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

F. Y. B. Tech.
Pattern 2022 Semester: I
FYE221001: Applied Mathematics-I

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :04hrs/week **Tutorial:01hr/week**	**04** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Tutorial / Termwork: 25Marks**

Prerequisite Courses: -

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+**	**COs Mapped -**

		2hrsTutorial)	**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.			

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

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. B. Tech. **Pattern 2022 Semester: II** **FYE 221002: Applied Mathematics-II**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 04hrs/week **Tutorial: 01hr/week**	**04** **01**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **Tutorial / TermWork: 25Marks**

Prerequisite Courses: -

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.			

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**	**COs 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
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F. Y. B. Tech.
Pattern 2022 Semester: I / II
FYE221003: Applied and Modern Physics (A)
(Group A – Computer, IT, E&TC, AI&DS & CSD)
(Group C - Electrical Engg., Robotics & Automation)

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

Prerequisite Courses, if any: -

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

	Course Outcomes	Bloom's Level
CO1	Describe basics of electromagnetics, advanced materials, wave optics, wave mechanics and environmental energy	1-Knowledge
CO2	Classify advanced materials, refracting crystals and solar cell	2-Understand
CO3	Explain properties of superconductors, nano-materials and matter waves	2-Understand
CO4	Calculate characteristics of electromagnetic circuits and optical devices, conductivity, efficiency of solar and wind power unit.	3-Apply
CO5	Use concepts of electromagnetic effect, semiconductors, wave optics and wave equations in real life problems	3-Apply

COURSE CONTENTS

Unit I	Electromagnetism & Electromagnetic Waves	(08hrs)	COs Mapped - CO1, CO2

Electromagnetism:
Introduction: Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule, nature of magnetic field of long straight conductor, solenoid and toroid. Concept of mmf, flux, flux density, reluctance, permeability and field strength, their units and relationships.
Simple series magnetic circuit, Introduction to parallel magnetic circuit, comparison of electric and magnetic circuit, force on current carrying conductor placed in magnetic field.
Faradays laws of electromagnetic induction, Fleming right hand rule, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of couplings. Energy stored in magnetic field; Fleming left hand rule.

Electromagnetic Waves
Introduction, Electromagnetic Waves, Electromagnetic Wave Equations, Maxwell's Wave Equations for Free Space

Unit II	Semiconductors, Superconductivity, Nano-Material	(06hrs)	COs Mapped - CO1, CO2, CO4, CO5

Semiconductors:
Types of semiconductor, Conductivity of conductors and semiconductors, temperature dependence of conductivity, Fermi Dirac distribution function, Position of Fermi level in intrinsic and extrinsic

semiconductors, variation with respect to temperature and doping concentration, Hall effect: Derivation for Hall voltage, Hall coefficient, applications of Hall effect.

Superconductivity:

Definition, Properties, type of superconductor, Josephson effect and applications

Nano-Materials:

Introduction, quantum confinement effect, surface to volume ratio, properties: Optical, electrical & Mechanical.

Unit III	**Wave Optics**	**(08hrs)**	**COs Mapped - CO1, CO2, CO4, CO5**

Polarization – Introduction of polarization, law of Malus, double refraction, Huygens theory, LCD.

Diffraction – Introduction of diffraction, types of diffraction, diffraction grating, conditions for principal maxima and minima, maximum orders of diffraction, Rayleigh's criterion,

Interference – Introduction, thin film interference, optical flatness testing, antireflection coating, Rayleigh interferometer and Radio interferometer.

Laser: Basic terms and types of lasers, application (IT, Medical & Industry), laser interferometer and Hologram Interferometer.

Optical Fibre – Introduction and basic terms, Fibre optic communication with block diagram.

Unit IV	**Quantum Mechanics & Quantum Computing**	**(07hrs)**	**COs Mapped - CO1, CO2, CO3, CO5**

Basics of Quantum theory, postulates of quantum mechanics, wave nature of particles, wave function, Schrodinger's time dependent equation, Stern-Gerlach experiment, electron spin, superposition of states, Entanglement Bits and Qubits, Implementing a quantum computer : Ion trap, Linear optics, NMR and superconductors.

Unit V	**Energy and Environment**	**(07hrs)**	**COs Mapped - CO1, CO2, CO4**

Energy and its Usage:

Overview of World energy scenario, climate change, Engineering for energy conservation, units and scales of energy.

