vectors, Linear and orthogonal transformations, Application to system of linear equations.

Unit II	**Eigen Values and Eigen Vectors**	**(08hrs+ 2hrsTutorial)**	**COs Mapped - CO1, CO2, CO3, CO5**

Eigen values &Eigen vectors, diagonalization, quadratic forms and reduction of quadratic forms to canonical forms, applications of Eigen values and Eigenvectors.

Unit III	Partial Differentiation	(07hrs+ 2hrsTutorial)	COs Mapped –CO2, CO3
Introduction to functions of two or more variables, Partial Differentiation, Euler's Theorem on Homogeneous Functions, Partial differentiation of Composite and Implicit functions, Total derivatives.			
Unit IV	**Application of Partial Differentiation**	**(07hrs+ 2hrsTutorial)**	**COs Mapped - CO1, CO2, CO3, CO5**
Jacobians, Functional Dependence & Independence, Errors and Approximation, Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.			
Unit V	**Introduction to Probability and Counting**	**(07hrs+ 2hrsTutorial)**	**COs Mapped - CO1, CO2, CO3**
Interpreting probabilities, Relative frequency and classical definition of probability, sample spaces and Events, mutually exclusive events, Permutations and Combinations, Axioms of probability, Addition rule, conditional probability, multiplication rule, Independent Events, Bayes' Theorem.			

TextBooks

1. B.V. Ramana, " Higher Engineering Mathematics", Tata McGraw-Hill.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.

Reference Books

1. Erwin Kreyszig ,"Advanced Engineering Mathematics" ,Wiley Eastern Ltd.
2. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics" (Volumes I and II), Pune Vidyarthi Griha Prakashan, Pune.

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	1	-	-	-	-	-	-	-	-	-	2
CO2	3	1	1	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	2	-	-	-	-	-	-	2
CO4	1	-	-	-	3	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Alloted**
1	Assignments (Total 3 Assignment, Unit I and II 20 marks, Unit III and IV 20 marks and Unit V 10 marks &50 marks will be converted to 10 Marks)	10
2	Tests on each unit using LearniCo (Each test for 15 M and total will be converted out of 10 M)	10

List of Tutorial Assignments		
Sr. No.	**Title**	**CO Mapped**
1	Examples on rank of a matrix, system of linear Equations	CO1, CO2
2	Examples on linear dependence and Independence of vectors, application to system of linear equations.	CO1, CO2, CO3
3	Examples on Eigen values & Eigen Vectors.	CO1, CO2, CO3
4	Examples quadratic forms to canonical forms.	CO1, CO2, CO3,CO5
5	Solve problems on matrices using Matlab.	CO1, CO2, CO4
6	Solve system of equations using Matlab.	CO1, CO2, CO4
7	Examples on partial differentiation, Euler's Theorem on homogeneous functions	CO2, CO3
8	Examples on partial differentiation of composite and implicit functions, total derivatives.	CO2, CO3
9	Examples on Jacobians, functional dependence & independence, errors and approximation	CO1, CO2, CO3 , CO5
10	Examples on maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	CO1, CO2, CO3, CO5
11	Examples on fundamental concepts of probability.	CO1, CO2
12	Examples on conditional probability, Bayes' Theorem.	CO1, CO2, CO3

Guidelines for Tutorial / Termwork Assessment		
Sr. No.	**Components for Tutorial / Termwork Assessment**	**Marks Allotted**
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	15
3	Attendance (Above 95 % : 05 Marks, below 75% : 0 Marks)	5

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F. Y. B. Tech.
Pattern 2023
2300103B: Differential Calculus

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03hrs/week **Tutorial: 01hr/week**	**03** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Tutorial / TermWork: 25Marks**

Prerequisite Courses: -

Course Objectives:
To introduce concepts of first order first degree differential equations.
To model various physical systems, such as orthogonal trajectories, Newton's law of cooling, Simple electrical circuits, Rectilinear motion, Heat transfer.
To introduce interpolating polynomials, numerical differentiation and integration.
. To introduce concept of double and triple integration and their applications.
. To introduce computational tools for solving mathematical problems.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Explain types of differential equations, finite differences and multiple integrals.	2- Understanding
CO2	Solve problems on differential equations and multiple integrals.	3- Apply
CO3	Apply concept of numerical methods, differential and multivariate calculus to engineering problems.	3- Apply
CO4	Use computational tools for solving mathematical problems.	3- Apply
CO5	Analyze the solution of differential equations, numerical differentiation & integration and multiple integrals.	4- Analyze

COURSE CONTENTS

Unit I	**Differential Equations (DE)**	**8hrs+ 2hrsTutorial**	**COs Mapped - CO1, CO2, CO3**

Formation of differential equations Exact DE, equations reducible to exact form, Linear DE and Differential equation reducible to linear form.

Unit II	**Applications of Differential Equations**	**7hrs+ 2hrsTutorial**	**COs Mapped - CO1, CO2, CO3, CO5**

Application of DE to Orthogonal trajectories, Newton's Law of Cooling, Kirchhoff's Laws of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Heat flow.

Unit	**Finite differences and Interpolation**	**7hrs+**	**COs Mapped**

III		**2hrsTutorial**	**– CO1, CO3 , CO5**
Finite differences, differences of polynomials, relations between the operators, Newton's interpolation formula, Stirling's formula, Lagrange's Interpolation formula.			
Unit IV	**Numerical Differentiation and Integration**	**7hrs+2hrsTutorial**	**COs Mapped - CO1, CO3, CO5**
Numerical Differentiation: Euler's method, Euler's Modified Method, Runge- Kutta fourth order, Predictor- Corrector Method. **Numerical Integration:** Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule.			
Unit V	**Multiple Integrals and their Applications**	**7hrs+2hrsTutorial**	**COs Mapped - CO1, CO2, CO3,CO5**
Double and Triple integrations, applications to area, volume, mean and root mean square values and Center of Gravity.			
TextBooks			
1.M.K. Jain, R.K.Jain, Iyengar, "Numerical Methods for scientific and engineering computation" (New age International) 2. B. S. Grewal ,"Higher Engineering Mathematics" Khanna Publication, Delhi.			
Reference Books			
1. Erwin Kreyszig ,"Advanced Engineering Mathematics" ,Wiley Eastern Ltd. 2. P. N. Wartikar and J. N. Wartikar," Applied Mathematics" (Volume I and II) , Pune Vidyarthi Griha Prakashan, Pune.			

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	1	-	-	-	-	-	-	-	-	-	2
CO 2	3	1	1	-	-	-	-	-	-	-	-	2
CO 3	3	3	2	2	2	-	-	-	-	-	-	2
CO 4	1	-	-	-	3	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignments (Total 3 Assignment, Unit I and II 20 marks, Unit III and IV 20 marks and Unit V 10 marks &50 marks will be converted to 10 Marks)	10
2	Tests on each unit using LearniCo (Each test for 15 M and total will be converted out of 10 M)	10

List of Tutorial Assignments		
Sr. No.	**Title**	**CO Mapped**
1	Examples on formation of differential equations exact DE.	CO1, CO2
2	Examples on linear DE and reducible to linear differential equations.	CO1, CO2
3	Examples on application of DE to Orthogonal trajectories, Newton's Law of cooling.	CO1, CO2, CO3,CO5
4	Examples on Electrical Circuits, motion under gravity, Rectilinear Motion.	CO1, CO2, CO3,CO5
5	Solving differential equation using Matlab.	CO1, CO2, CO4
6	Examples on finite differences, differences of polynomials, relations between the operators.	CO1, CO3
7	Examples on Newton's interpolation formula, Stirling's formula, Lagrange's Interpolation formula.	CO1, CO3 , CO5
8	Solve ordinary differential equations using Numerical Methods.	CO1, CO3 , CO5
9	Solve definite integration using Numerical Methods.	CO1, CO3 , CO5
10	Solving differential equation and definite integrals using Matlab.	CO1, CO2, CO4
11	Examples on double and triple integrations.	CO1, CO2, CO3
12	Examples on applications of double and triple integration.	CO1, CO2, CO3, CO5

Guidelines for Tutorial / Termwork Assessment		
Sr. No.	**Components for Tutorial / Termwork Assessment**	**Marks Allotted**
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	15
3	Attendance (Above 95 % : 05 Marks, below 75% : 0 Marks)	5

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F. Y. B. Tech.
Pattern 2022
2300114A: Fundamentals of Mechanical Engineering

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory:03hrs/week **Practical :** 02hrs/week	**03** **01**	**InSem Exam:** 20Marks **Continuous Assessment:** 20Marks**EndSem Exam:** 60Marks **Term Work:** 50 Marks

Prerequisite Courses: - Mathematics, Physics, Chemistry

Course Objectives:
To familiarize with properties of materials
To explain various power transmission elements
To discuss applications of laws o thermodynamics and heat transferTo explain working of IC engine, Electric and Hybrid Vehicles
To introduce various conventional and smart manufacturing processes and supp rt systems.

Course Outcomes: On completi n of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	**Explain** the basic concepts of IC engine, thermodynamics and smart manufacturing.	2- Understand
CO2	**Identify** various components of electric and hybrid vehicles.	2- Understand
CO3	**Apply** the knowledge of laws of thermodynamics and heat transfer to heat engine, heat pump and refrigerator.	3- Apply
CO4	**Calculate** material parameters for a given application	3- Apply
CO5	**Select** a suitable power transmission element for a required application.	3- Apply

COURSE CONTENTS

Unit I	**Properties of Soli and Power Transmission lements**	**(08 hrs)**	COs Mapped – CO4, CO5

a) Properties of Solid: Stress, Tensile, Compressive and Shear Stress, Strain, Elasticity, Plasticity, Stress-Strain Diagram and related properties, Proof Stress.
b)Power Transmission Elements: Chain drives, Types of gears and gear drives, Frictionclutch, Brakes.

