



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

F.Y. B. Tech. Structure (2026 Pattern)

w. e. f.: A.Y. 2026-2027

Branch: E & TC (Group B)

K. K. Wagh Institute of Engineering Education and Research, Nashik (Autonomous w. e. f. A.Y.2022-23)

Details of Course Structure: F. Y. B. Tech. w. e. f. A.Y. 2026-27

• Summary of Credits and Total Marks for U.G. Programme :

SEM	Group -A		Group -B		Group- C		Group-D		Group-E		Group-F	
	Credits	Marks	Credits	Marks	Credits	Marks	Credits	Marks	Credits	Marks	Credits	Marks
I	21	700	21	700	20	675	21	675	21	700	21	700
II	21	700	21	700	22	725	21	725	21	700	21	700
Total	42	1400	42	1400	42	1400	42	1400	42	1400	42	1400

• Definition of Credit :

The Under Graduate (U.G.) and Post Graduate (P.G.) programmes will have credit system. The details of credit will be as follow

1 **Credit** = 1 hour/week for **lecture**
 = 2 hours/week for practical
 = 1 hour /week for tutorial

• Abbreviations : TH : Theory PR : Practical TU : Tutorial OR : Oral CCE : Continuous Comprehensive Evaluation TW: Term work

• Description of Groups:

Group A= Computer, IT, AI&DS, CSD
 Group B= E & TC
 Group C= Chemical, Civil
 Group D = Mechanical
 Group E = Electrical
 Group F =R & A

• Description of various Courses:

Type of Course	Description	Type of Course	Description
ESC	Engineering Science Courses	PCC	Program Core Course
BSC	Basic Science Courses	PEC	Program Elective Courses
CC	Co-curricular courses (Liberal learning courses)	OE	Open Elective Courses of other than particular program
CEP/FP	Community Engagement/ Field	VEC	Value Education Courses
OJT	On Job Training	ASM	Additional Specialized / MOOCs
MD M	Multidisciplinary Minor	HSSM	Humanities, Social Science and Management
AEC	Ability Enhancement Course	VSEC	Vocational and Skill Enhancement Course
RP	Research Project	RM	Research Methodology
AC	Audit Course		

Note : The Induction Program for First year students will be conducted for 2 weeks in First Semester and I week in Second Semester before commencement of teaching as per A.I.C.T.E. guidelines.

K. K. Wagh Institute of Engineering Education and Research, Nashik (Autonomous w. e. f. A.Y.2022-23)															
F.Y. B. Tech. Structure w. e. f. A.Y. 2026-27 for SEM-I (Group- B)															
Branch and Divisions: E&TC (Div.: F, G)															
Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	ISE	ESE	CCE	TU	*TW	TOT	TH	TU	*PR	TOT
2600101	BSC	Linear Algebra and Differential Calculus	3	1	0	20	60	20	25	0	125	3	1	0	4
2600104	BSC	Applied Physics (A)	3	0	2	20	60	20	0	50	150	3	0	1	4
2602101	ESC	Fundamentals of Electronics Engineering	3	0	2	20	60	20	0	50	150	3	0	1	4
2601103	ESC	Data structure in C	2	0	2	0	0	50	0	50	100	2	0	1	3
2600107	AEC	Communication Skills	1	0	2	0	0	25	0	50	75	1	0	1	2
2605106	VSEC	Additive manufacturing	1	0	2	0	0	25	0	25	50	1	0	1	2
2600108	CC	Sports, Yoga and Art	0	2	0	0	0	0	50	0	50	0	2	0	2
Total			13	3	10	60	180	160	75	225	700	13	3	5	21

Note

*Note: Credits are as per the Teaching Scheme. *Credits for 'PR' head are linked with 'TW' marks.

BOS Chairman

Director

K. K. Wagh Institute of Engineering Education and Research, Nashik (Autonomous w. e. f. A.Y.2022-23)															
F.Y. B. Tech. Structure w. e. f. A.Y. 2026-27 for (SEM-II) (Group-B)															
Branch and Divisions: E&TC (Div.: F, G)															
Course Code	Course Type	Title of Course	Teaching Scheme			Evaluation Scheme and Marks						Credits			
			TH	TU	PR	ISE	ESE	CCE	TU	*TW	TOT	TH	TU	*PR	TOT
2600102	BSC	Differential Equations and Integral Calculus	3	1	0	20	60	20	25	0	125	3	1	0	4
2600106	BSC	Applied Chemistry	3	0	2	20	60	20	0	50	150	3	0	1	4
2601102	ESC	AI Essentials	1	1	0	0	0	25	25	0	50	1	1	0	2
2608103	ESC	Object Oriented Programming using C++	2	0	2	20	30	0	0	50	100	2	0	1	3
2602102	PCC	Electrical Circuits and Machines	2	0	0	20	60	20	0	0	100	2	0	0	2
2600109	IKS	Indian Knowledge System	2	0	0	0	0	50	0	0	50	2	0	0	2
2602103	VSEC	PCB Making	1	0	2	0	0	25	0	25	50	1	0	1	2
2600110	CC	Engineering Exploration	0	2	0	0	0	0	75	0	75	0	2	0	2
Total			14	4	6	80	210	160	125	125	700	14	4	3	21
2600111	AC**	Innovation and Prototyping Lab	0	0	2	Mandatory non-credit course of 50 marks									

Note

* Credits are as per the Teaching Scheme. *Credits for 'PR' head are linked with 'TW' marks.

**Audit course for Innovation and prototyping Lab is a non-credit mandatory course. Performance of this course will be calculated similar to TW evaluation for the other courses. The AC grade will be awarded for successful completion and ACN grade will be awarded for unsatisfactory performance.

