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

Curriculum
F.Y. B. Tech

Electronics and Telecommunication Engineering

w.e.f.: AY 2023-2024

F.Y. B.Tech Electronics and Telecommunication Engineering wef AY 2023-24															
SEM-I															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TU**	**TW**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300101A	**BSC**	Linear Algebra and Differential Calculus	3	1	0	20	60	20	25	0	**125**	3	1	0	**4**
2300103A	**BSC**	Applied Physics	3	0	2	20	60	20	0	50	**150**	3	0	1	**4**
2300107A	**ESC**	Fundamentals of Electronics Engineering	3	0	2	20	60	20	0	50	**150**	3	0	1	**4**
2300108A	**ESC**	Programming in C	1	0	2	20	30	0	0	50	**100**	1	0	1	**2**
2300112A	**AEC**	Communication Skills	1	0	2	0	0	25	0	50	**75**	1	0	1	**2**
2300111B	**VSEC**	Additive Manufacturing	1	0	2	0	0	25	0	25	**50**	1	0	1	**2**
2300115A	**CC**	Sports, Yoga and Art	0	2	0	0	0	0	50	0	**50**	0	2	0	**2**
Total			**12**	**3**	**10**	**80**	**210**	**110**	**75**	**225**	**700**	**12**	**3**	**5**	**20**

F.Y. B.Tech Electronics and Telecommunication Engineering wef AY 2023-24															
SEM-II															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TU**	**TW**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300102A	**BSC**	Differential Equations and Integral Calculus	3	1	0	20	60	20	25	0	**125**	3	1	0	**4**
2300104A	**BSC**	Applied Chemistry	3	0	2	20	60	20	0	50	**150**	3	0	1	**4**
2300109A	**ESC**	Programming in C++	3	0	2	20	60	20	0	50	**150**	3	0	1	**4**
2300110A	**ESC**	Engineering Drawing	1	0	2	20	30	0	0	50	**100**	1	0	1	**2**
2300118E	**PCC**	Electrical Networks	2	0	0	20	60	20	0	0	**100**	2	0	0	**2**
2300116A	**IKS**	Indian Knowledge System	0	2	0	0	0	0	50	0	**50**	0	2	0	**2**
2300117D	**VSEC**	PCB Making	1	0	2	0	0	25	0	25	**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**	**150**	**175**	**800**	**13**	**5**	**4**	**22**

Electronics and Telecommunication Engineering 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**	**TU**	**TW**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2300119A	**EXIT**	Internship*	0	0	0	0	0	0	0	100	**100**	0	2	0	**2**
2300128A	**EXIT**	Digital Electronics (Exit Course-1)	2	0	2	20	30	0	0	50	**100**	2	0	1	**3**
2300129A	**EXIT**	Electronic Maintenance and Troubleshooting (Exit Course-2)	2	0	2	20	30	0	0	50	**100**	2	0	1	**3**
Total			**4**	**0**	**4**	**40**	**60**	**0**	**0**	**200**	**300**	**4**	**2**	**2**	**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

Semester-I

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

F. Y. B. Tech.
Pattern 2023
2300101A: Linear Algebra and 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 : 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

K.K.Wagh Institute of Engineering Education and Research, Nashik
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F. Y. B. Tech.
Pattern 2023
2300103A: Applied Physics
(Group A – Computer, IT, E&TC, AI&DS & CSD, Electrical, R&A)

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 Objectives:

To impart knowledge on concepts of Electromagnetism and Electromagnetic waves.

To learn properties of semiconductors and nanomaterials for their applications in various technical fields.

To enable students to gain the knowledge of wave optics and their applications in various technical fields.

. To study basic concepts of Quantum Mechanics for quantum computing.

. To study the fundamentals and physical processes that govern energy usage and environmental conservation.

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”.

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

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

(Autonomous from Academic Year 2022-23)

F. Y. B. Tech. Pattern 2023 Semester: I

2300107A: Fundamentals of Electronics Engineering

(Branch: Electrical, E&TC, R&A, Comp, AIDS, CSD, IT)

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 Objectives:

1. To study basic electronic components like PN junction diode, Zener diode, LED, Photodiode, BJT, E-MOSFET and OpAmp along with their applications.
2. To understand different number systems, logic gates, Boolean algebra and basic digital circuits.
3. To study the basics of electronic communication system and mobile communication system.