Unit II	**Basics of Thermodynamics and Heat Transfer**	**(08 hrs)**	COs Mapped – CO3

a) First Law of Thermodynamics: Application of First law to open system, steady flow andclosed system. Introduction to Heat Engine, Heat Pump and Refrigerator.
Second Law of Thermodynami s: Kelvin Planck and Clausius Statement, Introduction toCarnot Heat Engine, Perpetual Motion Machine (PMM) - I and II
b) Heat Transfer: Heat, Modes f heat transfer. Laws of Heat Transfer and applications

Unit III	Fundamentals of I Engines and Electric and Hyb id Vehicles	(08 hrs)	COs Mapped – CO1, CO2
a) Fundamentals of IC Engines: Classification of Internal Combustion Engines, Working of2-stroke and 4-Stroke engines, A plications of IC Engines. **b) Introduction to Electric and Hybrid Vehicles:** Components of Electric and Hybrid Vehicles. Advantages and limitations of EVs and Hybrid vehicles.			
Unit IV	**Manufacturing Processes**	**(08 hrs)**	COs Mapped – CO1
Manufacturing Processes: Metal Casting, Forging, Sheet metal Working, Machining and machine tools, and Metal Joining Processes.			
Unit V	**Smart Manufacturing**	**(08 hrs)**	COs Mapped – CO1
a) Smart Manufacturing: Industrial automation: CNC technology, autonomous robots, Automated Guided Vehicles (AGV), Automated Storage (AS)/ Retrieval System (RS), Flexiblemanufacturing **b) Manufacturing support systems:** Computer integrated manufacturing, computer aided process planning, machine vision systems for inspection, Lean and agile manufacturing, valuestream mapping			
Text Books			
1. Iqbal Husain, "Electric and Hybrid Vehicles", CRC Press, Third Edition 2. Pravin Kumar, "Basic Mechanical Engineering", Pearson, Second Edition			
Reference Books			
1. Jonathan Wickert, Kemper Lewis, "An Introduction to Mechanical Engineering", CengageLearning, Fourth Edition 2. Groover M. P. (2016) "Automation, Production Systems, Computer integratedmanufacturing", Pearson			

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	-	-	-	-	-	-	-	-	2	-	1
CO2	3	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	-	2	-	-
CO4	3	-	-	-	-	-	-	-	-	2	-	1
CO5	3	-	-	-	-	-	-	-	-	2	-	1

Sr. No.	Components for Continuous Assessment	Marks Allotted
1	Peer Supported Independent Study (PSIS) based on one Industrial Visit Number of Activities: 2 Mark Distribution: 5 marks for each activity Student will work independently on given topic, (Topic that requires analysis, application or problem solving using core concepts already covered in a class) Topics: Properties of Solids, Manufacturing Processes, DrivesInput resources will be provided to students Students are asked to do research for latest articles; study in detail andcarefully observe real life applications of topic during Industrial visit and present review in 5 minutes or identify/suggest applications of theconcept.	10
2	One objective test per unit using LearniCo (Total 5 Test) (Each test for 10 Marks and average of 5 test will be considered)	10

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Engine trial for measurement of fuel flow, air flow and brake power	CO1, CO3
2	To determine thermal conductivity using Fourier's law for a simple slab	CO1, CO3
3	Calculations of gear ratio and identifying forces on different types of gears	CO5
4	Rockwell Hardness Test	CO4
5	Visit to molding and casting industry	CO1, CO4
6	To determine power consumption, refrigerating effect and COP of refrigerator	CO1, CO3
7	Survey of electric vehicles to study its specifications	CO2
8	Determination of Stiffness	CO4

Guidelines for Laboratory Conduction

1. Measurement of Hardness using Rockwell Hardness Tester for Mild Steel, Aluminium,Copper and Brass (Experiment 4)
2. Determine stiffness of 2 mm diameter wire (Aluminium or Copper). (Experiment 8)
3. Industrial Visit should be arranged to Molding and Casting Industry. Students will givepresentation based on observations made during Industrial Visit.

Guidelines for Student's Lab Journal

The Student's Lab Journal should contain following related to every experiment:

1. Theory related to the experiment
2. Apparatus with their detailed specifications
3. Schematic, Layout/diagram
4. Observation table
5. Sample calculations for Rockwell Hardness Test and Determination of Stiffness.
6. Result table. Graph and Conclusions
7. 3/4 questions related to the experiment
8. Attach Photo of experiment or image related to Experiment

Guidelines for Termwork Assessment

For every Lab Assignment -

Rubric	Mode of Assessment	Marks
Rubric R1	Timely Completion of Journal Writing	Marks 10
Rubric R2	Understanding of Experiments	Marks 10
Rubric R3	Presentation / Clarity of journal writing	Marks 10

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F. Y. B. Tech.
Pattern 2023
2300110A: Engineering Drawing

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory:01hr/week **Practical: 02hrs/week**	**01** **01**	**In-Sem Exam: 20Marks** **End-Sem Exam: 30Marks** **Term Work: 50 Marks**

Prerequisite Courses: -

Course Objectives:

. To explain the fundamental concepts of engineering drawing and its standards.
. To improve visualization skills of physical objects on paper.
. To develop interpretation and drawing skills by manual and computerized graphical techniques.

Course Outcomes: On completion of the course, students will be able to–

COs	**Course Outcomes**	**Bloom's Level**
CO1	Explain the need of engineering drawing and its standards.	2-Understand
CO2	Interpret engineering drawing by visualization.	2-Understand
CO3	Draw projections of 2D and 3D objects.	3-Apply
CO4	Apply manual and computerized graphical tools to solve practical problems.	3-Apply

COURSE CONTENTS

Unit I	**Projections of a Point and Line**	**(03hrs)**	**COs Mapped – CO2, CO4**

Projections of a point, projections of a line located in first quadrant only.

Unit II	**Projections of Plane**	**(02hrs)**	**COs Mapped – CO2, CO3, CO4**

Types of planes, projections of plane inclined to both the reference planes

Unit III	**Orthographic Projections**	**(03hrs)**	**COs Mapped - CO1, CO2, CO3, CO4**

Principle of projections, types of projections, introduction to first and third angle methods of projection, basic rules of orthographic projection, orthographic and sectional orthographic projection of simple objects and machine elements/parts. Applications of orthographic drawing in industries.

Unit IV	**Isometric Projections**	**(02hrs)**	**COs Mapped – CO2, CO3, CO4**

Introduction to isometric projection and isometric scale. Construction of isometric view from given orthographic views. Applications of isometric drawing in industries.

Unit V	**Development of Lateral Surfaces of Solids and Introduction to Computer Aided Drafting**	**(03hrs)**	**COs Mapped - CO1, CO2, CO3, CO4**

Types of solids, projection of solids resting on HP only. Methods of development: parallel line development and radial line development. Development of simple solids like cone, cylinder, prism, tetrahedron and pyramid. Introduction to CAD and basic commands to draw simple 2D and 3D objects.

TextBooks
1. Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India 2.Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi
Reference Books
1. Bhatt, N. D., "Machine Drawing", Charotar Publishing house, Anand, India.

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	--	--	--	--	--	--	--	--	--	--	1
CO2	2	--	--	--	--	--	--	--	--	1	--	1
CO3	2	--	--	--	2	--	--	--	--	1	--	1
CO4	2	--	--	--	2	--	--	--	--	1	--	1
Average	**2**	--	--	--	**2**	--	--	--	--	**1**	--	**1**

List of Laboratory Assignments		
Sr. No.	**Laboratory Assignments**	**CO Mapped**
1	Projection of lines and Projection of Planes (One problem each)	CO2, CO3, CO4
2	Orthographic Projection of given objects including sectional view. (Two Problems)	CO1, CO2, CO3, CO4
3	Isometric view / projection for the given set of two-dimensional views. (Two Problems)	CO2, CO3, CO4
4	Development of Lateral Surfaces of solids. (Two Problems)	CO1, CO2, CO3, CO4
5	Orthographic Projection of given object using any drafting software (One Problem)	CO1, CO2, CO3, CO4
6	Isometric view / projection of given object using any drafting software (One Problem)	CO2, CO3, CO4
Guidelines for Laboratory Conduction		
Students will solve first four laboratory assignments on A2 size drawing sheet and last two assignments using any drafting software.		
Guidelines for Term work Assessment		
Each laboratory assignments will be assessed for 30 Marks according to following rubrics: R1- Timely completion of assignments (10 Marks) R2- Understanding of assignment (10 Marks) R3 – Presentation/Clarity of journal writing (10 Marks) For all six drawing sheets total marks of 180 will be converted into 50 Marks.		

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. B. Tech.
Pattern 2023
2300112A: Communication Skills

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 01hr/week **Practical: 02hrs/week**	**01** **01**	**Continuous Comprehensive Evaluation: 25Marks** **Termwork: 50Marks**

Prerequisite Courses, if any: ----

Course Objectives:

1. To highlight the need to improve soft skills among engineering students so as to become good professionals.
2. To facilitate a holistic development of students by enhancing soft skills.
3. To develop and nurture the soft skills of the students through individual and group activities.
4. To expose students to right attitudinal and behavioural aspects and assist in building the same through activities.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Develop effective communication skills including Listening, Reading, Writing and Speaking	**3-Apply**
CO2	Practice professional etiquette and present oneself confidently.	**3-Apply**
CO3	Function effectively in heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.	**3-Apply**
CO4	Evaluate oneself by performing SWOC Analysis to introspect about individual's goals and aspirations.	**4-Evaluate**
CO5	Constructively participate in group discussion, meetings and prepare and deliver Presentations.	**4-Evaluate**

Text Books

1. Gajendra Singh Chauhan, Sangeeta Sharma, "Soft Skills – An Integrated Approach to Maximize Personality", Wiley India, ISBN:13:9788126556397
2. Simon Sweeney, "English for Business Communication", Cambridge University Press, ISBN 13:978- 0521754507

Reference Books

1. Indrajit Bhattacharya, "An Approach to Communication Skills", Delhi, Dhanpat Rai, 2008
2. Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press, ISBN 10:9780199457069
3. Business Communication & Soft Skills, McGraw Hill Education.
4. Atkinson and Hilgard, "Introduction to Psychology", 14th Edition, Geoffrey Loftus, ISBN-10:0155050699, 2003.
5. Kenneth G. Mcgee, "Heads Up: How to Anticipate Business Surprises & Seize Opportunities First", Harvard Business School Press, Boston, Massachusetts, 2004, ISBN 10:1591392993
6. Krishnaswami, N. and Sriraman T., "Creative English for Communication," Macmillan