BOS Chairman

Director

F.Y. B. TECH. CURRICULUM (2026 PATTERN)

SEM-I

BRANCHES: E & TC (Group B)



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

F. Y. B. Tech. Pattern 2026 2600101: Linear Algebra and Differential Calculus (All branches)		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03hrs/week Tutorial: 01hr/week	03 01	Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20Marks EndSem Exam: 60Marks Tutorial / Term Work: 25Marks
Prerequisite Courses: - Knowledge of algebra, differential calculus, matrices, determinants, and basic probability.		
Course Objectives: To introduce the concepts of matrices, systems of linear equations, the Gauss–Seidel method, and linear and orthogonal transformations. To introduce the concepts of vector spaces, eigenvalues, and eigenvectors. To introduce the concepts of partial differentiation. To introduce the concepts of Jacobians, maxima and minima, errors, and approximations. To introduce the fundamental concepts of probability To introduce computational tools for solving mathematical problems.		
Course Outcomes: Upon completion of the course, students will be able to:		
	Course Outcomes	Bloom's Level
CO1	State the fundamental concepts of rank, vector spaces, linear transformations, Jacobians, quadratic forms, eigenvalues, probability, and the Gauss–Seidel method.	1-Remember
CO2	Explain the principles of rank, vector spaces, Jacobians, partial derivatives, quadratic forms, eigenvalues, probability, and the Gauss–Seidel method in mathematical problem-solving.	2-Understanding
CO3	Solve problems involving linear algebra, partial derivatives, and probability.	3- Apply
CO4	Apply linear algebra, differential calculus, and probability with computational tools in engineering problems.	3- Apply
CO5	Analyze quadratic forms, extreme values of the functions, errors, and approximations.	4 -Analyze

COURSE CONTENTS			
Unit I	Matrices and System of Linear Equations	07hrs	COs Mapped - CO1, CO2, CO3, CO4
Rank of a matrix, Systems of linear equations, Linear transformations, Orthogonal transformations, Gauss–Seidel method, and Applications to systems of linear equations.			
Unit II	Eigenvalues and Eigenvectors	08hrs	COs Mapped - CO1, CO2, CO3, CO4, CO5

Vector spaces and subspaces, Linear dependence and independence, Basis and dimension, Eigenvalues and eigenvectors, Diagonalization, Quadratic forms, Reduction of quadratic forms to canonical forms, and Applications of eigenvalues and eigenvectors.			
Unit III	Partial Differentiation	07hrs	COs Mapped - CO2, CO3, CO4
Functions of two or more variables, Partial differentiation, Euler's theorem on homogeneous functions, Partial differentiation of composite and implicit functions, and Total derivatives.			
Unit IV	Application of Partial Differentiation	07hrs	COs Mapped - CO1, CO2, CO3, CO4, CO5
Jacobians, Functional dependence and independence, Errors and approximations, Maxima and minima of functions of two variables, and Lagrange's method of undetermined multipliers.			
Unit V	Introduction to Probability and Counting	07hrs	COs Mapped - CO1, CO2, CO3, CO4
Interpretation of probability, Relative-frequency and classical definitions of probability, Sample spaces and events, Mutually exclusive events, Axioms of probability, Addition rule, Conditional probability, Multiplication rule, Independent events, and Bayes' theorem.			
Text Books			
1.B. S. Grewal, <i>Higher Engineering Mathematics</i> , Khanna Publishers, Delhi. 2024 2.B.V. Ramana, <i>Higher Engineering Mathematics</i> , Tata McGraw-Hill. 2017.			
Reference Books			
1. Erwin Kreyszig, <i>Advanced Engineering Mathematics</i> , Wiley Eastern Ltd. 2019 2. P. N. Wartikar and J. N. Wartikar, <i>Applied Mathematics</i> , Volumes I and II, Pune Vidyarthi Griha Prakashan, Pune. 2005.			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments I & II	5
2	Assignments III & V	5
3	Variable Time Fixed Result(VTFR) Test	5
4	Tests on each unit using LMS (Each test is for 15 M, and the total will be converted out of 5 M)	5
Guidelines for Tutorial / Term Work Assessment		
Sr. No.	Components for Tutorial / Term Work Assessment	Marks Allotted
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	10
3	Tutorial through peer assessment (Each tutorial carries 15 marks)	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, applications to systems of linear equations, and the Gauss–Seidel method.	CO1,CO2CO3, CO4
3	Examples on eigenvalues & eigenvectors, vector spaces and subspaces	CO1, CO2, CO3, CO4
4	Examples on the reduction of quadratic forms to canonical forms.	CO1, CO2, CO3, CO4,CO5
5	Solve matrix problems using computational software tools.	CO4
6	Solve systems of linear equations using computational software tools.	CO4
7	Examples on partial differentiation, Euler’s Theorem on homogeneous functions	CO2, CO3, CO4
8	Examples on partial differentiation of composite and implicit functions, total derivatives.	CO2, CO3, CO4
9	Examples on Jacobians, functional dependence & independence, errors and approximation	CO1, CO2, CO3, CO4,CO5
10	Examples on maxima and minima of functions of two variables, Lagrange’s method of undetermined multipliers.	CO1, CO2, CO3, CO4,CO5
11	Examples on fundamental concepts of probability.	CO1, CO2, CO3
12	Examples on conditional probability, Bayes’ Theorem.	CO1, CO2, CO3, CO4