Solar Energy:

Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, basic physics of solar cell, carrier transport, generation & recombination in solar cell, semiconductor junctions: metal-semiconductor junction & p-n junction, essential characteristics of solar photovoltaic devices, First generation solar cells, Second generations of Solar cells, Third generations of solar cells-Quantum Dot solar cell, multi junction solar cells

Fluid and Wind Power:

Fluid dynamics and power in the wind, available resources, Wind turbine dynamics, wind farms

Text Books

1. V K Mehta and Rohit Mehta ,"Basic Electrical Engineering", S Chand Publications.
2. M.N. Avadhanulu and P.G. Kshirsagar ,"Engineering Physics ", S. Chand Publications
3. Robert L. Jaffe and Washington Tayler, "The Physics of Energy", Cambridge University Press

Reference Books

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Three Assignments on unit-1, Unit-2, Unit-3 & 4	05
2	Group Presentation on Unit-5	10
3	LearniCo Test on Each Unit	05
	Total	**20**

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of plano-convex lens).	**CO1, CO5**
2	To determine position of diffraction minima by studying diffraction at a single slit.	**CO4**
3	To determine unknown wavelength by using plane diffraction grating.	**CO4**
4	To verify Law of Malus.	**CO4, CO5**
5	Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).	**CO1, CO5**
6	To determine band gap of given semiconductor.	**CO4**
7	To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).	**CO4**
8	To determine Hall coefficient and charge carrier density.	**CO4, CO5**
9	Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).	**CO4**
10	Determination of refractive index using Brewster's law.	**CO4**
11	To determine magnetic force on a current carrying conductor.	**CO4, CO5**
12	To study magnetic induction due to current carrying conductor	**CO4, CO5**
13	To study the quantum confinement effect in synthesis of silver nano-particles.	**CO3, 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 and equipments required for the allotted experiment will be provided by the lab assistants using SOP.
3. Students will perform the allotted experiment in a group (two students in each group) under the supervision of faculty and lab assistant.
4. After performing the experiment students will check their readings, calculations from the teacher.
5. After checking they have to write the conclusion of the final result.

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 Termwork Assessment

1. Each experiment from lab journal is assessed for thirty marks based on three rubrics.
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
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F. Y. B. Tech.
Pattern 2022 Semester: I
FYE221004: Applied and Modern Physics (B)
(Group B- Mechanical Engg., Civil Engg., Chemical Engg.)

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

	Course Outcomes	Bloom's Level
CO1	Describe basics of mechanics, advanced materials, wave optics and environmental energy	1-Knowledge
CO2	Classify motions is kinematics, advanced materials, refracting crystals and solar cell	2-Understand
CO3	Explain properties of superconductors and nano-materials	2-Understand
CO4	Calculate parameters in kinematics, conductivity, efficiency of solar and wind power unit	3-Apply
CO5	Use knowledge of Laws of kinematics, semiconductors and wave optics in real life problems	3-Apply

COURSE CONTENTS

Unit I	**Kinematics of Rectilinear Motion**	**(7hrs)**	**COs Mapped – CO1, CO2, CO4**

Basic concepts, equations of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves. Relative motion and dependent motion.

Unit II	**Kinematics of Curvilinear Motion**	**(7hrs)**	**COs Mapped - CO1,CO2,CO4**

Basic concepts, Equation of motion in Cartesian Co-ordinates. Path and polar co-ordinates. Projectile motion.

Unit III	**Semiconductors, Superconductivity, Nano-Material**	**(7hrs)**	**COs Mapped – CO1, CO2, CO4, CO5**

Semiconductors:
Types of semiconductor, Conductivity of conductors and semiconductors, temperature dependence of conductivity, Fermi Dirac distribution function, Position of Fermi level in intrinsic and extrinsic semiconductors, variation with respect to temperature and doping concentration, Hall effect: Derivation for Hall voltage, Hall coefficient, applications of Hall effect.
Superconductivity: Definition, Properties, type of superconductor, Josephson effect and applications
Nano-Materials: Introduction, quantum confinement effect, surface to volume ratio, properties: Optical, Electrical & Mechanical.

Unit IV	Wave Optics	(8hrs)	COs Mapped - CO1, CO2, CO4, CO5

Polarization – Introduction of Polarization, Law of Malus, Double Refraction, Huygens Theory, LCD.
Diffraction – Introduction of Diffraction, types of diffraction, Diffraction grating, conditions for principal maxima and minima, Maximum orders of diffraction, Rayleigh's Criterion,
Interference – Introduction, Thin film Interference, optical flatness testing, Antireflection coating, Rayleigh Interferometer and Radio Interferometer.
Laser: Basic terms and types of lasers, Application (IT, Medical & Industry), Laser interferometer and Hologram Interferometer.
Optical Fibre – Introduction and basic terms, Fibre optic communication with block diagram.