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-	-	3	3	-	-
CO2	-	-	-	-	-	-	-	-	3	3	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	-

List of Laboratory Experiments / Class Assignments		
Sr. No.	**Laboratory Experiments / Class Assignments**	**COs Mapped**
1	**English Language Basics – Class Assignments** Fundamentals of English grammar, Vocabulary Building, Developing basic writing skills and Identifying Common Errors in Writing	**CO1**
2	**Listening and Reading Skills** **a. Listening Worksheets using Language Lab Software** Each student will be given specifically designed worksheets that contain blanks / matching / MCQs that are designed to an audio (chosen by the faculty). Students have to listen to the audio (only once) and complete the worksheet as the audio plays. This will help reiterate active listening as well as deriving information (listening to information between the lines) **b.** Reading Comprehension Worksheets to be distributed/displayed to students. – **Class Assignments** Teacher will choose reading passages from non-technical domains, design worksheets with questions for students to answer. This will enhance student's reading skills by learning how to skim and scan for information.	**CO1**
3	**Writing Skills** **a. Letter / Email Writing – Lab Experiment** After explaining to the students the highlights of effective writing, students can be asked to write (using digital platforms / paper-based) letter to an organization with the following subject matter, **i.** Requesting opportunity to present his/her product. **ii.** Complaining about a faulty product / service. **iii.** Apologizing on behalf of one's team for the error that occurred. **iv.** Providing explanation for a false accusation by a client. **b.** Abstract Writing – **Class Assignment** Teacher will choose a newspaper article / short stories and ask students to write an abstract.	**CO1**
4	**Speaking Skills / Oral Communication – Part A** **a. One minute Self Introduction – Class Assignment** Explain how to introduce oneself in a professional manner and presenting oneself positively Name, Academic Profile, Achievements, Career Aspirations, Personal Information (hobbies, family, social). **b. Presentations – Lab Experiment** Every student will have to choose a topic of his/her choice and make a 5-minute	**CO5, CO2**

	presentation using audio-video aids / PPT. Every student will make two presentations on – one technical and other non-technical topic. Focus and evaluation of each presentation should be the depth of knowledge about the topic, originality of perspective on the topic, well-researched or not, verbal and non-verbal skills and ability to answer questions effectively. Plagiarism should be discredit and students should be instructed about it.	
5	**Speaking Skills / Oral Communication – Part B** **a. Group Discussion – Lab Experiment / Class Assignment** The class will be divided into groups of 5-6 students for a discussion lasting 15 minutes. Topics should be provided by teachers. After each group finishes its discussion, the teacher will give critical feedback including areas of improvement. The teacher should act as a moderator / observer only	**CO1, CO5, CO2, CO3**
6	**Extempore** Various topics will be laid out in front of the audience and each student is to pick one topic and speak about the topic for 5 minutes followed by Q&A from audience. Teacher will evaluate each student based on thinking ability, content, communication skills, logical and cohesive presentation of topic, perspective of student, ability to handle questions and respond positively	**CO1, CO2**
7	**SWOC Analysis** **a.** Focus on introspection and become aware of one's Strengths, Weakness, Opportunities and Challenges. Students can write down their SWOC in a matrix and the teacher can discuss the gist personally. **b. Resume Writing** The teacher should conduct a brief session outlining the importance of a CV / Resume and students can write / type out their own resumes i. Share various professional formats. ii. Focus on highlighting individual strengths. iii. Develop personalized professional goals / statement at the beginning of the resume.	**CO4**

Guidelines for Laboratory Conduction

The teacher may design specific assignments that can highlight the learning outcomes of each unit. Each activity conducted in the lab should begin with a brief introduction of the topic, purpose of the activity from a professional point of view and end with the learning outcomes as feedback from students. Most of the lab sessions can be designed to be inclusive; allowing students to learn skills experientially; which will benefit them in the professional environment. Every student must be given sufficient opportunity to participate in each activity and constructive feedback from the instructor / facilitator at the end of the activity should learn towards encouraging students to work on improving their skills. Activities should be designed to respect cultural, emotional and social standing of students. Some of the activities can be designed to cater to enhancement of multiple skills – e.g. Team Building Activity can highlight 'open communication', 'group discussion', 'respecting perspectives', 'leadership skills', 'focus on goals' which can help students improve their inherent interpersonal skills.

At least one session should be dedicated to an interactive session that will be delivered by an expert from the industry; giving the students an exposure to professional expectations.

Guidelines for Student's Lab Journal

Each student should have a Lab Workbook (sample workbook attached) which outlines each lab activity conducted. The student must respond by writing out their learning outcomes and elaborating the activities performed in the lab., group discussion, group exercises and interpersonal skills and similar other activities/assignments.

Guidelines for Term work Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments and performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities-SWOC analysis, presentations, team activity, event management

K. K. Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2023-24)

F. Y. B. Tech. Pattern 2023 2300117G: Introduction to CAD		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 01hr/week Practical: 02hrs/week	**01 01**	**Continuous Comprehensive Evaluation: 25Marks Termwork: 25Marks**

Prerequisite Courses, if any: Fundamentals of Engineering Drawing

Course Objectives:

1. To introduce students to the fundamentals of AutoCAD and its interface.
2. To provide students with a basic understanding of drawing, editing commands and geometrical transformations of 2D geometries.
3. To familiarize students with essential features such as layers, colors, line types, text, dimensions, plotting, and printing.
4. To provide hands-on experience in using AutoCAD 2D/3D for drawing and designing purposes.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	**List** the fundamental drawing commands used in AutoCAD.	**1-Remember**
CO2	**Explain** the importance and purpose of managing layers, applying colors, dimensions, text and defining line types in AutoCAD.	**2-Understand**
CO3	**APPLY** geometric transformations to simple 2D geometries	**3-Apply**
CO4	**Apply** their knowledge to create 2D and 3D drawings, edit, and modify basic drawings using various commands in CAD.	**3-Apply**

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	--	--	--	2	--	--	--	--	--	--	1
CO2	2	--	--	--	2	--	--	1	--	--	--	1
CO3	2	--	--	--	2	--	--	--	--	--	--	1
CO4	2	--	--	--	2	--	--	1	--	--	--	1
Average	2	--	--	--	2	--	--	1	--	--	--	1

Course Contents:

Unit I	**Introduction to CAD**	**(2 Hrs)**	**CO Mapped: CO1**
Introduction to CAD, Various CAD software available, Overview of AutoCAD interface and features, understanding the workspace and basic tools, creating and saving drawings, Creating templates Setting up new drawing: Units, Limits, Grid, Snap, Standard sizes of sheet.			
Unit II	**Drawing and Editing Commands**	**(4 Hrs)**	**CO Mapped: CO1**
Working with basic drawing commands: line, circle, rectangle, etc., Use of modification commands: trim, extend, fillet, etc., Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear, Applying object snaps.			
Unit III	**Layers and Dimensions**	**(2 hours)**	**CO Mapped: CO2**
Managing layers and layer properties, Assigning colors and layers to objects, Defining and using different line types, Adding text and annotations to drawings, Formatting text styles and properties, Types of dimensions, Creating and editing dimensions, Dimension Styles, Setting up layout and paper space, Configuring plot settings and page setups, Plot Styles and Page Setups, Publishing to other File Types, Plotting and printing drawings.			
Unit IV	**Geometric Transformation**	**(4 hours)**	**CO Mapped: CO3**
Introduction, Geometric Transformations, Translation, Scaling, Rotation, Reflection/Mirror, Homogeneous Transformation, Inverse Transformation, Concatenated Transformation (limited to 2D objects with maximum 3 points only), Coordinate systems - Model (MCS), Working (WCS), Screen (SCS) coordinate system.			
Unit V	**Introduction to 3D CAD**	**(2 hours)**	**CO Mapped: CO4**
Introduction of 3D CAD, Introduction of 3D CAD and Overview of AutoCAD 3D and its applications, Interface and navigation in the 3D environment, Understanding coordinate systems in 3D space, Modifying 3D objects: move, rotate, scale, etc. Neutral 3D CAD file formats (DXF, IGES, PDES, STEP, ACIS, Parasolid, STL, etc.),			
Text / Reference Books			
2. Jolhe, D. A., "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi			

3. George Omura and Brian C. Benton, “Mastering AutoCAD 3D”, John Wiley & Sons
4. Bill Fane, "AutoCAD for Dummies", Wiley
5. Rao, P. N., (2017), “CAD/CAM: Principles and Applications”, 3rd edition, McGraw Hill Education, ISBN-13: 978-0070681934
6. Steve Heather AutoCAD 3D Modeling: Exercise Workbook, Industrial Press Inc., U.S.

List of Laboratory Assignments		
Sr. No.	**Laboratory Assignments**	**CO Mapped**
1	Create detailed 2D engineering drawings for mechanical parts, using lines, arcs, and circles. Apply proper dimensions and geometric constraints to ensure accuracy.	CO1, CO2,
2	Projection of Solids	CO1, CO2, CO3
3	Development of Lateral Surfaces of solids.	CO1, CO2, CO3
4	Create a sectional view of a mechanical parts/assembly.	CO1, CO2, CO3
5	Create a 3D model of a simple mechanical parts used for digital manufacturing.	CO1, CO2, CO4

Guidelines for Continuous Comprehensive Evaluation of Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignment on Unit 2 ,3 & 5	10
2	Assignment on Unit 4 - Numerical on Concatenated Transformation (limited to 2D objects with maximum 3 points only)	10
3	MCQ (LMS) test on each unit	05

Guidelines for Laboratory Conduction

Students will solve Five assignments two problems of each assignment by using any drafting software.
Drawing limits for all drawings to be made in drafting software should be set to A2 Size.
At the end of semester students shall submit all soft copies of all assignments to a concerned faculty.

Guidelines for Term work Assessment

Each laboratory and tutorial assignments will be assessed for 30 Marks according to following rubrics:
R1- Timely completion of assignments (10 Marks)
R2- Understanding of assignment (10 Marks)
R3 – Presentation/Clarity of journal writing (10 Marks)
For all five assignments total marks of 150 will be converted into 25 marks.