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

F. Y. B. Tech. Pattern 2026 2600104: Applied Physics (A) (Computer, IT, E&TC, AI&DS, CSD, Electrical Engg., Robotics & Automation)		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 03 hrs/week Practical: 02 hrs/week	03 01	Continuous Comprehensive Evaluation: 20Marks In Sem Exam: 20Marks End Sem Exam: 60Marks Term work: 50Marks
Prerequisite Courses, if any: -		
Course Objectives: 1) Provide strong foundations in electromagnetism, quantum physics, wave optics, semiconductor physics and energy technologies for engineering applications. 2) Develop experimental and problem-solving abilities using scientific principles and modern laboratory practices. 3) Enable learners to apply modern physics concepts for sustainable, interdisciplinary and technology-driven engineering solutions.		
Course Outcomes: On completion of the course, students will be able to–		
	Course Outcomes	Bloom's Level
CO1	Describe fundamentals of electromagnetism, semiconductors, wave optics, quantum mechanics, and green energy.	1-Remembering
CO2	Classify advanced materials, optical systems, quantum phenomena, and renewable energy technologies.	2-Understanding
CO3	Explain characteristics of superconductors, Nano-materials, matter waves and optical crystals.	2-Understanding
CO4	Solve engineering problems using principles of electromagnetism, wave optics, semiconductors, wave mechanics and energy technologies.	3-Applying
CO5	Use modern physics and energy technologies in context of engineering applications.	3-Applying

COURSE CONTENTS			
Unit I	Electromagnetism & Electromagnetic Waves	(08hrs)	COs Mapped - CO1, CO4, CO5
Electromagnetism: Introduction: Magnetic effect of an electric current, cross and dot conventions, Ampere circuital law, nature of magnetic field of solenoid and toroid, concept of flux, flux density, permeability and field strength, their units and relationships. Introduction to magnetic circuit, comparison of electric and magnetic circuit, force on current carrying conductor placed in magnetic field, Fleming left hand rule. 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;			

Unit II	Quantum Mechanics & Quantum Computing	(07hrs)	COs Mapped - CO1, CO2, CO3, CO4, CO5
Basics of Quantum theory, De-Broglie hypothesis, properties of matter waves, group velocity, phase velocity, Heisenberg uncertainty principle, wave function and probability interpretation, postulates of quantum mechanics, Schrödinger wave equation time independent, particle in 1-D rigid box (Qualitative), tunneling effect (Qualitative), Stern-Gerlach Experiment, qubits-superposition of states, entanglement, bits and qubits, implementing a qubit: ion trap, linear optics, NMR and superconductors.			
Unit III	Wave Optics	(08hrs)	COs Mapped - CO1, CO2, CO3, CO4, CO5
Polarization – Introduction of polarization, law of Malus, double refraction, Huygens theory, retardation plates. Diffraction – Introduction of diffraction, types of diffraction, diffraction due to single slit and diffraction grating. Interference – Introduction, thin film interference, antireflection coating, Newton’s ring (Qualitative). Laser – Basic terms and properties, pumping schemes, applications of LASER (LiDAR). Optical Fiber – Introduction and working principles, acceptance angle - numerical aperture, fiber optics communication block diagram, types of fiber.			
Unit IV	Semiconductors, Superconductivity, Nano-Material	(06hrs)	COs Mapped - CO1, CO2, CO3, CO4, CO5
Semiconductors: Band theory of solids, effect of external parameters on solids, types of semiconductors, Fermi Dirac distribution function, position of Fermi level in intrinsic semiconductor, variation of Fermi level with respect to temperature and doping concentration in extrinsic semiconductors, conductivity of conductors and semiconductors, 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 area to volume ratio, properties: optical & electrical. Applications of semiconductors and nanomaterials in optoelectronic devices.			
Unit V	Energy Technologies	(07hrs)	COs Mapped - CO1, CO2, CO3, CO4, CO5
Solar Energy: Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, basic physics of solar cell, carrier transport, electron-hole pair generation & recombination in solar cell, semiconductor junctions: metal-semiconductor junction & p-n junction, essential characteristics of solar photovoltaic devices, evolving technologies in solar cells. Fluid and Wind Power: Wind energy, wind turbine dynamics (Qualitative), wind farms. Energy Storage Devices: Batteries, supercapacitors, battery vs supercapacitors, characterization of energy storage devices.			

Text Books
1. V K Mehta and Rohit Mehta, “Basic Electrical Engineering”, S Chand Publications, 6 th Edition, 2012. 2. M.N. Avadhanulu and P.G. Kshirsagar, “Engineering Physics”, S. Chand Publications, 11 th Edition, 2018. 3. Robert L. Jaffe and Washington Taylor, “The Physics of Energy”, Cambridge University Press, 1 st Edition, 2018.

Reference Books	
1.	H. D. Young and R. A. Freedman, “University Physics”, Pearson Publication, 15 th Edition, 2021.
2.	Resnick and Halliday, “Principles of Physics”, John Wiley and Sons, 12 th Edition, 2023.
3.	Jenkins and White, “Optics”, Tata McGraw Hill, 4 th Edition, 2017.
4.	Noson S. Yanofsky and Mirco A. Mannucci, “Quantum computing for computer scientists”, 1 st Edition, 2008.

Reference Research Articles	
1.	Quantum Mechanics & Quantum Computing: Roman Rietsche, Christian Dremel, Samuel Bosch, Léa Steinacker, Miriam Meckel & Jan-Marco Leimeister, Quantum Computing, Electronic Markets, (2022) 32, 2525-2536 https://link.springer.com/article/10.1007/S12525-022-00570-Y
2.	Wave optics: Natarajan Shanmugam, Rishi Pugazhendhi, Rajvikram Madurai Elavarasan, Pitchandi Kasiviswanathan and Narottam Das, Anti-Reflective Coating Materials: A Holistic Review from PV Perspective, Energies, (2020) 13, 10, en13102631 https://www.mdpi.com/1996-1073/13/10/2631
3.	Semiconductor: Avi Karsenty, A Comprehensive Review of Integrated Hall Effects in Macro-, Micro-, Nanoscales, and Quantum Devices, Sensors, (2020) 20(15), 4163 https://www.mdpi.com/1424-8220/20/15/4163
4.	Nanomaterials: Nadeem Baig, Irshad Kammakakam, Wail Falath, Nanomaterials: a review of synthesis methods, properties, recent progress, and challenges, Material Advances, (2021), 2 (6), 1821-1871. https://pubs.rsc.org/ma/article/2/6/1821/689725/Nanomaterials-a-review-of-synthesis-methods
5.	Energy Technologies: Henok Ayele Behabtu, Maarten Messagie, Thierry Coosemans, Maitane Berecibar, Kinde Anlay Fante, Abraham Alem Kebede, and Joeri Van Mierlo, A Review of Energy Storage Technologies’ Application Potentials in Renewable Energy Sources Grid Integration, Sustainability, (2020) 12 (24), 10511 https://www.mdpi.com/2071-1050/12/24/10511