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

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

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)	**10**

	Unit No. 4 (10 Questions - 10 Marks) Unit No. 5 (10 Questions - 10 Marks)	

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-impairedperson. (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 2023
2300108A: Programming in C

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

Prerequisite Courses, if any: -

Course Objectives:

- To get acquainted with the fundamental concepts of 'C'programming
- To understand data types, control structures and functions in 'C'
- To use concept of arrays, string operations in C to solve a problem
- To apply the concept of structures in 'C' to solve a problem
- To build the programming skills using 'C' to solve a problem

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

	Course Outcomes	Bloom's Level
CO1	Illustrate algorithm, flowchart for a given problem	2- Understand
CO2	Apply fundamentals of 'C' programming to solve a given problem	3-Apply
CO3	Build a solution for a given problem using conditional and iterative algorithmic constructs	3-Apply
CO4	Use arrays and functions in developing programs	3-Apply
CO5	Develop program using structure	3-Apply

COURSE CONTENTS

Unit I	Introduction to Programming Languages	02 hrs	COs Mapped – CO1

Program planning tools- Algorithm, flowchart and pseudo code, Introduction to top-down structured programming,
Types of Program Errors: Syntax, logical, runtime, debugging.

Unit II	Fundamentals of 'C' Programming	03 hrs	COs Mapped – CO2

Introduction to 'C' Programming, Identifiers, Data Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise), Expressions, Precedence and Associatively, Type conversions.

Unit III	Conditional and Iterative Algorithmic Constructs	04 hrs	COs Mapped – CO3

Conditional algorithmic constructs- if, if-else, nested if-else, cascaded if-else and switch statement
Iterative algorithm constructs: Construction of loops, Establishing initial condition, 'for', 'while', 'do-while' statements, nested loops, Continue, break statements.

Unit IV	Arrays and Functions	04 hrs	COs Mapped – CO4

Arrays: Concept, One- dimensional, multidimensional array, character arrays (Strings).
Function types: Library functions (math, string), user defined functions: Function definition, function declaration, arguments, scope rules and lifetime of variables, function calls and return.

Unit V	Structure	02 hrs	COs Mapped – CO5
Defining a structure, accessing members, structure initialization.			
Text Books			
1.Yashavant Kanetkar, "Let Us C" – Seventh Edition, BPB Publications, 2007 2. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 2002			
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.			

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

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	In a departmental store, a customer is offered an x% discount on the printed price of each commodity. The customer needs to pay y% sales tax on the discounted amount. Draw a flowchart, write an algorithm / a pseudo-code and write a C program to calculate the amount to be paid by the customer for a commodity using above conditions.	**CO1,CO2**
2	A type of a triangle (equilateral, isosceles, right angle triangle etc) is decided using the length of its three sides. Draw a flowchart, write an algorithm /write a pseudo-code and write a C program to accept the length of three sides of a triangle and display the type of triangle. Also Calculate its area and perimeter.	**CO1,CO2, CO3**
3	After conducting a class test for a course, a teacher wants to record the marks obtained by all the students in the class and find the Minimum and Maximum score obtained. The teacher is also interested in knowing the number of students who passed in this test Draw a flowchart, write an algorithm/ a pseudo-code and write a C program to record the marks and perform above functions.	**CO1,CO2, CO3,CO4**

4	Draw a flowchart/write an algorithm / a pseudo-code and write a menu driven C program to perform following string operations using library and user defined function: i. Find length of a string ii. Copy a string iii. Concatenate the string iv. Compare two strings	**CO1,CO2, CO3,CO4**
5	Draw a flowchart/write an algorithm / a pseudo-code and write a C program using functions to perform the following operations: i. Addition of Two Matrices ii. Multiplication of Two Matrices iii. Transpose of a given matrix	**CO1,CO2, CO3,CO4**
6	Draw a flowchart, write an algorithm / a pseudo-code and write a C program using a function to test whether the given number is a prime number and also to find smallest divisor, GCD, LCM of the given number	**CO1,CO2, CO3,CO4**
7	A company desires to maintain a database of its customer by recording information about customers such as name, mobile, gender, city etc. The sales department personnel would like to get i. Customers with all the details, ii. Customers and their mobile numbers, iii. Customers from a given city Draw a flow-chart, write an algorithm / a pseudo-code and develop a menu driven application to provide above functionalities	**CO1,CO2, CO3,CO4, CO5**