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech. (All Branches)
Pattern 2023
2300115A: Arts and Sports

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 02 hrs/Week	**02**	**Termwork: 50Marks**

Course Objectives:
To introduce co curricular activities for holistic development of student

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Write critics about books & films and understand the problems of rural india.	2-Understand
CO2	Present the knowledge gained by all coo curricular activities.	4- Analyze 5-Evaluate
CO3	Perform Yoga and play different sports of his own development.	3. Apply

COURSE CONTENTS

Assignment 01	**Review of book**	**(6 hrs)**	**COs mapped-CO1**

1. Select a book you like (non technical)
2. Read book at home
3. Write a critics about the book
4. Share it into class for 5min

Evaluation will be based on

1. Critics document—10Marks
2. Sharing experience—10Marks

Assignment 02	**Review of Film**	**(6 hrs)**	**COs mapped-CO1**

1. Select a movie with good message to society.
2. See the movie at home
3. Write a critics about the book
4. Share it into class for 5min

Evaluation will be based on

1. Critics document—10Marks
2. Sharing experience—10Marks

Assignment 03	**Assessment of Problem of Rural India**	**8 hrs)**	**COs mapped-CO4**

1. Select a village you like as far as remote village or rural school (group of 6 to 7)
2. Visit to that place for one day
3. Take interview of people at villages for their problem.
4. Make a document of it with possible remedial action.
5. Share it into class

Evaluations will be based on

1. Document of problems of rural India—10Marks 2. Remedial suggestions---10 Marks			
Assignment 04	**Yoga and Sports**	**(8 hrs)**	**COs mapped-CO2, CO3**
1. Get the knowledge about Yoga 2. Participate the Yoga training at institute 3. Perform it daily 1. Physical Education session at ground 2. Introduction of sports to students Evaluation will be based on 1. Attending Yoga session of 4 Hours in semester—20 Marks 2. Physical education test—10 Marks 3. Attending 4 hour session of sports—10 Marks			

Term work Assessment:

1.	Assignment 01	10 Marks
2.	Assignment 02	10 Marks
3.	Assignment 03	10 Marks
4.	Assignment 04	20 Marks

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech.
Pattern 2023
2300102A: Differential Calculus

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03hrs/week **Tutorial: 01hr/week**	**03** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Tutorial / TermWork: 25Marks**

Prerequisite Courses: -

Course Objectives:

. To introduce concepts of first order first degree differential equations.
. To model various physical systems, such as orthogonal trajectories, Newton's law of cooling, Simple electrical circuits, Rectilinear motion, Heat transfer.
. To introduce interpolating polynomials, numerical differentiation and integration.
. To introduce concept of double and triple integration and their applications.
. To introduce computational tools for solving mathematical problems.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Explain types of differential equations, finite differences and multiple integrals.	2- Understanding
CO2	Solve problems on differential equations and multiple integrals.	3- Apply
CO3	Apply concept of numerical methods, differential and multivariate calculus to engineering problems.	3- Apply
CO4	Use computational tools for solving mathematical problems.	3- Apply
CO5	Analyze the solution of differential equations, numerical differentiation & integration and multiple integrals.	4- Analyze

COURSE CONTENTS

Unit I	**Differential Equations (DE)**	**8hrs+ 2hrsTutorial**	**COs Mapped - CO1, CO2, CO3**

Formation of differential equations Exact DE, equations reducible to exact form, Linear DE and Differential equation reducible to linear form.

Unit II	**Applications of Differential Equations**	**7hrs+ 2hrsTutorial**	**COs Mapped - CO1, CO2, CO3, CO5**

Application of DE to Orthogonal trajectories, Newton's Law of Cooling, Kirchhoff's Laws of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Heat flow.

Unit III	Finite differences and Interpolation	7hrs+ 2hrsTutorial	COs Mapped – CO1, CO3 , CO5
Finite differences, differences of polynomials, relations between the operators, Newton's interpolation formula, Stirling's formula, Lagrange's Interpolation formula.			
Unit IV	**Numerical Differentiation and Integration**	**7hrs+2hrsTutorial**	**COs Mapped - CO1, CO3, CO5**
Numerical Differentiation: Euler's method, Euler's Modified Method, Runge- Kutta fourth order, Predictor- Corrector Method. **Numerical Integration:** Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule.			
Unit V	**Multiple Integrals and their Applications**	**7hrs+2hrsTutorial**	**COs Mapped - CO1, CO2, CO3,CO5**
Double and Triple integrations, applications to area, volume, mean and root mean square values and Center of Gravity.			

TextBooks

1.M.K. Jain, R.K.Jain, Iyengar, "Numerical Methods for scientific and engineering computation" (New age International)
2. B. S. Grewal ,"Higher Engineering Mathematics" Khanna Publication, Delhi.

Reference Books

1. Erwin Kreyszig ,"Advanced Engineering Mathematics" ,Wiley Eastern Ltd.
2. P. N. Wartikar and J. N. Wartikar," Applied Mathematics" (Volume I and II) , Pune Vidyarthi Griha Prakashan, Pune.

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	3	1	-	-	-	-	-	-	-	-	-	2
CO 2	3	1	1	-	-	-	-	-	-	-	-	2
CO 3	3	3	2	2	2	-	-	-	-	-	-	2
CO 4	1	-	-	-	3	-	-	-	-	-	-	2
CO5	3	3	2	2	2	-	-	-	-	-	-	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignments (Total 3 Assignment, Unit I and II 20 marks, Unit III and IV 20 marks and Unit V 10 marks &50 marks will be converted to 10 Marks)	10
2	Tests on each unit using LearniCo (Each test for 15 M and total will be converted out of 10 M)	10

List of Tutorial Assignments		
Sr. No.	**Title**	**CO Mapped**
1	Examples on formation of differential equations exact DE.	CO1, CO2
2	Examples on linear DE and reducible to linear differential equations.	CO1, CO2
3	Examples on application of DE to Orthogonal trajectories, Newton's Law of cooling.	CO1, CO2, CO3,CO5
4	Examples on Electrical Circuits, motion under gravity, Rectilinear Motion.	CO1, CO2, CO3,CO5
5	Solving differential equation using Matlab.	CO1, CO2, CO4
6	Examples on finite differences, differences of polynomials, relations between the operators.	CO1, CO3
7	Examples on Newton's interpolation formula, Stirling's formula, Lagrange's Interpolation formula.	CO1, CO3 , CO5
8	Solve ordinary differential equations using Numerical Methods.	CO1, CO3 , CO5
9	Solve definite integration using Numerical Methods.	CO1, CO3 , CO5
10	Solving differential equation and definite integrals using Matlab.	CO1, CO2, CO4
11	Examples on double and triple integrations.	CO1, CO2, CO3
12	Examples on applications of double and triple integration.	CO1, CO2, CO3, CO5

Guidelines for Tutorial / Termwork Assessment		
Sr. No.	**Components for Tutorial / Termwork Assessment**	**Marks Allotted**
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	15
3	Attendance (Above 95 % : 05 Marks, below 75% : 0 Marks)	5

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech.
Pattern 2023
2300104A: Applied Chemistry

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03hrs/week **Practical : 02hrs/week**	**03** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **TermWork: 50Marks**

Prerequisite Courses, if any: -

Course Objectives:

. To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials.
. To understand structure, properties and applications of speciality polymers, nano material and alloys.
. To study conventional and alternative fuels with respect to their properties and applications
. To understand technology involved in analysis and improving quality of water as commodity.
. To understand corrosion mechanisms and preventive methods for corrosion control.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Describe different techniques used for chemical entities present in fluids, fuel, polymer, alloys.	1-Knowledge
CO2	Select appropriate technology involved in determination of purity and properties of material.	2- Understand
CO3	Illustrate causes and preventive measures of ill effect of hard water and corrosion	3-Apply
CO4	Analyse the fluids, fuels and selection of appropriate purification methods.	3-Apply
CO5	Compare composition of fuels, purity of water and mitigation for corrosion control	4-Analyze

COURSE CONTENTS

Unit I	**Cells, Batteries and Electro analytical Techniques**	**(8hrs)**	**CO1,CO4**

Introduction: Dry cell, alkaline battery, Ni-Cd battery, H_2O_2 fuel cells, Lithium ion battery. Reference electrode (calomel electrode), ion selective electrode (combined glass electrode).
Conductometry: Introduction, conductometric titrations of acid versus base with titration curves (SA-SB).
pH metry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve.
UV-Visible Spectroscopy: Introduction, interaction of electromagnetic radiation with matter, statement of Beer's law and Lambert's law, different electronic transitions, terms involved in UV-visible Spectroscopy.

Unit II	**Fuels**	**(8hrs)**	**CO1, CO4, CO5**

Introduction, classification, Calorific value (CV): Gross calorific value (GCV) and Net calorific value (NCV), Determination of Calorific value: Bomb calorimeter, Solid fuel: Coal: Analysis of Coal-Proximate and Ultimate analysis, Liquid fuel: Petroleum: Refining of petroleum, CNG, Hydrogen gas as a fuel. Alternative fuels: Power alcohol, biodiesel and Rocket propellants, Knocking in engines, octane number and cetane number.

Unit III	**Introduction to Engineering Materials**	**(8hrs)**	**CO1, CO2**

Solid: crystalline and amorphous solids, Polymorphism, unit cell, crystal system-cubic, APF. Metallurgy-Ores and Minerals, Alloys- classification. Composition, woods metal, brass, Bronze, Ti-alloys. Preparation of alloys by fusion and powder method. Introduction of polymer: Terms-Speciality polymers: Introduction, structure, properties and applications of the polymers:
1. Bio-degradable polymers: Poly (hydroxybutyrate-hydroxyvalanate),
2. Conducting and doped conducting Polymer: Polyacetylene
3.Polymer Composite,
Nanomaterials: Introduction, definition, classification of nanomaterials based on dimensions, properties and general applications.