Unit V	Energy and Environment	(7hrs)	COs Mapped - CO1,CO2,CO4

Energy and its Usage
Overview of World Energy scenario, climate change, Engineering for Energy conservation, units and scales of energy.
Solar Energy:
Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, basic physics of solar cell, carrier transport, generation & recombination in solar cell, semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation solar cells, Second Generations of Solar cells, Third generations of solar cells-Quantum Dot solar cell, multi junction solar cells.
Fluid and Wind Power
Fluid dynamics and power in the wind, available resources, Wind turbine dynamics, wind farms

Text Books

1. M.N. Avadhanulu and P.G. Kshirsagar , "Engineering Physics", S. Chand Publications
2. R. C. Hibbeler, "Engineering Mechanics", Pearson Education
3. Robert L. Jaffe and Washington Tayler, "The Physics of Energy", Cambridge University Press

Reference Books

1. H.D.Young and R.A.Freedman , "University Physics", Pearson Publication
2 Jenkins and White, "Optics", Tata Mcgraw Hill
3. S. P. Timoshenko and D. H. Young, "Engineering Mechanics", McGraw- Hill publication
4. J. L. Meriam and Craige , "Engineering Mechanics", John Willey

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Three Assignments on unit-1, Unit-2, Unit-3 & 4	05
2	Group Presentation on Unit-5	10
3	LearniCo Test on Each Unit	05
	Total	**20**

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**COs Mapped**
1	Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of plano-convex lens).	**CO1, CO5**
2	To determine position of diffraction minima by studying diffraction at a single slit.	**CO4**
3	To determine unknown wavelength by using plane diffraction grating.	**CO4**
4	To verify Law of Malus.	**CO4, CO5**
5	Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).	**CO1, CO5**
6	To determine band gap of given semiconductor.	**CO4**
7	To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).	**CO4**
8	To determine Hall coefficient and charge carrier density.	**CO4, CO5**
9	Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).	**CO4**
10	Determination of refractive index using Brewster's law.	**CO4**
11	Draw velocity diagram of four bar mechanism.	**CO2, CO4**
12	To determine the angular acceleration of flywheel	**CO2, CO4**
13	To study the quantum confinement effect in synthesis of silver nano-particles.	**CO3, 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 and equipments required for the allotted experiment will be provided by the lab assistants using SOP.
3. Students will perform the allotted experiment in a group (two students in each group) under the supervision of faculty and lab assistant.
4. After performing the experiment students will check their readings, calculations from the teacher.
5. After checking they have to write the conclusion of the final result.

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 Termwork 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
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F. Y. B. Tech.
Pattern 2022 Semester: I/II
FYE221005: 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 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)**	**COs mapped- 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)**	**COs mapped- 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	**Introduction to Engineering Materials**	**(8hrs)**	**COs mapped- CO1,**

III			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)	COs mapped- 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)	COs mapped- 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

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**	**COs 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. (All Branches)
Pattern 2022 Semester: I / II
FYE221006: Fundamentals of Electrical Engineering

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: -

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.	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	Solve problems on AC-DC circuits, work, power and energy using relevant laws and theorems.	3-Apply
CO5	Select appropriate machines, protective devices for a given applications.	3-Apply
CO6	Calculate and analyze transformer efficiency, regulation and LT, HT electricity bill.	4-Analyze

COURSE CONTENTS

Unit I	**Work, Power, Energy, Batteries and Supplies**	**(8hrs)**	**COs mapped - CO1, CO4**

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.
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 II	**DC circuits**	**(8hrs)**	**COs mapped - CO1, CO4**

Types of electrical circuits, KVL and KCL, sources and source transformations, star-delta connection, Superposition, and Thevenin's theorem

Unit III	**AC Circuits**	**(8hrs)**	**COs mapped - CO1, CO4**

Representation of sinusoidal waveforms, peak and RMS values, Phasor representations, real power, reactive power, apparent power, power factor, analysis of single-phase AC circuits consisting of pure R, L, C, series R-L, R-C, R-L-C combinations, parallel AC circuit, series, and parallel resonance

Unit	**Three-phase circuits and Electrical Installations**	**(8hrs)**	**COs mapped -**

IV			CO3, CO4, CO5
Three-Phase Circuit: Three-phase balanced circuits, voltage and current relations in star and delta connections, and power calculations. **Electrical Installations:** Components of LT Switchgear: fuse MCB, ELCB, types of wiring, earthing.			
Unit V	**Electrical Machines**	**(8hrs)**	**COs mapped - CO1, CO3, CO5, CO6**
Transformers: Construction, principle, e.m.f. equation, ideal and practical transformer, vector diagram for ideal transformer, losses, regulation and efficiency, Introduction to Auto-transformer. **Electrical machines:** Construction, working principle and types of DC generator and motor, construction, working principle and applications of stepper motor.			