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments on Unit-1, Unit-2, and Unit-3 & 4	05
2	Group Presentation	05
3	LMS Test on each Unit	05
4	Variable Time Fixed Result (VTFR) Test on Each Unit	05
	Total	20

List of Laboratory Experiments / Assignments		
Sr. No.	Laboratory Experiments / Assignments	CO Mapped
1	Introduction to Physics Lab instrument.	CO1
2	Computer-Based Graph Plotting and Data Analysis Using GeoGebra	CO1, CO4
3	Field Visit	CO1, CO5

4(A)	Activity Based Experiment	CO4, CO5
4(B)	Activity Based Experiment	CO4, CO5
5	To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).	CO2, CO4, CO5
6	To determine band gap of given semiconductor.	CO1, CO4
7	To determine Hall coefficient and charge carrier density.	CO1, CO4
8	Determination of refractive index using Brewster's law.	CO1, CO2, CO4
9	To determine position of diffraction minima by studying diffraction at a single slit.	CO1, CO4
10	Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of plano-convex lens).	CO1, CO4
11	Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).	CO2, CO3, CO4
12	To verify Law of Malus.	CO1, CO2, CO4
13	To determine unknown wavelength by using plane diffraction grating.	CO1, CO4
14	Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).	CO1, CO4, CO5
15	To study the quantum confinement effect in synthesis of silver nano-particles.	CO2, 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 equipment's 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 Term Work 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. (E&TC) Pattern 2026 Semester: I 2602101: Fundamentals of Electronics Engineering			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 3 Hrs/week Practical: 2 Hrs/week		3 1	Continuous Comprehensive Evaluation: 20 Marks In-Sem Exam: 20 Marks End-Sem Exam: 60 Marks Term Work: 50 Marks
Prerequisite Courses: Semiconductor Theory, Mathematics			
Course Objectives: • To study basic electronic components like PN junction diode, Zener diode, LED, Photodiode, BJT, E-MOSFET, OpAmp and IC555 along with their applications. • To understand different number systems, logic gates, Boolean algebra and basic digital circuits. • To develop understanding of the principles, characteristics, selection, and applications of various sensors and introduce the fundamentals of IoT architecture.			
Course Outcomes: On completion of the course, students will be able to			
CO No.	Course Outcome		Bloom's Level
CO1	Describe the working of semiconductor diodes, transistors, OpAmp and IC555.		L2 – Understand
CO2	Explain the basics of number systems, logic gates, Boolean algebra, sensors and IoT.		L2 – Understand
CO3	Apply the knowledge of semiconductor diodes, transistors, OpAmp and IC555 in the realization of electronic circuits.		L3 – Apply
CO4	Apply the knowledge of number systems, logic gates, Boolean algebra, sensors and IoT in the realization of electronic circuits.		L3 – Apply
CO5	Analyze the basic analog and digital application circuits.		L4 – Analyze
COURSE CONTENTS			
Unit I	Semiconductor Diodes	8 Hrs	COs Mapped- CO1, CO3, CO5
PN Junction Diode: Construction, Working and VI Characteristics Block diagram of regulated DC power supply 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	8 Hrs	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	8 Hrs	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 Timer IC 555: pin diagram, astable multi-vibrator			
Unit IV	Digital Electronics	8 Hrs	COs Mapped- CO2, CO4, CO5
Number Systems: Binary, Octal, Decimal, Hexadecimal and 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	Sensors and IoT Fundamentals	8 Hrs	COs Mapped- CO2, CO4, CO5
Introduction to sensors, Active / passive sensors, Analog / digital sensors, Sensor selection criteria, Temperature sensor: Thermocouple, Thermistor, RTD, IR sensor, Ultrasonic sensor, LDR, Load cell, Gas sensor, Introduction to IoT architecture			
Text Books			
1. "Electronics Devices" by Thomas. L. Floyd, 9 th Edition, Pearson 2. "Modern Digital Electronics" by R. P. Jain, 4 th Edition, Tata McGraw Hill 3. "Electronic Instrumentation" by H. S. Kalasi, 3 rd Edition, Tata McGraw Hill			
Reference Books			
1. "The Art of Electronics" by Paul Horowitz, 3 rd Edition, Cambridge University Press 2. "Sensors and Transducers" by D. Patrnabis, 2 nd Edition, PHI			

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Courses		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment (on Unit No. 1 and 2)	5 Marks
2	VTFR Test (on Unit No. 1 and 2)	5 Marks
3	Written Class Test (on Unit No. 3, 4 and 5)	5 Marks
4	LMS Tests	5 Marks