Guidelines for Laboratory Conduction

Use coding standards such as variable naming conventions, use of constants, proper indentation, comments and documentation

For each assignment, students should write number of lines of code, various errors encountered and test cases used to test the program

Students should incorporate functionalities mentioned in boldface in the assignments

In addition to above eight assignments, students may develop an application in consultation with the teacher

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 the overall performance of a student. Assessment of each laboratory assignment shall be based on rubrics that include

R1- Timely completion (10) – Full marks if submitted in time, 5 marks otherwise,

R2- Understanding of assignment (10) Full marks for accurate flowchart, algorithm / pseudo-code and working code

R3- Use Coding standards, proper documentation, neatness of writeup (10) – 5 marks for coding standards and documentation and 5 marks for neatness of write up.

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

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 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-	**CO5, CO2**

	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 2022-23)

F. Y. B. Tech. (E&TC)
Pattern 2023 Semester: I
2300111B Additive Manufacturing

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

Prerequisite Courses, if any: -Nil

Companion course, if any: Nil

Course Objectives:

1. Learn to Construct different Geometrical figures using drawing Instruments
2. To draw orthographic Projections giving proper dimensioning with title block using appropriate line type and scale
3. To draw isometric projection from orthographic views (and vice-versa) and draw oblique projection from orthographic views.
4. To perform CAD application in 2D interface
5. To create and plot assembly and detail views of simple geometrical solid with Dimension, Tolerance & Annotation in 3D Modelling
6. Study Additive Manufacturing (AM) Technology and emerging trends in Additive Manufacturing

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

	Course Outcomes	**Bloom's Level**
CO1	Construct different Geometrical figures using drawing Instruments	2-Understand
CO2	draw orthographic Projections giving proper dimensioning with title block using appropriate line type and scale	2-Understand
CO3	draw isometric projection from orthographic views (and vice-versa) and draw oblique projection from orthographic views	3-Apply
CO4	perform CAD application in 2D interface	3-Apply
CO5	create and plot assembly and detail views of simple geometrical solid with Dimension, Tolerance & Annotation in 3D Modeling	3-Apply
CO6	Explain Additive Manufacturing (AM) Technology and emerging trends in Additive Manufacturing	2-Understand

COURSE CONTENTS

Unit I	**Construction of different Geometrical figures using drawing Instruments**	**(02 hrs)**	COs Mapped - CO1

- Draw straight and parallel lines, triangles, polygons, circles, parallelogram, angle bi-sector and line bi-sector.
- Construct regular polygons (up to 8 sides) on equal base.
- Layout a A3 drawing sheet with margin and name plate.
- Label a drawing views showing the types of line are used
- Construct ellipse, parabola & hyperbola
- Construct involutes, cycloid curves, helix & spiral

Unit II	**Draw orthographic Projections**	(02 hrs)	COs Mapped - CO2

- Generate views in orthographic projection by placing object between horizontal and vertical plane of axes.

- Generate side view of laminar objects in different inclination on VP and HP by auxiliary vertical plane.
- Draw orthographic projection of points, lines and plain laminar figures.
- Draw orthographic projection of solids viz. prism, cones, pyramids and their frustums in 1st angle and 3rd angle method.

Unit III	**Draw isometric projection**	(02 hrs)	COs Mapped – CO3

- Construct an Isometric scale to a given length.
- Draw the isometric projection of regular solids.
- Draw the isometric views for the given solids with hollow and cut sections.
- Draw the orthographic views of hanger, bracket & support from their isometric view.