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.

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 LearniCo sessions (taking best 5)	4 Marks
4	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 2022 Semester: I / II
FYE221007: Fundamentals of Electronics Engineering

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: Semiconductor Theory, Mathematics

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

	Course Outcomes	Bloom's Level
CO1	Describe the working of semiconductor diodes, transistors and OpAmp.	2- Understand
CO2	Explain the basics of number systems, logic gates, Boolean algebra, electronic communication system, AM, FM, cellular concepts and GSM system.	2- Understand
CO3	Apply the knowledge of semiconductor diodes, transistors and OpAmp in realization of basic analog circuits.	3-Apply
CO4	Apply the knowledge of number systems, logic gates and Boolean algebra in realization of basic digital circuits.	3-Apply
CO5	Analyze the basic analog and digital application circuits.	4-Analyze

COURSE CONTENTS

Unit I	Semiconductor Diodes	(08hrs)	COs Mapped CO1, CO3, CO5

PN Junction Diode: Construction, Working and VI Characteristics
Rectifiers: Working and Parameters of Half Wave Rectifier and Full Wave Rectifiers
Working of Bridge Rectifier with Capacitor Filter
Zener Diode: Working, VI Characteristics, Breakdown Mechanisms, Zener Diode as Voltage Regulator
LED and Photodiode: Working, Characteristics and Applications

Unit II	Transistors	(08hrs)	COs Mapped - CO1, CO3, CO5

Transistors: Introduction and Types
BJT: Construction, Types and Regions of Operations, CB and CE configurations with their characteristics and current relationships, BJT as Switch, DC Load Line, Voltage Divider Bias Circuit, Single Stage CE Amplifier
Enhancement MOSFET: Types, Construction, Operation and Characteristics

Unit III	Linear Integrated Circuits	(08hrs)	COs Mapped - CO1, CO3, CO5

Introduction to OpAmp, Ideal Differential Amplifier, OpAmp Parameters, Introduction to Open Loop and Closed Loop OpAmp Configurations, Applications of OpAmp: Comparator, Inverting Amplifier,

Non-Inverting Amplifier, Voltage Follower and Summing Amplifier.			
Unit IV	**Digital Electronics**	**(08hrs)**	**COs Mapped - CO2, CO4, CO5**
Binary, Octal, Decimal, Hexadecimal, their conversion, Binary Arithmetic, Logic Gates, Boolean Laws, De Morgan's Theorem, Half Adder, Full Adder, Flip Flops: SR, JK, D and T			
Unit V	**Electronic Communication Systems**	**(08hrs)**	**COs Mapped - CO2**
Block Diagram of Communication System, Communication Media: Wired and Wireless, Modes of Transmission, Electromagnetic Spectrum, Modulation and It's Need, AM and FM: Definition, Modulation Index and Bandwidth, Mobile Communication System: Cellular Concept and Block Diagram of GSM System			
Text Books			
1. Thomas. L. Floyd, "Electronics Devices", 9th Edition, Pearson 2. R. P. Jain, "Modern Digital Electronics" , 4th Edition, Tata McGraw Hill 3. George Kennedy, "Electronic Communication Systems", 5th Edition, Tata McGraw Hill			
Reference Books			
1. Paul Horowitz, "The Art of Electronics", 3rdEdition, Cambridge University Press 2. Theodore S. Rappaport , "Wireless Communications: Principles and Practice", 2ndEdition,Pearson			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	**Assignment:** Assignment No. 1 - Unit 1, 2 (10 Marks) Assignment No. 2 - Unit 3, 4, 5 (10 Marks)	**10**
2	**Quiz (Using Learnico):** Unit No. 1 (10 Questions - 10 Marks) Unit No. 2 (10 Questions - 10 Marks) Unit No. 3 (10 Questions - 10 Marks) Unit No. 4 (10 Questions - 10 Marks) Unit No. 5 (10 Questions - 10 Marks)	**10**

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Build and demonstrate appropriate AC to DC converter for Mobile charger. How to rectify the fault, if the output of your circuit reduces to half of the required value?	**CO3, CO5**
2	Build and demonstrate a circuit to superimpose analog signal with DC signal. Hint: Television system.	**CO3, CO5**
3	Build and demonstrate basic charging circuit for battery of an electric vehicle.	**CO3, CO5**
4	Build and demonstrate a simple circuit to control the flashing speed of LEDs used in decorative lighting system.	**CO3, CO5**