List of Laboratory Experiments		
Sr. No.	Experiment Title	COs Mapped
1	Study of A. Active and Passive Components B. Printed Circuit Board	CO1, CO2
2	Study of Electronic Instruments A. Digital Multimeter B. Digital Storage Oscilloscope C. Function Generator D. Regulated DC Power Supply	CO1, CO2
3	Study of Simulation Tools A. Multisim B. TinkerCAD Example 1: LED flashing Example 2: TMP36 Temperature Sensor with Arduino (Only for advanced learners)	CO3, CO4, CO5
4	Build and demonstrate an appropriate AC to DC converter for a mobile charger. How to rectify the fault, if the output of the circuit reduces to half of the required value?	CO3, CO5
5	Built and demonstrate a BJT based circuit to improve the strength of a weak analog signal.	CO3, CO5
6	A. Build and demonstrate a simple OpAmp based circuit that will amplify a low level analog signal. B. Build and demonstrate a simple circuit that will turn off a water pump automatically when the water tank is full. C. Design and simulate the simple PUC system which will show green light indication if all CO ₂ , SO ₂ and CO levels are less than threshold value otherwise it should show red light indication. (Only for advanced learners)	CO3, CO5
7	Build and demonstrate a simple circuit to control the flashing speed of LEDs used in decorative lighting system.	CO3, CO5
8	A. Build and demonstrate a binary addition circuit that will add two single bits with carry from previous position. B. Built and demonstrate a basic traffic signal controller using flip-flops and logic gates for sequential control of traffic lights.	CO4, CO5

9	Build and demonstrate basic charging circuit for battery of an electric vehicle.	CO3, CO5
10	Case study (any one of the following) A. Suggest a smart street lighting system. B. Suggest a smart home safety system. C. Suggest a smart greenhouse monitoring system. D. Suggest a smart air quality monitoring system. E. Suggest a smart biogas monitoring system. (Implementation is expected by only advanced learners.)	CO3, CO4, CO5
Guidelines for Laboratory Conduction		
- Experiments should be performed in a group of two students only. - Avoid contacting circuits with wet hands or wet materials. - Double check circuits for proper connections and polarity prior to applying the power. - Observe polarity when connecting polarized components or test equipment. - Make sure test instruments are set for proper function and range prior to taking a measurement.		
Guidelines for Student's Lab Journal		
- Attend all lab experiments regularly. - Complete each lab experiment as per schedule. - Get your lab journal checked regularly. - Do not copy the lab journal.		
Guidelines for Term Work Assessment		
- Each experiment will be assessed continuously for 30 marks based on following rubrics. ➤ R1: Timely completion (10 marks) ➤ R2: Understanding (10 marks) ➤ R3: Presentation / clarity of journal writing (10 marks) - Total marks of all experiments will be converted into 50 marks of term work.		



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

F. Y. B. Tech. (E&TC) Pattern 2026 Semester: I 2601103: Data Structures in C			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 2 Hrs/week Practical: 2 Hrs/week		2 1	Continuous Comprehensive Evaluation: 50 Marks Term Work: 50 Marks
Prerequisite Courses: -			
Course Objectives: - To get acquainted with the fundamental concepts of ‘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			
CO No.	Course Outcome		Bloom's Level
CO1	Explain the concepts of algorithms, flowcharts, and fundamentals of C programming for solving a given problem.		L2 – Understand
CO2	Solve a given problem using conditional and iterative algorithmic constructs.		L3 – Apply
CO3	Develop programs using arrays, functions and structures.		L3 – Apply
CO4	Apply various linear data structures and memory allocation strategies to solve computational problems.		L3 – Apply
CO5	Apply appropriate non-linear data structures, searching, and sorting algorithms to solve computational problems.		L3 – 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. Introduction to ‘C’ Programming: Identifiers, Data Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise), Expressions, Precedence and Associativity, Type conversions.			
Unit II	Conditional and Iterative Algorithmic Constructs	3 Hrs	COs Mapped- CO1,CO2

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 III	Arrays and Functions	4 Hrs	COs Mapped- CO1,CO2, CO3
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. Structures: Defining a structure, accessing members, structure initialization.			
Unit IV	Foundations & Linear Structures	5 Hrs	COs Mapped- CO1,CO4
The Data Hierarchy, Data Structures, Abstract Data Types, Classification of Data structures, Memory management: Static and Dynamic Memory Allocation, Linear Data Structures: Linked Lists, Stacks and Queues.			
Unit V	Non-Linear Structures & Algorithmic Techniques	6 Hrs	COs Mapped- CO1,CO2, CO5
Nonlinear Data Structures: Trees and Graphs, Searching Techniques: Linear search and Binary Search, Sorting Techniques: Bubble sort, Selection sort and Insertion sort. C programming for Searching and Sorting Techniques.			
Text Books			
1. “Let us C” by Yashwant Kanetkar Seventh Edition, BPB Publications, 2007			
2. “Programming in ANSI C” by E. Balagurusamy, Tata McGraw Hill, 2002			
Reference Books			
1. “The C Programming Language” by Brian W. Kernighan and Dennis M. Ritchie, Pearson Education, 1988			
2. “Computer Science: A Structured Programming Approach Using C” by B. A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.			