Unit IV	**CAD**	(02 hrs)	COs Mapped - CO3, CO4

- Create 2D geometrical figures using commands from menu bar, toolbar and by typing in command prompt. Create simple object in 2D drawing space.
- Edit 2D objects using modify commands.
- Construct orthographic sectional views of brackets with dimension in different layers.
- Draw isometric view of machine blocks.
- Arrange drawing in multiple viewports within layout space

Unit V	**3D Modelling**	(02 hrs)	COs Mapped – CO3, CO4, CO5

- Create geometrical figures and patterns using sketch entities.
- Create 3D solid figures by Sketching features & applied features.
- Sketch an angle plate and a block – Create / Modify constraints.
- Create geometric dimensioning & tolerance (GD&T) with DimXpert manger.
- Create 3D solid and edit solid.
- Create a new assembly, Insert components into an assembly, Add mates (degree of freedom) and perform components configuration in an assembly.
- Predict aesthetic design, assembly costing, design library & toolbox as per different standards.
- Construct multibody, save as a new part and case study.
- Create a 3D model putting: Driving dimensions, Bill of materials, Driven (Reference) Dimensions and Annotations.
- Prepare drawings & detailing: Named views, standard 3views, auxiliary views, section views and detail views.
- Create a 3D transition figure.
- Create 3D model by annotating Holes and Threads, centerlines, symbols and leaders.
- Create simulation, plot various results, perform design optimisation.
- Compute data translation facilitate to export design.

Unit VI	**Additive Manufacturing (AM) Technology and emerging trends**	(02 hrs)	COs Mapped – CO3, CO4, CO5

- Explain the underlying principles of Additive Manufacturing (AM).
- Demonstrate various machines used in AM.
- Identify the Extrusion AM technology – Fused Filament & Continuous Filament fabrication.
- Ensure Digital Light Processing Technology.
- Elaborate the emerging trend in AM.

List of Laboratory Assignments

Sr. No	Unit name	Title of the Experiment	CO Mapped
1	Construction of different Geometrical figures using drawing Instruments	Two Problems - 1) Construction of Ellipse, Parabola, Hyperbola (Any One) 2) Construction of Cycloid, Involute, Helix, Spiral (Any One)	CO1
2	Draw orthographic Projections	Orthographic Projection of given objects including sectional view. (Two Problems)	CO2
3	Draw isometric projection	Isometric view / projection for the given set of two-dimensional views. (Two Problems)	CO3
4	CAD	Orthographic or Isometric Projection (One Problem) of given object using any drafting software	CO3, CO4
5	3D Modelling	Part Modeling of Pyramid / Prism using any Modelling Software	CO3, CO4, CO5
6	Additive Manufacturing (AM) Technology and emerging trends	Create Gcode File / STL File of Part Modelling Object using any Slicing Software	CO3, CO4, CO5

Guidelines for Laboratory Conduction

Students will solve first three laboratory assignments on A3 size drawing / Sketch Book and last three assignments using Suitable software.

Guidelines for Term work Assessment

Each laboratory assignments will be assessed for 30 Marks according to following rubrics:

1. R1- Timely completion of assignments (10 Marks)
2. R2- Understanding of assignment (10 Marks)
3. R3 – Presentation/Clarity of journal writing (10 Marks)

For all six drawing sheets total marks of 180 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: Sports, Yoga and Art

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 02 hrs/Week	**02**	**Tutorial: 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

Semester-II

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

F. Y. B. Tech.
Pattern 2023
2300102A: Differential Equations and Integral 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: 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
2300109A: Programming in C++

Teaching Scheme:	**Credit Scheme:**	**Examination Sch me:**
Theory : 03hrs/week **Practical : 02hrs/week**	**3** **1**	**Continuous Comprehensive Evaluation: 20Marks** **InSem Exam: 20Marks** **EndSem Exam: 60Marks** **TermWork: 50Marks**

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 roblems 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 e ception 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 la guage.
Abstraction mechanism: Classes, objects, access specifiers (private, public, protected), constructors, destructors, member data, membe 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, d rived classes, types of inheritance , constructor and destructor execution in inheritance, base initialization using derived class constructors, A biguity in Multiple Inheritance,, Virtual Base Class, bstract 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 inC++, 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 classtemplate, Generic Functions.
Exception handling: Fundamentals of error handling, try, catch, throw, Simple exception handlingexamples.
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/Owith 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 distancesin 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 astudent'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 theComplex Number data type. Implement the following 1. Constructor (including a default constructor which creates the complexnumber 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 ascalar 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 consistsof 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 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 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.		