5	Build and demonstrate simple circuit that will convert sine waveform into square waveform.	**CO3, CO5**
6	Build and demonstrate a simple circuit that will turn off a water pump automatically when the water tank is full.	**CO3, CO5**
7	Build and demonstrate the simple PUC system which will show green light indication if all CO_2, SO_2, Carbon monoxide levels are less than threshold value otherwise it should show red light indication. Hint: MQ series sensors along with comparators cane be used	**CO4, CO5**
8	Suggest a simple electronic system for a hearing-impaired person. (Implementation is not expected)	**CO3, CO4, CO5**
9	Suggest a simple system to transmit your voice signal from a recording room in Nashik to a broadcasting station in Mumbai. (Implementation is not expected)	**CO3, CO4, CO5**

Guidelines for Laboratory Conduction

1. Experiments should be performed in a group of two students only.
2. Avoid contacting circuits with wet hands or wet materials.
3. Double check circuits for proper connections and polarity prior to applying the power.
4. Observe polarity when connecting polarized components or test equipment.
5. Make sure test instruments are set for proper function and range prior to taking a measurement.

Guidelines for Student's Lab Journal

Student's lab journal should contain following related things -
Title, Objectives, Hardware/ Software requirement, Theory, Circuit Diagram, Observation table, Graph, Calculations, Results, Conclusion and Assignment questions

Guidelines for Termwork Assessment

1. R1: Timely completion of experiment (10 Marks)
2. R2: Understanding of experiment (10 Marks)
3. R3: Presentation / clarity of journal writing (10 Marks)
4. Total 30 marks for each experiment and average marks of all experiments will be converted into 25 marks of term work.

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. B. Tech.
Pattern 2022 Semester: I/II
FYE221008: Fundamentals of Mechanical Engineering

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

Prerequisite Courses: -

Course Outcomes: On completion 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 Solid and Power Transmission Elements**	**(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, Friction clutch, 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 and closed system. Introduction to Heat Engine, Heat Pump and Refrigerator.
Second Law of Thermodynamics: Kelvin Planck and Clausius Statement, Introduction to Carnot Heat Engine, Perpetual Motion Machine (PMM) - I and II
b) Heat Transfer: Heat, Modes of heat transfer. Laws of Heat Transfer and applications

Unit III	**Fundamentals of IC Engines and Electric and Hybrid Vehicles**	**(08 hrs)**	**COs Mapped – CO1, CO2**

a) Fundamentals of IC Engines: Classification of Internal Combustion Engines, Working of 2-stroke and 4-Stroke engines, Applications 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), Flexible manufacturing **b) Manufacturing support systems:** Computer integrated manufacturing, computer aided process planning, machine vision systems for inspection, Lean and agile manufacturing, value stream 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", Cengage Learning, Fourth Edition 2.Groover M. P. (2016) "Automation, Production Systems, Computer integrated manufacturing", Pearson			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**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, Drives Input resources will be provided to students Students are asked to do research for latest articles; study in detail and carefully observe real life applications of topic during Industrial visit and present review in 5 minutes or identify/suggest applications of the concept.	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 give presentation 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

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

F. Y. B. Tech.
Pattern 2022 Semester: I/II
FYE221009: 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: 25Marks

Prerequisite Courses, if any: -

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

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.
Pattern 2022 Semester: I/II
FYE221010: Computational Thinking and C Programming

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 02hrs/week **Practical : 02hrs/week**	**02** **01**	**InSem Exam: 25Marks** **EndSem Exam: 50Marks** **Termwork: 50 Marks**

Prerequisite Courses, if any: -

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

	Course Outcomes	**Bloom's Level**
CO1	Develop algorithms and flowcharts for computational problems	3-Apply
CO2	Translate an algorithm into a C program	2-Understand
CO3	Build a solution for a given problem using control structures	3-Apply
CO4	Use arrays, structures and files in developing programs	3-Apply
CO5	Identify logical and syntactical errors	2-Understand
CO6	Develop programs using functions	3-Apply

COURSE CONTENTS

Unit I	**Computational Thinking (CT) and Problem Solving**	**06 hrs**	**COs Mapped – CO1**

Computational Thinking (CT): What is CT? Purpose of CT, Logical Thinking, CT and Problem Solving Strategies
Program planning tools- algorithm, flowchart and pseudo code, Introduction to top-down structured programming, Types of programming languages, Introduction to System Software, Types of Program Errors: Syntax, logical, runtime, Debugging.