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Courses		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment (on Module 1)	10 Marks
2	Problem Solving Activity (on Module 2)	10 Marks
3	LMS Test (on Module 3)	10 Marks
4	Written Test (on Module 4)	10 Marks
5	Presentation (on Module 5)	10 Marks

List of Laboratory Experiments

Sr. No.	Experiment Title	COs 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
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
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: 1. Find length of a string 2. Copy a string 3. Concatenate the string 4. Compare two strings	CO1, CO2, CO3
5	Draw a flowchart/write an algorithm / a pseudo-code and write a C program using functions to perform the following operations: Addition of Two Matrices Multiplication of Two Matrices Transpose of a given matrix	CO1, CO2, CO3
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
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

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 write-up (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 2022-2023)

F. Y. B. Tech. Pattern 2026 2600107: Communication Skills		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory:01hr/week Practical: 02hrs/week	01 01	Continuous Comprehensive Evaluation: 25 Marks Term Work: 50 Marks
Course Objectives: - To highlight the need to improve soft skills among engineering students so as to become good professionals. - To facilitate a holistic development of students by enhancing soft skills. - To develop and nurture the soft skills of the students through individual and group activities. - 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

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	CO 1
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.	CO 1

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, 1. Requesting opportunity to present his/her product. 2. Complaining about a faulty product / service. 3. Apologizing on behalf of one's team for the error that occurred. 4. Providing explanation for a false accusation by a client. b. Abstract Writing - Class Assignment Teacher will choose newspaper articles / short stories and ask students to write an abstract.	CO 1
4	Speaking Skills / Oral Communication - Part A a. One minute Self Introduction - Class Assignment Explain how to introduce oneself in a professional manner and presenting oneself positively Name, Academic Profile, Achievements, Career Aspirations, Personal Information (hobbies, family, social). b. Presentations - Lab Experiment Every student will have to choose a topic of his/her choice and make a 5-minute presentation using audio-video aids / PPT. Every student will make two presentations on - one technical and other non-technical topic. Focus and evaluation of each presentation should be the depth of knowledge about the topic, originality of perspective on the topic, well-researched or not, verbal and non-verbal skills and ability to answer questions effectively. Plagiarism should be discredited and students should be instructed about it.	CO 2, CO 5
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 I observer only	CO 1, CO 2, CO3, CO5
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 1. Share various professional formats. 2. Focus on highlighting individual strengths. 3. Develop personalized professional goals / statement at the beginning of the resume.	CO4

	Text Books	
	1. 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	
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		

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments: 3 Written Assignments/AI assisted Picture Perception, Abstract Writing of 10 Marks each (Total 30 marks will be converted to 5 Marks)	5
2	LMS Tests on English Grammar Proficiency (Level 1) (5 Tests, each test carries 10 marks and total will be converted out of 5 marks)	5
3	LMS Tests on English Grammar Proficiency (Level 2) (5 Tests, each test carries 10 marks and total will be converted out of 5 marks)	5
4	Industry Exploration Activity (SWOC Analysis) (Total 10 marks converted to 5 marks)	5
5	Spoken Analysis Activity/ AI enabled Elevator Pitch (Self Introduction) (Total 10 marks converted to 5 marks)	5
Total		25

AI-Integrated Communication Skills Activities

Sr. No.	Activity
1	AI-Assisted Resume Building for First-Year Students
2	Picture Perception: My View vs AI's View
3	Abstract Writing with AI
4	AI Product Pitch: Solve an Everyday Problem
5	AI Elevator Pitch
6	AI Debate Partner
7	AI Email & Professional Communication Simulator
8	AI Explain-It-Simply Challenge



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

F. Y. B. Tech. (E&TC)			
Pattern 2026 Semester: I			
2605106: Additive Manufacturing			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 1 Hr/week		1	Continuous Comprehensive Evaluation: 25 Marks Term Work: 25 Marks
Practical: 2 Hrs/week		1	
Prerequisite Courses:			
- Basic knowledge of Engineering Graphics and Geometry - Fundamental computer skills			
Course Objectives:			
- Understand the fundamentals of engineering drawing and apply geometrical construction techniques for technical communication. - Develop 2D engineering drawings using CAD software by utilizing essential drawing, editing, dimension, and layering commands. - Create basic 3D solid models of engineering components using sketch-based modeling features and visualize them through appropriate views. - Understand the principles, workflow, and applications of additive manufacturing (3D printing), including the complete process from CAD model preparation to printed prototype. - Explore different additive manufacturing technologies and their industrial applications, while recognizing the role of AI and Industry 4.0 in enhancing smart manufacturing and print quality.			
Course Outcomes: On completion of the course, students will be able to			
CO No.	Course Outcome	Bloom's Level	
CO1	Explain and apply engineering drawing principles to construct basic geometrical figures and curves.	L2 – Understand, L3 – Apply	
CO2	Apply 2D CAD tools to create and modify engineering drawings.	L3 – Apply	
CO3	Analyze 3D CAD models using basic modelling features.	L4 – Analyze	
CO4	Analyze and demonstrate the CAD-to-AM workflow involving STL conversion, slicing and layer-by-layer fabrication of engineering components.	L4 – Analyze	
CO5	Analyze and select suitable additive manufacturing technologies and processes for producing engineering and electronic components based on given requirements.	L4 – Analyze	
COURSE CONTENTS			
Unit I	Fundamentals of Engineering Drawing	2 Hrs	COs Mapped- CO1

• Introduction to engineering drawing instruments and sheet layout • Construction of basic geometrical figures: lines, triangles, polygons, circles, parallelogram • Construction of regular polygons (up to 8 sides) • Types of lines and their applications • Introduction to simple curves: ellipse, parabola, cycloid			
Unit II	2D CAD Drafting	2 Hrs	COs Mapped- CO2
• Introduction to CAD interface and tools • Creation of 2D geometrical figures using CAD commands • Editing using modify commands: move, copy, rotate, scale • Development of simple 2D component drawings			
Unit III	3D CAD Modeling	3 Hrs	COs Mapped- CO3
• Introduction to 3D modeling concepts (sketch-based) • Creation of 3D models using extrude and revolve features • Visualization of isometric views • Modeling of simple components (brackets, supports, enclosures) • Basic concept of sectional and hollow views			
Unit IV	Fundamentals of Additive Manufacturing	3 Hrs	COs Mapped- CO4
• Definition and basic concept of additive manufacturing • Comparison with traditional manufacturing methods • Layer-by-layer fabrication principle • Components of 3D printer • Workflow: CAD → STL → slicing → printing • Introduction to Slicing Software (any one) • Applications in electronics (enclosures, PCB holders, prototyping)			
Unit V	Additive Manufacturing Technologies	2 Hrs	COs Mapped- CO5
• Overview of AM technologies, Classification • Introduction to AM machines and working environment • FDM – Construction and working • CAD to AM integration • Applications in electronics and industry			
Text Books			
1. N. D. Bhatt and V. M. Panchal, “Engineering Drawing” – Charotar Publishing House. 2. M. B. Shah and B. C. Rana, “Engineering Drawing and Computer Graphics” – Pearson Education. 3. Ian Gibson, David Rosen, and Brent Stucker, “Additive Manufacturing Technologies: 3D Printing,			

Rapid Prototyping, and Direct Digital Manufacturing” – Springer.