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

F Y B Tech (E&TC Branch)
Pattern 2023 Semester: I
2300118E: Electrical Networks

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

Prerequisite Courses, if any: -Physics and Mathematics

Companion course, if any: Lab work in Electronic Maintenance and Troubleshooting

Course Objectives: To make the students understand
1. Network Theorem.
2. RL, RC and RLC circuits
3. Two port networks

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

	Course Outcomes	**Bloom's Level**
CO1	Apply Thevenin's and Norton's theorems to analyze and design for maximum power transfer.	2-Understand
CO2	Evaluate the performance of RL, RC, and RLC circuits by the application of Laplace transform	2-Understand
CO3	Analyze the given network using different two port network parameters	3-Apply

COURSE CONTENTS

Unit I	**DC Circuits**	**(07 hrs)**	**COs Mapped - CO1**

Types of Networks – Sources transformation – Star – Delta transformation – formation of matrix equation and analysis of circuits using mesh current and Nodal voltage method for DC and AC circuits. Superposition, and Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer

Unit II	**AC Circuits**	**(08 hrs)**	**COs Mapped - CO1**

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 III	**Laplace Transform**	**(08 hrs)**	**COs Mapped - CO1, CO2**

Laplace transforms and properties: Partial fraction, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions

Unit IV	**Linear 2-port network parameters**	**(08hrs)**	**COs mapped -**

Two Port networks: Two port parameters, short circuit admittance parameter, open circuit impedance parameters, Transmission parameters, Image parameters and Hybrid parameters. Ideal two port devices, ideal 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. D Roy Chaudhuri: Networks and Systems, New Age Publishers.

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.

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

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

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

Course Objectives:
To create awareness of contribution 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. Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
2. Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
3. Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
4. Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
5. Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
6. Acarya, P.K. (1996). Indian Architecture, MunshiramManoharlal Publishers, New Delhi.
7. 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. (E&TC)
Pattern 2023 Semester: II
2300117D: PCB Making

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

Prerequisite Courses, if any: -Fundamentals of Electronics Engineering

Companion course, if any: Lab work in PCB Making

Course Objectives:

7. To learn PCB designing basics
8. To study different types of electronic components
9. To study PCB design tools.
10. To design PCB layout
11. To fabricate PCB

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

	Course Outcomes	**Bloom's Level**
CO1	Understand PCB designing basics	2-Understand
CO2	Study different types of electronic components	2-Understand
CO3	Study different PCB design tools	3-Apply
CO4	Apply software used in PCB Design	3-Apply
CO5	Fabricate PCB	3-Apply

COURSE CONTENTS

Unit I	**Introduction to PCB designing concepts**	**(06 hrs)**	COs Mapped - CO1

Introduction & Brief History

- What is PCB
- Difference between PWB and PCB
- Types of PCBs: Single Sided (Single Layer), Multi-Layer (Double Layer)
- PCB Materials

Introduction to Electronic design Automation (EDA)

- Brief History of EDA
- Latest Trends in Market
- How it helps and Why it requires

- Different EDA tools
- Introduction to SPICE and PSPICE Environment
- Introduction and Working of PROTEUS

Unit II	**Component introduction and their categories**	(07 hrs)	COs Mapped - CO2

Types of component
Active component: Diode, Transistor, MOSFET, LCD, SCR. Integrated Circuits (ICs)
Passive component: Resistor, Capacitor, Inductor, Transformer, Speaker/ Buzzer
Component Package Types: Through Hole Packages: Axial lead, Radial lead, Single inline package (DIP), Transistor outline (TO), Pin Grid Array (PGA)
Through Hole Package: Metal Electrode Face(MELE), Leadless Chip Carrier (LCC), Small outline integrated circuits (SOIC), Quad Flat Pack (QPF), and Thin QFP (TQFP), Ball Grid Array (BGA), Plastic Leaded Chip Carrier (PLCC)