Unit II	**Introduction to C Programming and Conditional Algorithmic Constructs**	**05 hrs**	**COs Mapped – CO1, CO2, CO3**

Identifiers, Data Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise), Expressions, Precedence and Associativity, Type conversions.
Controlling algorithm execution
Conditional algorithmic constructs- if, if-else, nested if-else, cascaded if-else and switch statement

Unit III	**Iterative Algorithmic Constructs and Arrays**	**06 hrs**	**COs Mapped – CO1, CO2,CO3, CO4, CO5**

Iterative algorithm constructs: Construction of loops, Establishing initial condition, 'for', 'while', 'do-while' statements, nested loops, Continue, break statements
Arrays: Concept, One- dimensional, multidimensional array, character arrays (Strings).

Unit IV	**Decomposition using function**	**05 hrs**	**COs Mapped – CO1, CO2, CO3, CO5, CO6**

Function types: Library functions (math, string), user defined functions: Function definition, function declaration, arguments, scope rules and lifetime of variables, function calls and return.
Self study: macro

Unit V	**Structures and File handling**	**04 hrs**	**COs Mapped – CO1, CO2, CO3, CO4, CO5**

Defining a structure, accessing members, structure initialization, arrays of structures
Files: Concept of files, records, fields, File Processing - fopen(), fclose(), fprintf(), fscanf(), getc(), putc(), closing files.
Self Study: Enum, Union

Text Books

1.Yashavant Kanetkar, "Let Us C" – Seventh Edition, BPB Publications, 2007
2. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 2002
3.Karl Beecher, "Computational Thinking, A Beginner's guide to Problem solving and Programming", BCS Learning & Development Ltd, 2017

Reference Books

1.Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education, 1988
2.Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**COs Mapped**
1	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program to calculate the amount to be paid by the customer. A customer is offered x% discount on the printed price of a commodity. The customer has to pay y% sales tax on the remaining amount.	**CO1, CO2, CO5**
2	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program to accept the length of three sides of a triangle from the console and to test and print the type of triangle – equilateral, isosceles, right angled, none of these.	**CO1, CO2, CO3, CO5**
3	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program to store marks obtained by N students in an array and find the Minimum and Maximum score.	**CO1, CO2, CO3, CO4, CO5**
4	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program to perform following string operations using library and user defined function: Find length of a string Copy a string Concatenate the string	**CO1, CO2, CO3, CO4, CO5**
5	Draw a flow-chart/write a pseudo-code and write a C program that uses functions to perform the following operations: i) Addition of Two Matrices ii) Multiplication of Two Matrices	**CO1, CO2, CO3, CO5, CO6**
6	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program using function to test given number as prime number and to find smallest divisor, GCD, LCM of given number	**CO1, CO2, CO3, CO5, CO6**
7	Draw a flow-chart/write an algorithm/write a pseudo-code and write a C program to read structure of customer details (id, name, mobile, sex, city) and display it	**CO1, CO2, CO3, CO4, CO5**
8	Write a C program to read a text file and count number of characters, words and lines	**CO1, CO2, CO3, CO4, CO5**

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation and comments.
Use of open source software is to be encouraged.
Operating System recommended:- Linux or its derivative
Programming tools recommended: - Open Source line gcc/g++

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Term work Assessment

Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).

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

F. Y. B. Tech.
Pattern 2022 Semester: II
FYE221011: Programming in C++

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 03hrs/week **Practical : 02hrs/week**	**03** **01**	**InSem Exam: 25 Marks** **EndSem Exam: 50 Marks** **Termwork: 50 Marks**

Prerequisite Courses, if any: Computational Thinking and C Programming

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

	Course Outcomes	**Bloom's Level**
CO1	Illustrate Object Oriented Programming concepts to solve various computing problems using C++	2-Understand
CO2	Apply the concept of Inheritance for reusability of a class	3-Apply
CO3	Apply Polymorphism to build a solution	3-Apply
CO4	Use template and exception handling in a given problem	3-Apply
CO5	Use files for developing a program	3-Apply

COURSE CONTENTS

Unit I	**Fundamentals of Object Oriented Programming**	**(7hrs)**	**COs Mapped – CO1**

Introduction and Need of object-oriented programming (OOP), Fundamentals: objects, classes, characteristics of OOP, Benefits of OOP, C++ as object oriented programming language.
Abstraction mechanism: Classes, objects, access specifiers (private, public, protected), constructors, destructors, member data, member functions, Static members: variable and functions, inline function, friend function.
Self Study : C++ as extension of C - Comments, Global scoping operator

Unit II	**Inheritance**	**(8hrs)**	**COs Mapped – CO1, CO2**

Inheritance: Class hierarchy, derived classes, types of inheritance , constructor and destructor execution in inheritance, base initialization using derived class constructors, Ambiguity in Multiple Inheritance,, Virtual Base Class, Abstract class, Friend Class, Nested Class
Self Study : Class hierarchy with "IS - A" and "Has-a" relationships

Unit III	**Polymorphism**	**(7hrs)**	**COs Mapped – CO1, CO3**

Introduction to Pointers: Introduction (Basic Concepts)

Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Operator Overloading-Overloading Unary, Binary Operators.