Reference Books

1. P. N. Rao, “CAD/CAM: Principles and Applications” – McGraw Hill.
2. A. K. Chitale and R. C. Gupta, “Product Design and Manufacturing” – PHI Learning.
3. J. M. Hollister, R. D. Madhavan, and others, “Introduction to 3D Printing and Additive Manufacturing” – CRC Press.

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Courses

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment 1	5 Marks
2	Assignment 2	5 Marks
3	Assignment 3	5 Marks
4	Test 1	5 Marks
5	Test 2	5 Marks

List of Laboratory Experiments

Sr. No.	Experiment Title	COs Mapped
1	Two Problems - 1) Construction of Ellipse, Parabola, Hyperbola (Any One) 2) Construction of Cycloid, Involute, Helix, Spiral (Any One)	CO1
2	Orthographic Projection of given objects including sectional view. (Two Problems)	CO1
3	Isometric view / projection for the given set of two-dimensional views. (Two Problems)	CO2
4	Orthographic or Isometric Projection (One Problem) of given object using any drafting software	CO2
5	Part Modelling of Pyramid / Prism using any Modelling Software	CO3
6	Create Gcode File / STL File of Part Modelling Object using any Slicing Software	CO5

Guidelines for Laboratory Conduction

- Students must attend the laboratory in proper uniform and carry the laboratory manual, drawing sheets (if required), and a notebook.
- Students should report to the laboratory on time and occupy the assigned workstation.

- Understand the CAD software interface and the experiment requirements.
- Follow the standard operating procedure (SOP) while using CAD software and 3D printers.
- Maintain cleanliness around the printer and dispose of waste filament properly.

Guidelines for Student's Lab Journal

- Use the prescribed laboratory journal or notebook as instructed by the department.
- Maintain proper margins and page numbering.
- Complete the journal immediately after performing each experiment.
- Label all figures, sketches, and screenshots properly.

Guidelines for Term Work Assessment

- Each experiment will be assessed continuously for 30 marks based on following rubrics.
 - R1: Timely completion (10 marks)
 - R2: Understanding (10 marks)
 - R3: Presentation / clarity of journal writing (10 marks)
- Total marks of all experiments will be converted into 25 marks of term work.



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

F. Y. B. Tech. Pattern 2026 2600108: Sports, Yoga and Art (All branches)		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Tutorial: 02hrs/week	02	Term work: 50 Marks.
Course Objectives: This course promotes holistic development through Sports, Yoga, Wellness, and Warli Art Practices. Students will learn techniques for physical fitness, mental well-being, creativity, cultural awareness, teamwork, and sustainable living.		
Course Outcomes: Upon completion of the course, students will be able to:		
CO	Course Outcomes	Bloom's Level
CO1	Explain the significance of Sports Yoga and relate them to individual well-being.	2- Understand
CO2	Interpret cultural, environmental, and entrepreneurial aspects of Warli Art.	2-Understand
CO3	Demonstrate basic Yoga practices for physical and mental wellness and reflect their impact on lifestyle.	3-Apply
CO4	Create Warli artwork using traditional symbols and design techniques.	3-Apply
CO5	Present insights from book review, art appreciation and rural/social awareness activities	3- Apply

COURSE CONTENTS			
Unit I	Foundations and Fundamentals of Sports and Yoga	04 hrs	CO1
- History and evolution of Sports and Yoga - Importance of physical fitness and wellness - Fundamental principles and objectives of Yoga - Sports as a tool for personality development and social harmony - Physical, mental, emotional, and spiritual benefits of Sports and Yoga - Role of Sports and Yoga in enhancing quality of life and well-being. Concept of holistic health and wellness - Yogic lifestyle and daily routine (Dinacharya) - Introduction to Ashtanga Yoga - Yoga for stress management and emotional balance - Yoga and mental health - Role of Yoga in preventive healthcare			
Unit II	Practical Yoga Applications	14 hrs	CO3
- Safety guidelines and precautions in Yoga practice - Basic standing, sitting, supine, and relaxation asanas - Introduction to Surya Namaskar - Pranayama practices: Anulom-Vilom, Bhramari, Kapalabhati (basic level) - Cleansing techniques (Kriyas): , Kapalabhati, Trataka (demonstration/awareness) - Meditation and mindfulness practices - Reflective journaling on lifestyle changes through Yoga			

Unit III	Introduction to Warli Art, Sustainability and Entrepreneurship	04 hrs	CO2,CO4
- History and cultural heritage of Warli Art - Traditional Warli lifestyle and artistic expression - Common symbols, motifs, and storytelling elements - Environmental and ecological messages in Warli paintings - Warli Art as a medium for sustainability awareness - Entrepreneurship opportunities through indigenous art forms - Contemporary applications of Warli Art in design and products			
Unit IV	Warli Art Practice and Creative Expression	04 hrs	CO4
- Basic geometric shapes in Warli Art: circle, triangle, square - Drawing human figures, animals, trees, and village scenes - Composition and layout techniques - Traditional and contemporary Warli painting methods - Designing thematic Warli artwork on social and environmental issues - Creation of individual/group Warli Art project			
Unit V	Book review, Art appreciation and social awareness	04hrs	CO2,CO4, CO5
- Select a book you like (non-technical) - Read book at home - Share it into class for 5min - Art awareness and physical awareness - Rural problem identification			