Unit IV	**Analytical Aspects of Fluids**	**(8hrs)**	**CO1, CO2, CO3, CO4, CO5**

Properties of Fluids-Surface Tension, Capillary action , Viscosity, Vapour Pressure, Types of Fluid Liquid Fluid- Water and Oil
Water: hardness of water: Types, Determination of hardness by EDTA method, Chloride content in water by Mohr's method, Ill effects of hard water in boiler, External Treatment of water i) Zeolite method ii) Demineralization method. Purification of water: Reverse osmosis.
Oil: Aniline point, Flash Point, Fire point.
Gaseous fluids: Gas Sensors, Types of Gas sensors

Unit V	**Corrosion Science**	**(8hrs)**	**CO3, CO5**

Introduction, Types of corrosion – Dry and Wet corrosion, mechanism, nature of oxide films and Pilling-Bedworth's rule, hydrogen evolution and oxygen absorption, Factors influencing rate of corrosion. Methods of corrosion control: cathodic protection, Metallic coatings and its types, Galvanizing and Tinning, Electroplating, Powder coating.

Text Books

1. O .G. Palanna, "Engineering Chemistry", Tata Magraw Hill Education Pvt. Ltd.
2. Dr. S. S. Dara, Dr. S. S. Umare, "Textbook of Engineering Chemistry", S. Chand & Company Ltd.

Reference Books

1. Wiley Editorial, “Engineering Chemistry”, Wiley India Pvt.Ltd
2. Shriver and Atkins, “Inorganic Chemistry”, 5ed, Oxford University Press,
3. S. M. Khopkar, “Basic Concept of Analytical Chemistry”, 2ed, New Age-International Publisher

Strength of CO-PO Mapping												
	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	1	--	--	--	--	--	--	--	--	--	2
CO2	3	1	--	--	--	2	--	--	--	--	--	2
CO3	3	1	--	--	--	1	1	--	--	--	--	2
CO4	3	1	1	--	--	1	2	--	--	--	--	2
CO5	3	1	1	--	--	1	2	--	--	--	--	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignment on Unit 1 & 2	**05**
2	Group presentations on Unit 3/4/5	**10**
3	LearnCo test on each unit	**05**

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Daniel Cell	**CO1**
2	To determine strength of strong acid using conductometer.	**CO2**
3	To determine maximum wavelength of absorption and find unknown concentration of given sample by colorimeter.	**CO4**
4	Determine the calorific value of given solid fuel by using Bomb calorimeter.	**CO2**
5	Proximate analysis of coal.	**CO5**
6	To determine hardness of water by EDTA method	**CO4**
7	Estimation of chloride content by Mohr's method	**CO4**
8	Estimation of Cu from given brass alloy	**CO4**
9	ECE - To coat copper and zinc on iron plate using electroplating.	**CO1**
10	Preparation of nanomaterials.	**CO1**
11	Preparation of biodiesel from oil.	**CO1**
12	To determine alkalinity of water	**CO5**

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students its procedure, observations calculation, and outcome of this experiment.
2. Apparatus, chemicals, solutions and equipments required for given experiment will be provided by the lab assistants using SOP.
3. Students will perform the same experiment in a group (two students in each group) under the supervision of faculty and lab assistant. After performing the experiment students will check their readings, calculations from respective teacher.

Guidelines for Student's Lab Journal

Write-up should include title, aim, diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Term work Assessment

Each experiment from lab journal is assessed for thirty marks based on three rubrics.
Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech.
Pattern 2023
2300113A: Engineering Mechanics

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03hrs/week **Practical : 02hrs/week**	**03** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Termwork: 50Marks**

Prerequisite Courses, if any: Differentiation and integration, trigonometry, geometry, force system, equations of motion

Course Objectives:

. To bestow knowledge of force systems, resultant of forces, moment of a force and centroid of area.
. To impart knowledge about equilibrium, types and reactions of beams, trusses and cables.
. To explain the concepts of friction and to teach the analysis of body under friction.
. To edify the knowledge about kinetics.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level
CO1	Select appropriate method to solve problems on rigid bodies.	1 - Remember
CO2	Extend the concepts of engineering mathematics and trigonometry for analyzing structures.	2 - Understanding
CO3	Construct the free body diagram and correlate active and reactive forces.	3 - Applying
CO4	Determine centroid and moment of inertia of plane lamina.	3 - Applying
CO5	Apply the concept of work, power, energy and impulse-momentum to solve engineering problems.	3 - Applying

COURSE CONTENTS

Unit I	**Resolution, Composition, Moment of Forces and Equilibrium of particle**	**(10hrs)**	**CO1, CO2, CO3**

a) **Resultant of force system:** Basic concepts, force system, resolution and composition of forces, resultant of coplanar forces, moment of a force, Varignon's theorem, resultant of parallel force system, couple, equivalent force-couple systems
b) **Equilibrium:** Free body diagram, conditions of equilibrium for various force systems, equilibrium of two, three and more than three forces.

Unit II	**Analysis of Statically Determinate Beams and Truss**	**(7hrs)**	**CO1, CO2, CO3**

a) Types of beams and types of supports
b) Reactions of simple beams and reactions of Cantilever beams.
c) Two force members, analysis of plane truss using method of joints and sections

Unit III	**Centroid and Moment of Inertia**	**(7hrs)**	**CO1, CO2, CO4**

a) Centre of gravity, centre of mass and centroid, centroid of plane laminas. Area moment of inertia.

Unit IV	**Friction**	**(7hrs)**	**CO1, CO2, CO3**

a) Nature and characteristic of friction, static and dynamic friction, laws of friction, angle of friction, angle of repose, cone of friction.
b) Block friction on horizontal and inclined planes, wedge friction. Ladder friction and Belt friction.

Unit V	**Kinetics**	**(9hrs)**	**CO1, CO2,CO3, CO5**

a) Kinetics of rectilinear and curvilinear motion.
b) **Work-energy principle:** Work, power and energy, work-energy principle.
c) **Collision of elastic bodies:** Impact, elastic and inelastic impact, conservation of momentum, coefficient of restitution, Impulse-momentum principle

Text Books

1. F. P. Beer and E. R. Johnson, "Vector Mechanics for Engineers", McGraw-Hill Publication
2. D.S. Kumar, "Engineering Mechanics – Statics and Dynamics", S. K. Kataria and Sons Publication

Reference Books

1. S. P. Timoshenko and D. H. Young, " Engineering Mechanics", McGraw- Hill Publication
2. J. L. Meriam and Craige, "Engineering Mechanics", John Willey Publication

Strength of CO-PO Mapping

	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	3	-	-	-	-	-	-	2	1	-	-
CO2	3	3	-	-	-	-	-	-	2	1	-	-
CO3	3	3	-	-	-	-	-	-	2	1	-	-
CO4	3	3	-	-	-	-	-	-	2	1	-	-
CO5	3	3	-	-	-	-	-	-	2	1	-	-

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	LearniCo Performance – Weekly 2 lectures and min. 5 questions in each lecture (5marks)	5
2	Unit Tests with Peer Assessment - 1st test on Unit 1 & 2, 2nd test on Unit 3 & 4 (15marks)	15

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Determine resultant of given force system (a) Experiment on Verification of law of polygon of forces (b)Practice problems on resultant and equilibrium of forces, moment, couple.	**CO1, CO2, CO3**
2	Curvilinear motion (a) Experiment on study of rolling motion of a sphere on a curved surface and trajectory of spinning sphere (b)Practice problems on Kinetics of curvilinear motion.	**CO1, CO2, CO5**
3	Belt friction – (a)Experiment on determination of coefficient of friction of flat and v-belt (b) Practice problems on friction, centroid and moment of inertia.	**CO1, CO2, CO3, CO4**
4	Analysis of Beams and Truss (a) Experiment on determination of support reaction of the given beam. (b) Practice problems on analysis of beams and truss.	**CO1, CO2, CO3**
5	Study of impact (a)Experiment on Finding the coefficient of restitution for impact between two bodies (b) Practice problems on impulse – momentum principle, D'Alembert's principle and work – energy principle.	**CO1, CO2, CO3, CO5**
Guidelines for Laboratory Conduction		
1. Experiments should be performed in the group of 4-5 students. 2. Practice problems should be solved in the group of 4-5 students.		
Guidelines for Student's Lab Journal		
Write-up should include title, aim, diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any. Practice problems should be written in a separate book.		
Guidelines for Termwork Assessment		
Practical Assessment – 30 marks each (Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation where each rubric carries ten marks.) Assessment of Practice Problems – 30 marks each Total Marks of Practical and Practice Problems will be converted to 25 Marks for Term Work.		

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech. (All Branches)
Pattern 2023
2300106A: Basic Electrical Engineering

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory:01hrs/week **Practical: 02hrs/week**	**01** **01**	**InSem Exam: 20Marks** **EndSem Exam:30Marks** **Termwork: 50Marks**

Prerequisite Courses: -

Course Objectives:
. To explain the working principles of electrical machines and batteries
. To introduce the components of low voltage electrical installations

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Define terminologies and laws related to AC-DC circuits, machines and batteries an solve numerical	1-Remember
CO2	Demonstrate the need for safety precautions and procedures, components and instruments in the laboratory.	2-Understand
CO3	Elaborate construction, working and performance characteristics of electrical machines and protective devices.	2-Understand
CO4	Select appropriate machines, protective devices for a given applications.	3-Apply
CO5	Calculate and analyze transformer efficiency, regulation and LT, HT electricity bill.	4-Analyze

COURSE CONTENTS

Unit I	**Work, Power, Energy**	**(3hrs)**	**COs mapped CO1**

Work, Power, Energy: Effect of temperature on resistance, resistance temperature coefficient, insulation resistance, conversion of energy from one form to another in electrical, mechanical, and thermal systems.

Unit II	**Batteries and Power supplies**	**(3hrs)**	**COs mapped - CO1, CO2**

Batteries and Power Supply: Charging and discharging of batteries, the concept of depth of charging, maintenance of batteries, series-parallel connection of batteries, Introduction to UPS, SMPS

Unit III	**DC/AC Circuits**	**(3hrs)**	**COs mapped - CO1, CO2**

Types of electrical circuits, KVL and KCL, AC Fundamentals, RL, RC and RLC series circuit, three phase star-delta load.

Unit IV	**Electrical Installations and DC machines**	**(3hrs)**	**COs mapped - CO3, CO2**

Electrical Installations: Components of LT Switchgear: fuse MCB, ELCB, types of wiring, earthing.