Unit III	**Introduction to Development Tools**	(08 hrs)	COs Mapped – CO3

- Introduction to PCB Design using OrCAD tool
- Introduction to PCB Design using PROTEUS tool

Unit IV	**Detailed description and practical of PCB designing**	(07 hrs)	COs Mapped - CO3, CO4

PCB Designing Flow Chart

- Schematic Entry
- Net Listing
- PCB Layout Designing
- Prototype Designing
  - Design Rule Check (DRC)
  - Design for Manufacturing (DFM)
- PCB Making
  - Printing
  - Etching
  - Drilling
- Assembly of component

Description of PCB Layers

- Electrical Layers
  - Top layer
  - Mid layer
  - Bottom layer
- Mechanical layers
  - Board outlines and cutouts
  - Drill details
- Documentation layers
  - Component outlines
  - Reference designation
  - Text

Keyword & their description

- Footprint
- Pad stacks
- Vias
- Tracks

- Color of Layers
- PCB Track size calculation formula

PCB Material

- Standard FR-4 Epoxy Glass
- Multifunctional FR-4
- Tetra Function FR-4
- NelcoN400-6
- GETEK
- BT Epoxy Glass
- Cyanate Aster
- Plyimide Glass
- Teflon

Rules for Track

- Track Length
- Track Angle
- Rack Joints
- Track size

Study of IPC Standards

- IPC Standard For Schematic Design
- IPC Standard For PCB Designing
- IPC Standard For PCB Materials
- IPC Standard For Documentation and PCB Fabrication

Unit V	**PCB Fabrication**	(06 hrs)	COs Mapped – CO3, CO4, CO5

Starting the PCB designing

- Understanding the schematic Entry
- Creating Library & Components
- Drawing a Schematic
- Flat Design / hierarchical Design
- Setting up Environment for PCB
- Design a Board

Auto routing

- Introduction to Auto routing
- Setting up Rules
- Defining Constraints
- Auto router Setup

PCB Designing Practice

- PCB Designing of Basic and Analog Electronic Circuits
- PCB Designing of Power Supplies
- PCB Designing of Different Sensor modules

- PCB Designing of Electronics Projects
- PCB Designing of Embedded Projects

Post Designing & PCB Fabrication Process

- Printing the Design
- Etching
- Drilling
- Interconnecting and Packaging electronic Circuits (IPC) Standards
- Gerber Generation
- Soldering and De-soldering
- Component Mounting
- PCB and Hardware Testing

Project work

- Making the schematic of Academic and Industrial projects
- PCB Designing of these projects
- Soldering and De-soldering of components as per Design
- Testing and Troubleshooting Methods

Text Books

1. Walter C Bosshart "Printed Circuit Boards: Design and Technology" Tata McGraw-hill
2. R S Khandpur, "Printed Circuit Boards: Design, Fabrication, Assembly & Testing", Tata McGraw-hill

Reference Books

1. Charles A. Harper, "Handbook of Electronics Packaging", McGraw- hill
2. Printed Circuit Boards: Design Techniques For EMC Compliance Montrose Mark I IEEE Press Series of Electronics Technology

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

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

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial : 02hrs/week	**02**	**Tutorial: 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%)**

Exit Courses

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

F Y B Tech (E&TC) Exit course-1
Pattern 2023
2300128A: Digital Circuits

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

Prerequisite Courses, if any: -Fundamentals of Electronics Engineering

Companion course, if any: Lab work in Digital circuits

Course Objectives: To make the students understand
1. To analyze logic processes and implement logical operations using combinational logic circuits.
2. The principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.