Dynamic (Run Time) Polymorphism- Pointers to Base class, virtual function and its significance in C++, pure virtual function, abstract base class

Unit IV	**Generic Programming and Exception handling**	**(7hrs)**	**COs Mapped – CO1,CO4**

Templates- The Power of Templates, Function template, overloading Function templates, and class template, Generic Functions.

Exception handling: Fundamentals of error handling, try, catch, throw, Simple exception handling examples.

Self study : STL vector, list

Unit V	**File handling**	**(7hrs)**	**COs Mapped – CO1, CO5**

Data hierarchy, Stream and files, Stream Classes, Disk File I/O with Streams, File Pointers, File I/O with Member Functions.

Self Study : Formatted I/O, command line arguments

Text Books

1.Deitel,"C++ How to Program", 4th Edition, Pearson Education, ISBN:81-297-0276-2

2.Robert Lafore, "Object-Oriented Programming in C++", 4th edition, Sams Publishing, ISBN:0672323087

3.E.Balagurusamy, "Object-Oriented Programming with C++", 7th edition, McGraw-Hill Publication, ISBN 10: 9352607996

Reference Books

1. Herbert Schildt, "C++-The complete reference", 8th edition, McGraw Hill Professional, 2011, ISBN:978-00-72226805

2. Bjarne Stroustrup, "The C++ Programming Language", 4th edition, Addison-Wesley ISBN 978-0321563842. May 2013

List of Laboratory Assignments

Sr. No.	**Laboratory Assignments**	**COs Mapped**
1	Write a C++ Program to display Names, employee_id, salary of 3 employees. Declare the class of employee. Create an Array of class objects. Read and display the contents of the array.	**CO1**
2	Write a C++ Program to Create class DM which stores the value of distances in meters and centimeters. Read values for the class objects and add one object of DM with another object and find greater distance from two objects. Use a friend function to carry out the addition operation. The display should be in the format of meters and centimeters	**CO1**

3	Write a C++ program to develop a program in C++ to create a database of a student's information system containing the following information: Name, Roll number, Class, Division, Date of Birth and Telephone number. Construct the database with suitable member functions. Make use of constructor, default constructor, copy constructor, destructor, count number of students	**CO1**
4	Write a C++ program to create a base class Person (name and phone number). Derive Academic Performance (Degree, percentage) class from Person class. Display Biodata of the person.	**CO1, CO2**
5	Write a C++ program to implement a class Complex which represents the Complex Number data type. Implement the following 1. Constructor (including a default constructor which creates the complex number 0+0i). 2. Overload operator+ to add two complex numbers. 3. Overload operator* to multiply two complex numbers	**CO1, CO3**
6	Write a C++ program to make operations for a publishing company which does marketing for book and audio cassette versions. Create a class publication that stores the title (a string) and price (type float) of publications. From this class derive two classes: book which adds a page count (type int) and tape which adds a playing time in minutes (type float). Write a program that instantiates the book and tape class, allows users to enter data and displays the data members. If an exception is caught, replace all the data member values with zero values. Use virtual functions	**CO1, CO3**
7	Write a C++ program to Create a class template to represent generic vectors. Include following functions: To create a vector, To modify the value of given vector, Multiply vector by a scalar value, Display vector	**CO1, CO4**
8	Write a C++ program to Create a class of employees (data members name, DOB, mobile). Write a function to accept the data and display the information. Use exception handling while accepting the data. e.g in DOB day value should be in between 1 to 31, month value should be in between 1 to 12 etc. Store and retrieve a data from the file.	**CO1, CO4, CO5**

Guidelines for Laboratory Conduction

Use of coding standards and Hungarian notation, proper indentation and comments.
Use of open source software is to be encouraged.
Operating System recommended:- Linux or its derivative
Programming tools recommended: - Open Source line g++

Guidelines for Student's Lab Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, problem statement, theory Concepts in brief, algorithm, flowchart, test cases and conclusions). Program codes with sample outputs shall be submitted in soft form.

Guidelines for Term work Assessment

Continuous assessment of laboratory work shall be based on overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include R1- timely completion (10), R2- understanding of assignment (10) and R3- presentation/clarity of journal writing (10).