Electrical machines: Construction, working principle and types of DC generator and motor, construction, working principle and applications of stepper motor.

Unit V	**Transformer**	**(3hrs)**	**COs mapped – CO5**

Transformers: Construction, principle, e.m.f. equation, ideal and practical transformer, vector diagram for ideal transformer, losses, regulation and efficiency, Introduction to Auto-transformer.

Text Books

1. B.L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology" - Volume I: Basic Electrical Engineering: Part 1 and 2. S Chand Publication.
2. Bharti Dwivedi, Anurag Tripathi, "Fundamentals of Electrical Engineering", 2nd Edition, Wiley Publication.

Reference Books

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. H. Cotton, "Electrical Technology", 7th Edition, CBS Publications and distributors.

Strength of CO-PO Mapping												
Course Outcomes	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	--	--	--	--	--	--	--	--	--	1
CO2	3	--	--	--	--	3	--	--	2	3	--	3
CO3	3	2	--	--	--	--	--	--	2	3	--	3
CO4	3	--	2	--	--	--	--	--	2	3	--	3
CO5	3	2	--	--	--	--	--	--	2	3	--	2

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignment 1 – (Units 1 to 2, before the in-semester exam)	4 Marks
2	Assignment 2 – (Units 3 to 4, after in-semester exam)	4 Marks
3	Minimum 10 LMS sessions (taking best 5)	4 Marks
4	MCQ based LMS Class Test – (Units 3 to 5, before end-semester exam)	8 Marks

List of Laboratory Experiments		
Sr. No.	**Laboratory Experiments**	**COs Mapped**
1	To introduce basic safety precautions, introduction and use of measuring instruments, like voltmeter, ammeter, multi-meter, oscilloscope, etc., the practical relevance of resistors, capacitors and inductors.	**CO2**
2	To analyze the effect of temperature on resistance of conducting material and measure the insulation resistance of cable/equipment using Megger	**CO2**
3	To study LT and HT electricity bills and energy conservation	**CO6**
4	To demonstrate different types of electrical protection equipment such as fuses, MCB, MCCB, ELCB	**CO3, CO5**
5	To verify Thevenin's Theorem on DC supply	**CO1, CO4**
6	To analyze series RL and RC circuits on single phase AC supply.	**CO4**
7	To find efficiency and regulation of single-phase transformer at different loading conditions.	**CO6**
8	To determine the relationship between phase and line quantities for a three-phase AC circuit when the load is star and delta connected.	**CO4**
9	To demonstrate the construction and working of electrical machines.	**CO3, CO5**

Guidelines for Laboratory Conduction

- In each laboratory session, four to five students will perform the experiment in a group.
- Students should do connections under the supervision of the teachers and get the results by following safety precautions and procedures.

Guidelines for Student's Lab Journal

The Student's Lab Journal should contain the following -

- Apparatus with their detailed specifications.
- Connection diagram /circuit diagram.
- Observation table/ simulation waveforms.
- Sample calculations for one/two readings.
- Result table, Graph and Conclusions.
- Few short questions related to the experiment.

Guidelines for Term Work Assessment

1. The student's termwork will be through continuous assessment.
2. Each experiment from lab journal is assessed for thirty marks based on three rubrics. Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech.
Pattern 2023
2300118G: Joining Processes

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 02hrs/week	**02**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks**

Prerequisite Courses: - Basic science skills, Basic Chemistry

Course Objectives:
. To introduce concepts of welding processes.
. To impart fundamental understanding of metal joining processes
. To discuss different mechanical testing of welded joints
. To introduce to welding defects and the process to be carried out for inspection.
. To know the modern welding processes and its role in manufacturing industry.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Acquire knowledge of various welding processes.	2-Understanding
CO2	Select the appropriate metal joining process	2-Understanding
CO3	Apply knowledge of various Mechanical testing of welded joints.	3- Apply
CO4	Identify the welding defects & suggest their remedies.	4- Analyze
CO5	Explain the Metal Arc, TIG, MIG, Thermit Welding, Submerged and Atomic Hydrogen Welding processes used in manufacturing.	4- Analyze

COURSE CONTENTS

Unit I	**Arc Welding Processes and Equipment's**	**04 Hrs.**	**COs Mapped - CO1, CO5**

Fusion welding processes : Definition, types of processes, Carbon Arc Welding, Flux Shielded Metal Arc Welding, Submerged Arc Welding, Tungsten Inert Gas Welding, Metal Inert Gas Welding, Electroslag Welding, Electro Gas Welding, Plasma Arc Welding, Arc Welding equipment's, Electrode Types.

Unit II	**Soldering and Brazing**	**04 Hrs.**	**COs Mapped - CO1, CO2**

Soldering and Brazing: Definition, Limitations and Advantages of Soldering, Brazing and Welding. Principle, joint design, filler alloy, fluxes, processes and application. Applications of soldering and brazing in Engineering. Spot welding, Seam welding, Adhesive joining process.

Unit III	**Weld Defects and Inspection**	**04 Hrs.**	**COs Mapped – CO3, CO4**

Welding Defects – Types, Causes, Prevention. Destructive testing of weld – Tensile, Bend, Impact, Nick Break, Etch Tests. Non-Destructive Testing of Welds – Visual, Leak, X- ray and Gamma ray Radiography, Magnetic Particle Inspection, Dye, Fluorescent Penetrant Tests. Weld Metallurgy, Sensitization, Weld Decay, Concept of HAZ.

Unit IV	Riveted and Threaded Joints	04 Hrs.	COs Mapped– CO2
Basics: riveted joints, Types of rivet head, Lap and Butt joints, material. Threaded joints, Basic types of screw fastening, Terminology of screw threads, locking devices, Materials, Applications of Riveted and Bolted Joints.			
Unit V	**Introduction to Modern Welding Processes**	**04 Hrs.**	**COs Mapped - CO1, CO2, CO5**
Electron beam welding. Laser beam welding, Explosive Welding, Atomic Hydrogen Welding. Thermit Welding, Ultrasonic welding, under water welding, Industrial applications of Modern Welding Processes.			

Text Books

1. O.P. Khanna, "Welding Technology", Dhanpat Rai Publisher.
2. Dr. R.S.Parmar, Welding Processes and Technology Khanna Publisher.
3. Richard Little, Welding and Welding Technology McGraw Hill Education.
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Education

Reference Books

1. Dr. K. S. Yadav, "Advanced Welding Technology"', Rajsons Publications Pvt. Ltd.
2. N. K. Srinivasan, Welding Technology Khanna Publisher

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO 1	2	-	-	-	2	1	-	-	-	-	-	3
CO 2	2	1	2	-	2	1	-	-	1	-	-	3
CO 3	2	-	2	-	2	1	-	-	2	-	-	3
CO 4	2	1	2	-	2	-	-	-	2	-	-	3
CO5	2	-	1	-	2	1	-	-	-	-	-	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignments- Two Assignment 1 based on Unit I and Unit II Assignment 2 based on Unit III, Unit IV and Unit V	06
2	Unit Test Pre Insem and Pre Endsem	10
3	LearniCo Test on each Unit	04

K.K.Wagh Institute of Engineering Education and Research, Nashik
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech. (All Branches)
Pattern 2023
2300116B: Indian Knowledge System

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 02 hrs/Week	**02**	**Termwork: 50Marks**

Course Objectives:
To create awareness of contributiojn of India in the field of engineering

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Understand the term 'Indian Knowledge System' it's framework andkey components.	1-Remember
CO2	Appreciate the measurement techniques and mathematics in IKS	2-Understand
CO3	Identify and elaborate the applications of IKS in engineering domain	3-Apply

COURSE CONTENTS

Unit I	**Overview of Indian Knowledge System**	**(6 hrs)**	**COs mapped-CO1**

Importance of ancient knowledge, Definition of IKS, the IKS Corpous, Caturdasa and Vidyasthana. Tarka: The Indian Art of Debate, The knowledge triangle, Premeya, Praman, Samasya, Framwork for establishing valid knowledge.

Unit II	**Mathematics and Measurement in IKS**	**(6 hrs)**	**COs mapped-CO1**

Numbering system in India, Salient features of Indian Numeral System, Unique approaches to represent numbers, measurement of time, distance and weight, Pingala and the binary system.

Unique aspects of Indian mathematics, Great mathematicians and their contribution, square a number, square root, series and progressions, Geometry, The value of π, Trigonometry, algebra, Binary mathematics and combinatorial problems in Chandah-sastra of Pingala, magic squares in India

Unit III	**Astronomy in IKS**	**(6 hrs)**	**COs mapped-CO4**

Unique aspects of Indian Astronomy, Historical development of astronomy in India, The celestial coordinate system, elements of Indian Calender, Aryabhatiya and Siddhantic tradition, Pancanga-The Indian calender system, Astronomical instruments, Jantar Mantar of Raja Jai Singh Sawai

Unit IV	**Metalworking and Other applications in IKS**	**(6 hrs)**	**COs mapped-CO2, CO3**

The Indian S&T heritage, mining and Ore extraction, metal and metalworking technology, Iron and steel in India, Lost wax casting of Idols and Artfacts, Apparatuses used.

Literature sources of science and technology, physical structures in India, Irrigation and water

management, dyes and paintings technology, shipbuilding, 64 Kalas.			
Unit V	**Town Planning and Architecture in IKS**	**(6 hrs)**	**COs mapped- CO3, CO5**
Indian Architecture, Vastu-sastra, Vastupurush mandala, Eight limbs of vastu, Town planning, Unitary building, Temple architecture			

Text Books

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
2. Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P.

Reference Books

1. Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
2. Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
3. Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
4. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
5. Acarya, P.K. (1996). Indian Architecture, MunshiramManoharlal Publishers, New Delhi.
6. Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.

Online Course

1. Indian Knowledge System(IKS): Concepts and Applications in Engineering
https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

Term work Assessment:

1.	Assignment 01 (Unit 01 and 02)	15 Marks
2.	Assignment 02 (Unit 03 and 04)	15 Marks
3.	Field visit and quiz	10 Marks
4.	Group Presentation (group of 5 students)	10 Marks

Guidelines for Term Work Assessment

1. The student's termwork will be through continuous assessment.
2 Rubric R-1 for timely completion, R-2 for understanding and R-3 for presentation/journal writing where each rubric carries ten marks.