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

	Course Outcomes	**Bloom's Level**
CO1	Design and implement combinational logic circuits.	3-Apply
CO2	Design and implement sequential circuits	3-Apply

COURSE CONTENTS

Unit I	**Combinational Logic Circuits**	**(05 hrs)**	**COs Mapped - CO1, CO2, CO3**

Standard representation of logic function (SOP, POS), Minimization of logic functions for min terms, Minimization of logic functions for max terms, Design examples: half adder, full adder, subtractor using adder

Unit II	**Combinational Logic Design**	**(05 hrs)**	**COs Mapped - CO1, CO2, CO3**

Codes and code converters-BCD, Gray, XS-3, 7 Segment ,ALU design (using 7487) ,Digital Comparator, Parity checker, parity generator Multiplexer and Demultiplexer Quine McCluskey method (only for advanced learners)

Unit III	**Sequential Logic Circuits**	**(05 hrs)**	**COs Mapped - CO1, CO2**

Flip flops-1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops.
Application of Flip flops: Registers, Shift registers

Unit IV	**Sequential Logic Design**	**(05 hrs)**	**COs Mapped - CO1, CO2, CO5**

Counter part1: Counters (ring counters, twisted ring counters), Counter part 2: Ripple counters, up/down counters Counter part 3: Synchronous counters, Modulo counter Issues in sequential design: Lock out, Clock Skew, Clock jitter. Effect on synchronous designs.

Text Books
1. R.P. Jain, “Modern Digital Electronics”, Tata McGraw Hill Publication, 3 rd Edition 2. M. Morris Mano, “Digital Logic and Computer Design”, Prentice Hall of India, 4 th Edition3.
Reference Books
1. Anand Kumar, “Fundamentals of Digital Circuits”, Prentice Hall of India, 1st Edition 2. J. F. Wakerly, “Digital Design- Principles and Practices,” Pearson, 3rd Edition.

Lab Assignments:

1. Design and verification of the truth tables of Half and Full adder circuits
2. Verification of the truth table of the Multiplexer 74150 and De-Multiplexer 74154
3. Test different types of flip-flops (SR, JK, T, D)
4. Verify the counter using 7490 and 7493
5. Design of 4-bit shift register (shift right)

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

F Y B Tech E&TC Exit course-2
Pattern 2023
2300129A: Electronic Maintenance and Troubleshooting

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

Prerequisite Courses, if any: -Fundamentals of Electronics Engineering

Companion course, if any: Lab work in Electronic Maintenance and Troubleshooting

Course Objectives: To make the students understand
1. Knowledge about Protective devices.
2. Tools and equipment
3. Electronics troubleshooting

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

	Course Outcomes	**Bloom's Level**
CO1	Acquiring knowledge about Protective devices	2-Understand
CO2	Acquiring skills on tools and equipment	2-Understand
CO3	Do electronic troubleshooting	3-Apply

COURSE CONTENTS

Unit I	Acquiring knowledge about Protective devices	**(05 hrs)**	**COs Mapped - CO1**

Fuse types and its rating. Understanding of Relay use in system protection and their working. MCB and its types, protection against ESD.

Unit II	Acquiring skills on tools and equipment	**(05 hrs)**	**COs Mapped - CO1**

Screw Driver Set Tweezers, Different Types of Tweezers, Nose Pliers, Wire Cutter Hot air gun Liquid solder paste, Magnifying Lamp and Measuring Tools Brush, CRO, Nipper , Multimeter Operation etc

Unit III	Electronics Troubleshooting	**(10 hrs)**	**COs Mapped - CO1, CO2**

Basic troubleshooting method, Getting into troubleshooting, selected instruments for troubleshooting Component testing methods, Testing of components in circuits , Logical steps of fault finding, Troubleshooting through circuit diagram, Removal and Replacement of faulty component Soldering Iron, Soldering wire, Soldering Flux, Soldering method, Zero defect soldering De-soldering pump, Temperature controlled soldering station

Text Books

1. Basic Electronics - Repair & Maintenance of Power supply, Invertor & UPS – NIMI Published by National Instructional Media Institute, Chennai

Reference Books

4. Switching Power Supply Design, 3rd Ed. by Abraham Pressman (Author),
5. Uninterruptible Power Supplies Alexander King, William Knight McGraw Hill Professional

Lab Assignments:

1. To find cause of battery failure, diagnosis and testing, visual inspection, Heavy load test
2. Do installation of UPS and Inverter
3. Troubleshoot UPS and Inverter
4. Do installation of Stabilizer and CCTV
5. Troubleshoot Stabilizer and CCTV