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F. Y. B. Tech.
Pattern 2022 Semester: I/II
FYE221012: Engineering Drawing

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory:01hr/week Practical: 02hrs/week Tutorial:01hr/week	01 01 01	InSem Exam: 25Marks EndSem Exam: 50Marks Term Work: 25 Marks Tutorial: 25 Marks

Prerequisite Courses: -

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+ 2hrsTutorial)**	**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+ 2hrsTutorial)**	**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+ 2hrsTutorial)**	**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	**Projections of Solids and Development of Lateral Surfaces of Solids**	**(03hrs+ 4hrsTutorial)**	**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.			

TextBooks

1. Bhatt, N. D. and Panchal, V. M., "Engineering Drawing", Charotar Publication, Anand, India
2.Jolhe, D. A., "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi

Reference Books
1. Bhatt, N. D., "Machine Drawing", Charotar Publishing house, Anand, India.

List of Tutorial Assignments (Solve assignments related to following topics by using any drafting software.)		
Sr. No.	**Title**	**CO Mapped**
1	Projection of line. (One Problem)	CO2, CO4
2	Orthographic Projection of Simple objects from given pictorial views. (One Problem)	CO1, CO2, CO3, CO4
3	Development of 3D model from the given orthographic views. (One Problem)	CO2, CO3, CO4
4	Projection of solids. (One Problem)	CO2, CO3, CO4

List of Laboratory Assignments		
Sr. No.	**Laboratory Assignments**	**CO Mapped**
1	Engineering drawing standards like types of lines, lettering and dimensioning.	CO1
2	Projection of lines. (Two Problems)	CO2, CO4
3	Projection of Planes.(Two Problems)	CO2, CO3, CO4
4	Orthographic Projection of given objects including sectional view. (Two Problems)	CO1, CO2, CO3, CO4
5	Isometric projection for the given set of two-dimensional views. (Two Problems)	CO2, CO3, CO4
6	Projection of Solids and Development of Lateral Surfaces of solids. (One problem each)	CO1, CO2, CO3, CO4
Guidelines for Laboratory Conduction		
Students will solve six laboratory assignments on A2 size drawing sheet.		
Guidelines for Tutorial Conduction		
Students will solve four tutorial assignments 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 Termwork and Tutorial 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 six drawing sheets total marks of 180 will be converted into 25 Marks. For all four tutorial assignments total marks of 120 will be converted into 25 marks.		

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F. Y. B. Tech. Pattern 2022 Semester: I / II FYE221013: Workshop Practice		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02 hrs/week	**01**	**Termwork: 50Marks**

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

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, tapping operations 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, exporting STL file, choosing parameters, creating G code and printing	**CO2**

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.

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

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F. Y. B. Tech.
Pattern 2022 Semester: I
FYE221014: Communication Skills

Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 1hr/week **Practical: 02hrs/week**	**01** **01**	**Continuous Comprehensive Evaluation: 25Marks** **Termwork: 50Marks**

Prerequisite Courses, if any: ----

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

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 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.	**CO5, CO2**
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,	**CO4**

	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.	

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

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F. Y. B. Tech. **Pattern 2022 Semester: II** **FYE221015: Engineering Explorations**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Term Work: 100Marks**
Prerequisite Courses, if any: ----		

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.	**4-Synthesis**

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.

Reference Books

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

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 Semester: I/II
FYE22016: Democracy, Election and Governance

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory : 02hrs/week	**02**	**InSem Exam: 25Marks** **EndSem Exam: 25Marks**

Prerequisite Courses, if any:

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

	Course Outcomes	**Bloom's Level**
CO1	Understand and practice key principles of Democracy	2-Understand
CO2	Identify how different rights are protected in Democratic systems	2-Understand
CO3	Understand various approaches for Governance	2-Understand
CO4	Reflect on the various threats and challenges to Democracy	3-Apply

COURSE CONTENTS

Unit I	**Democracy- Foundation and Dimensions**	**(8hrs)**	**COs Mapped – CO1, CO2,CO4**

Constitution of India, Evolution of Democracy- Different Models, Dimensions of Democracy- Social, Economic, and Political

Unit II	**Decentralization**	**(8hrs)**	**COs Mapped – CO1, CO2,CO3, CO4**

Indian tradition of decentralization, History of Panchayat Raj institution in the lost independence period 73rd and 74thamendments, Challenges of caste, gender, class, democracy and ethnicity

Unit III	**Governance**	**(8hrs)**	**COs Mapped – CO2, CO3, CO4**

Meaning and concepts, Government and governance, Inclusion and exclusion

Text Books

1. Basu, D. D. (1982), "Introduction to the Constitution of India", Prentice Hall of India.
2. Chandra, B. (1999), "Essays on contemporary India", Har-Anand Publications.