K.K.Wagh Institute of Engineering Education and Research, Nashik.
(Autonomous from Academic Year 2022-23)

F. Y. B. Tech. **Pattern 2022** **2300111A: Workshop Practice**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Lecture : 01 hrs/week **Practical : 02 hrs/week**	**01** **01**	**Continuous Comprehensive Evaluation :25** **Term work: 25Marks**

Course Objectives:
To acquire the basic knowledge of fundamentals Machine Tools.
To inculcate the basics of various manufacturing processes.
To impart practical aspects of Machine Tools and Manufacturing processes used in industrial applications
To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shop

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Select appropriate machine and cutting tools for a given application	1- Remember
CO2	Describe the process and programming methods for CNC machines and 3D printing	2-Understand
CO3	Apply the basic knowledge of Shop Floor Safety, Machine tools and Manufacturing processes.	3-Apply
CO4	Fabricate the simple mechanical parts	3-Apply

COURSE CONTENTS

Unit I	**Workshop Safety and Maintenance**	**(2 hrs)**	**COs Mapped-** CO3

a. Introduction to Workshop Safety: Introduction to workshop safety norms and guidelines. Identifying potential hazards in a workshop. Proper usage of personal protective equipment (PPE). Safety guidelines forhandling various tools and equipment. Emergency procedures and first aid basics.

b. Workshop Maintenance and Housekeeping : Importance of workshop maintenance and cleanliness. Regular maintenance of tools and equipment. Workshop layout and organization for efficient workflow. Properstorage of tools and materials to ensure longevity.

Unit II	**Measurement and Introduction to Welding**	**(2 hrs)**	**COs Mapped-CO2**

a. Measurement and Metrology: Importance of accurate measurement in workshop practice. Various measuring tools and their uses –varnier calipers, micrometers, rulers, etc. Metrology and its role in qualitycontrol. Understanding measurement units and conversions.

b. Introduction to Welding Shop: Overview of Welding Shop and its applications. Understanding the arc welding process and its principles. Safety precautions for welding operations. Demonstration of simple weldingtasks.

Unit III	Machine Tools	(2 hrs)	COs Mapped- CO1,CO2
a. Demonstration of Conventional Machine Tools: Introduction to Lathe and its components. Understandingthe Milling Machine and its operations. Practical applications of Lathe and Milling Machine in different industries. Safety guidelines while operating conventional machine tools.			
b. Introduction to CNC Machine Tools: Understanding CNC (Computer Numerical Control) technology. Types of CNC machines - CNC turning, VMC (Vertical Machining Center), and plasma arc machining, CNC wood router, etc. Detailed demonstration of any one CNC process, including a programming assignment. Safety considerations specific to CNC machine operations.			
Unit IV	**Introduction to 3D Printing**	**(2 hrs)**	**COs Mapped- CO2**
a. 3D Printing: Overview of 3D printing technology and its applications. Step-by-step process of 3D printing,from design to printing. Software used in 3D printing - creating a design, exporting STL file, choosing parameters, and generating G code. Safety measures while handling 3D printing equipment and materials. **b. Materials and Their Properties:** Overview of common workshop materials - metals, wood, and plastics. Physical and mechanical properties of materials. Material selection criteria for specific projects. Recycling andsustainable practices in the workshop.			
Unit V	**Workshop Projects, Problem-Solvingand Troubleshooting**	**(02 hrs)**	**COs Mapped –CO4**
a. Introduction to Workshop Projects: Planning and executing workshop projects. Understanding projectrequirements and specifications. Breakdown of complex tasks into smaller achievable steps. Importance of teamwork and collaboration in workshop projects. **b. Problem-Solving and Troubleshooting:** Approaches to problem-solving in workshop scenarios. Common issues and challenges in workshop practice. Troubleshooting techniques for tools and equipment. Encouraging aproactive approach to tackle workshop-related problems.			

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**COs Mapped**
1	**Workshop safety** Introduction to workshop facilities, workshop safety norms.	**CO3**
2	**Fitting shop** Preparation of simple fitting job having sawing, filing, drilling, tappingoperations using different tools/equipments such as files, hammers, drills & taps, etc.	**CO4**
3	**Tin Smithy shop** Preparation of simple sheet metal job having shearing, bending and joining operations using different tools/equipments such as hammers, mallet, stake block, snip, etc. needed for it.	**CO4**
4	**Carpentry Shop** Preparation of simple wooden job having marking, sawing, planning, chiseling operations using different tools/equipments such as saws, Jack plane, chisel, hammer, mallet etc. needed for it.	**CO4**

5	**Welding Shop** Demonstration of simple welding job using arc welding process.	**CO1**
6	**Demonstration of conventional machine Tools** Demonstration of conventional machine Tools: Lathe and Milling machine	**CO1**
7	**Demonstration of CNC machine Tools** Introduction to CNC turning, VMC, plasma arc machining, Laser cutting, CNC wood router. Detail demonstration of any one process with one programming assignment.	**CO2**
8	**Demonstration of 3D printing** Demonstration of basic steps of 3D printing such as creating a design,	**CO2**
	exporting STL file, choosing parameters, creating G code and printing	

Guidelines for Laboratory Conduction

1. Importance of workshop practical and shop floor safety norms should be emphasized in the first practical session.
2. Students should develop one product/prototype involving operations from Practical 2 to 5.
3. Instructor should demonstrate detailed working of welding and machine tools.
4. Instructor should demonstrate one programming assignment on 3D printing and CNC machine.

Guidelines for Student's Lab Journal

1. Prepare work diary based on practical performed in workshop. Work diary consists of job drawing, operations to be performed, required raw materials, tools, equipments, date of performance with instructor signature.
2. Student has to maintain one file for write ups based on safety norms and illustrations/sketches of demonstrated parts/mechanisms/machine tools etc.

Guidelines for Termwork Assessment

Term work assessment shall be based on the timely completion of jobs, quality of job, skill acquired, completion of workshop diary and brief write-ups.

Strength of CO-PO Mapping

	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	-	-	-	-	-	-	-	1	-	1	1
CO2	2	-	-	-	1	-	-	-	1	1	-	1
CO3	2	-	-	-	-	1	-	-	1	-	-	1
CO4	2	-	-	-	-	-	-	1	1	1	-	1

Text Books

1. S. K. Hajra Choudhary, Nirjhar Roy, “Element of Workshop Technology: Vol.1 and 2”, Media Promoters and Publishers Pvt. Ltd., 15th Edition, 2012
2. H. S. Bawa, “Workshop Practice”, Tata McGraw Hill Education (Publisher)

Reference Books

1. John, K. C., “Mechanical Workshop Practice”, Prentice Hall Publication, New Delhi
2. Mikell P. Groover, “Introduction to Manufacturing Processes”, Wiley Publications

F. Y. B. Tech.
Pattern 2023 Semester: II
2300115B: Engineering Explorations

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial : 02hrs/week	**02**	**Tutorial/Term Work: 75Marks**

Prerequisite Courses, if any: ----

Course Objectives:
1. To promote learning through interdisciplinary and student-centric activities.
2. To inculcate independent learning by problem solving.
3. To engage students in rich experiential learning.
4. To provide opportunity to get involved in a group so as to develop team skills and learn professionalism.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Apply principles from several disciplines.	**3-Apply**
CO2	Demonstrate long-term retention of knowledge and skills acquired.	**3-Apply**
CO3	Function effectively as a team to accomplish a desired goal.	**3-Apply**
CO4	Explore an Engineering Product and prepare its Mind map	**4-Analysis**
CO5	Enhance their learning ability to solve practical problems.	**5-Synthesis**

Reference Books

1. Project-Based Learning, Edutopia, March 14, 2016.
2. What is PBL? Buck Institute for Education.

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	2	-	1	-	2	2	1	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	2	2
CO3	-	-	-	-	-	-	-	-	3	-	-	-
CO4	2	2	-	2	-	2	2	1	3	3	-	-
CO5	2	2	2	2	2	2	2	1	3	3	2	2

Preamble

Experiential learning involves a number of steps that offer student a hands-on, collaborative and reflective learning experience which helps them to "fully learn new skills and knowledge". During each step of the experience, students will engage with the content, the instructor, each other as well as self–reflect and apply what they have learned in another situation.
Students undergo the Experiential Learning through following phases of Engineering Exploration, Engineering Design and Product Realization. Students will undertake mini projects to acquaint with knowledge in the various domains of Engineering.
The course introduces students to analyzing, designing, developing, testing, report writing and project presentations that demonstrate understanding. Students will be asked to observe, document, raise questions and draw conclusions. Teachers rely on a variety of resources to enrich students' studies that may include meeting experts and hands-on experimentation.

Guidelines for Course Conduction

- There should be a group of 4-5 students.
- Groups will be monitored by the Course teacher.
- Following two assignments will be completed by all groups
  A) Exploration of an Engineering product like Electronic Voting Machine, Car, Mobile handset, Elevator / Escalator, Operation Table, Solar water heater. The exploration will be based on working principle, specifications, material used, manufacturing process, technology used, operations (observable and controllable), ergonomics, extent of automation, safety features, environmental issues, maintenance and costing.
  B) Teachers will identify 12-15 mini project ideas.
- Every group will undertake a mini project in consultation with the Course teacher.
- Project ideas will be common to all first year divisions but the implementation might be different.
- The students will plan, manage and complete the associated tasks.

Guidelines for Course Completion

Students will present/submit the Mind Map of the Engineering product chosen for exploration.
Students will exhibit/demonstrate the completed project at the end of the semester along with a brief report in a recommended format as term work submission.

Guidelines for Term work Assessment

The Course teacher is committed to assess and evaluate the students' performance. Progress of work done will be monitored on weekly basis.

During process of monitoring and continuous assessment, the individual and team performance is to be measured.

- Individual assessment for each student should be based on understanding individual capacity, role and involvement in the Engineering Product Exploration/project.
- Group assessment should be based on roles defined, distribution of work, intra-team communication and togetherness.
- Documentation and Demonstration.

It is recommended that all activities are to be recorded regularly and proper documents are to be maintained by both students as well as the course teacher.
Continuous Assessment Sheet (CAS) is to be maintained by the Course teacher.

A) Recommended parameters for assessment of Engineering Product Exploration: (25marks)
   Working principle, specifications, material used, manufacturing process, technology used, operations (observable and controllable), ergonomics, extent of automation, safety features,

environmental issues, maintenance and costing.

B) Recommended parameters for assessment of Project: (25marks)

- Outcomes of Mini Project / Problem Solving Skills / Solution provided / Final product **(50%)** (Individual assessment and team assessment)
- Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) **(25%)**
- Demonstration (Presentation, User Interface, Usability, Participation in Exhibition/Contest etc) **(15%)**
- Awareness / Consideration of – Environmental / Social / Ethical / Safety / Legal aspects **(10%)**

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F. Y. B. Tech. **Pattern 2022** **2300132A:Welding Technology**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Lecture : 02 hrs./week **Practical : 02 hrs./week** **Tutorial**	**02** **--** **01**	**InSem Exam:20 Marks** **Endsem Exam:30Marks** **Term work:50Marks**
Prerequisite Courses: - Metallurgy, Physics, Mathematics		
Course Objectives: To understand the welding join preparation method and selection of filler material. To develop the skill through hands-on practices using different welding machine and tools used during welding processes. . To understand the drawing layout for welding.		

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	Familiar with safety norms to prevent any mishap during welding processes	1- Remember
CO2	Able to handle appropriate process in welding technology	2-Understand
CO3	Able to understand the use of engineering drawing in welding technology	2-Understand
CO4	Able to know simple precautions before performing the experiment	3-Apply

COURSE CONTENTS			
Unit I	**Basics of Welding**	**(2 hrs.)**	**COs Mapped-** CO1
Introduction to Welding processes - Welding Introduction, Definition of welding, Advantages of welding, Disadvantages of welding, Types of welding used in Industry, Welding process, Classification of welding process, Comparisons of welding process			
Unit II	**Equipment's and machinery details for welding process**	**(2 hrs.)**	**COs Mapped- CO1 , CO2,CO3**
- Classification of welding joints, Preparation methods for joints, Drawing requirements and Symbolic representation, -How to read the welding drawing for Weld Operators, Cross sections of weld, Suitable length or thickness of weld, Stresses or failure in weld			
Unit III	**Equipment's and machinery details for welding process**	**(2 hrs.)**	**COs Mapped- CO1,CO2**
- Handling instruments for welding methods, Safety for operator/human, Apron, Goggle, glass shield, hand glows, Safety shoes, first aid box etc…. - Safety for joint, Various tools like, pliers, chisel, hammer, polish paper, cloth, cleaning			

chemicals etc…

- Safety guidelines while operating welding process.

Unit IV	**Welding joint preparation and precaution**	**(2 hrs.)**	**COs Mapped- CO2,CO4**

- Welding joint preparation based on the type of joint and its application ,
- Precaution during welding the joint about type of material get weld.

Unit V	**Troubleshooting and Defect analysis of welding**	**(02hrs.)**	**COs Mapped –CO1, CO4**

Dos and Don'ts in welding

Introduction to Troubleshooting about welding process

Voltage, Current, Gas Flow rate, Surface cleaning, Feed and Speed of weld etc..

Defect analysis in weld

Manual defect analysis, Equipment used for defect analysis, and preparation of surface for new weld joint.

List of Laboratory Experiments / Assignments

Sr. No.	Laboratory Experiments / Assignments	COs Mapped
1	Interpretation of engineering welding drawing	**CO3**
2	Surface preparation for welding joint	**CO2,CO3**
3	Practical on different type of welding methods	**CO2,CO3**
4	Practical on different type of welding joints	**CO3,CO4**
5	Post processing of welded joints	**CO1**
6	Welding inspection for strength and defects	**CO4**

Guidelines for Laboratory Conduction

Lab instructor is expected to cover following points:
1. Engineering Program Outcome (Graduate Attribute) and which attributes will be covered during practical
2. List of experiments to be performed with mention of objectives and outcome of the experiment
3.DO's and DON'T, along with precautions, are need to be displayed at prominent location in laboratory
4. Students should be informed about DO'S and DON'T and precautions before performing the experiment

Guidelines for Student's Lab Journal

Student's lab journal is expected to cover:
1. List of experiments to be performed with mention of objectives and outcome of the experiment.
2. Instructions to students for performing the experiments
3. Precautions for each experiment
4. Write up an experiment (Preferably mentioning significance of experiment)

Guidelines for Termwork Assessment

1. The distribution of weightage of term work marks should be informed to students before the start of the semester.
2. Term work assessment should be on a continuous basis. At frequent intervals students are expected to inform about their progress/lagging

Strength of CO-PO Mapping												
	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	-	-	-	1	1	-	-	1	1	-	1
CO2	2	-	-	-	-	-	-	-	1	1	-	1
CO3	2	-	-	-	-	-	-	-	1	2	-	1
CO4	2	-	-	-	-	-	-	1	1	1	1	1

Text Books
1. S. Welding skills and Technology, Dave Smith, Mc-Graw Hill Book Company 1985 2.Welding Process and Technology, Parmar S.S, Khanna Publisher 1997
Reference Books
1.Gas and Arc welding, Marfels W, Wiley Eastern Ltd. 1985 2.Introduction to welding Fluxes, Davis Louise, The welding Institute 1997 3.Welding Technology Japan, The welding Institute 1997

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F. Y. B. Tech.
Pattern 2023 Semester I
2300133A: 3D Printing

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Lecture : 02 hrs./week **Practical : 02 hrs./week** **Tutorial**	**02** **--** **01**	**InSem Exam:20 Marks** **Endsem Exam:30Marks** **Term work:50Marks**

Prerequisite Courses: - Computer-Aided Design (CAD), Mathematics, Materials Science, Manufacturing Processes,

Course Objectives:

. To introduce concepts of 3D printing.
. To impart fundamental understanding of various rapid prototyping systems
. To discuss software tools for 3D printing
To select the process parameters for an additive manufacturing technology
To Build hands-on projects.

Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	**Bloom's Level**
CO1	**Identify** the importance of 3D printing in Manufacturing	2-Understanding
CO2	**Explain** various rapid prototyping systems	2-Understanding
CO3	**Use** of software tools for 3D printing	3- Apply
CO4	Analyze and select the process parameters for an additive manufacturing technology	4- Analyze
CO5	**Build** hands-on projects using FDM technology and develop job-relevant skills.	6- Create

COURSE CONTENTS

Unit I	**Introduction to 3D Printing Machines & Processes**	**2 Hrs.**	**COs Mapped - CO1**

Introduction to 3D Printing Machines: Historical Perspectives, Distinction Between 3D Printing and subtractive processes, Rapid Prototyping - An Integral Part of Time Compression Engineering, RP Information Workflow. Rapid Prototyping Processes: Classification of Rapid Prototyping Processes

Unit II	**Rapid Prototyping Systems**	**2 hrs**	**COs Mapped - CO2**

Stereolithography Apparatus, Solid Ground Curing Systems, Fused Deposition Modelling Systems, Selective Laser Sintering Systems, Laminated Object Manufacturing Systems

Unit III	**3D CAD Model Technology**	**2hrs**	**COs Mapped - CO3**

Development of 3D CAD model Technology: Introduction, Different CAD Software,3D Scanner, MIMICS software, Other Associated Technologies, Milestones in 3D Printing Development, 3D

Printing around the World.

Unit IV	Design, Guidelines For Process Selection	2 Hrs	COs Mapped - CO4

Preparation of CAD Models – the STL File, Problems with STL Files, STL File Manipulation, Beyond the STL File, Additional Software to Assist 3D Printing. 3D Printing Unique Capabilities, Guidelines for Process Selection - Selection Methods for a Part, Challenges of Selection, Preliminary Selection, Basic printer setup and calibration, Post-Processing techniques for 3 D printed parts, application of 3D printing in Biomedical, fashion design and engineering sectors.

Unit V	4D printing	2 Hrs	COs Mapped -

Introduction, Difference between 3 D printing and 4 D printing, Material used in 4D printing, Basic working principle, design for 4 D printing

Text Books

1. Dr. Sabrie Soloman "Additive Manufacturing -3D Printing & Design" The 4th Industrial Revolution.
2. Chua, C. K., Leong, K. F. (2000). Rapid Prototyping: Principles And Applications In Manufacturing sigapoor: World Scientific Publishing Company. Elliott, A., Waters, C. (2019).
3. Amelia Elliott, Cynthia Waters (2019) "Additive Manufacturing for Designers: A Primer". UK: SAE International.

Reference Books

1. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
2. Awari, G. K., Thorat, C. S., Ambade, V., Kothari, D. P. (2021) ""Additive Manufacturing and 3D Printing Technology: Principles and Applications" UK CRC Press.
3. Rupinder Singh "4D Printing Fundamentals and Applications" Elsevier 2022

List of Practical Assignments

Sr. No.	Title	CO Mapped
1	Review of CAD Modeling Techniques and Introduction to RP	CO1
2	Modeling Creative Designs in CAD Software	CO2, CO3
3	Assembling Creative Designs in CAD Software	CO2, CO3
4	Generating STL files from the CAD Models & Working on STL files	CO2, CO3
5	Processing the CAD data in software (Selection of Orientation, Supports generation, Slicing, Tool path generation)	CO2, CO3
6	Sending the tool path data to FDM RP machine and fabricating the physical part on FDM RP machine	CO3, CO4
7	Removing the supports & post processing (cleaning the surfaces)	CO3, CO4
8	Demonstrating Creative Working Models	CO3, CO4

9	Converting CT/MRI scan data into STL file using **MIMICS software** (Demo)	CO3, CO4

Guidelines for Tutorial / Termwork Assessment		
Sr. No.	**Components for Tutorial / Termwork Assessment**	**Marks Allotted**
1	Assignment on computational software	25
2	Demonstrating Creative Working Model	20
3	Attendance (Above 95 % : 05 Marks, below 75% : 0 Marks)	5