Guidelines for Term Work Assessment		
Sr. No.	Assignment Components	Marks Allotted
1	Yoga Attendance & Wellness Logbook with daily practice record	10
2	Yogasana Practical performance	10
3	Pranayama and relaxation practice reflection	10
4	Warli & Creative Artwork	10
5	Group Project on Rural/Social Awareness through Sports, Yoga or Warli Art	10

F.Y. B. TECH. CURRICULUM (2026 PATTERN)

SEM-II

BRANCHES: E & TC (Group B)



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

F. Y. B. Tech. Pattern 2026 2600102: Differential Equations and Integral Calculus (E&TC, CHEM, CIVIL, MECH, ELECT, R&A)		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory : 03hrs/week Tutorial: 01hr/week	03 01	Continuous Comprehensive Evaluation: 20 Marks InSem Exam: 20Marks EndSem Exam: 60Marks Tutorial / Term Work: 25Marks

Prerequisite Courses: Fundamental knowledge of Algebra, Trigonometry, Coordinate Geometry, Differential and Integral Calculus.

Course Objectives:

- To introduce concepts of first order, first degree differential equations.
- To model physical and engineering systems involving orthogonal trajectories, Newton's law of cooling, electrical circuits, rectilinear motion, heat transfer, and growth and decay.
- To introduce interpolation techniques and numerical methods for solving differential equations and evaluating definite integrals.
- To introduce the concepts of double and triple integrals and their applications.
- To introduce computational tools for solving mathematical problems.

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

	Course Outcomes	Bloom's Level
CO1	State the fundamental concepts of differential equations, finite differences, numerical methods, and multiple integrals.	1-Remember
CO2	Explain the principles of differential equations, finite differences, numerical methods, and multiple integrals.	2-Understanding
CO3	Solve problems involving differential equations, numerical methods, and multiple integrals using appropriate analytical and numerical techniques.	3- Apply
CO4	Apply numerical methods, differential calculus, multivariable calculus and computational tools in mathematical, and engineering applications.	3- Apply
CO5	Analyze solutions of differential equations and numerical techniques used in mathematical and engineering problems.	4- Analyze

COURSE CONTENTS			
Unit I	Differential Equations	8hrs	Cos Mapped- CO1,CO2, CO3, CO4
Formation of differential equations, Exact differential equations, Differential equations reducible to exact form, Linear differential equations, and Differential equations reducible to linear form.			

Unit II	Applications of Differential Equations	7hrs	Cos Mapped- CO1,CO2, CO3, CO4,CO5
Applications of differential equations to Orthogonal trajectories, Newton's law of cooling, Kirchhoff's laws of electrical circuits, Motion under gravity, Rectilinear motion, Heat flow, and Growth and decay models.			
Unit III	Finite differences and Interpolation	7hrs	Cos Mapped- CO1,CO2, CO3, CO4
Finite differences, Differences of polynomials, Relations between finite difference operators, Newton's forward interpolation formula, Newton's backward interpolation formula, Stirling's interpolation formula, Lagrange's interpolation formula, Newton's divided difference interpolation formula, and Inverse interpolation.			
Unit IV	Numerical Methods for Differential Equations and Integration	7hrs	Cos Mapped- CO1,CO2, CO3, CO4,CO5
Numerical solution of ordinary differential equations: Euler's method, Modified Euler's method, Fourth-order Runge-Kutta method, and Predictor-Corrector method; Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule.			
Unit V	Multiple Integrals and their Applications	7hrs	Cos Mapped- CO1,CO2, CO3, CO4
Double and triple integrals, Applications to area, volume, mean value, root mean square value, and center of gravity.			
Text Books			
1. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, <i>Numerical Methods for Scientific and Engineering Computation</i> , New Age International Publishers, New Delhi. 2022. 2. B. S. Grewal, <i>Higher Engineering Mathematics</i> , Khanna Publishers, New Delhi. 2024.			
Reference Books			
1. Erwin Kreyszig, <i>Advanced Engineering Mathematics</i> , Wiley Eastern Ltd. 2019. 2. P. N. Wartikar and J. N. Wartikar, <i>Applied Mathematics</i> , Volumes I and II, Pune Vidyarthi Griha Prakashan, Pune. 2005			

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments I & II	5
2	Assignments III & V	5
3	Variable Time Fixed Result(VTFR) Test	5
4	Tests on each unit using LMS (Each test for 15 M and total will be converted out of 5M)	5

Guidelines for Tutorial / Term Work Assessment		
Sr. No.	Components for Tutorial / Term Work Assessment	Marks Allotted
1	Assignment on computational software	5
2	Tutorial (Each tutorial carries 15 marks)	10
3	Tutorial through peer assessment (Each tutorial carries 15 marks)	10
List of Tutorial Assignments		
Sr. No.	Title	CO Mapped
1	Examples on the formation of differential equations and exact differential equations.	CO1, CO2, CO3
2	Examples on linear differential equations and differential equations reducible to linear form.	CO1, CO2, CO3
3	Examples on applications of differential equations to orthogonal trajectories and Newton's law of cooling.	CO1, CO2, CO3, CO4, CO5
4	Examples on electrical circuits, motion under gravity, rectilinear motion, heat flow, growth and decay model	CO1, CO2, CO3, CO4, CO5
5	Examples on Newton's interpolation formula, Lagrange's Interpolation formula.	CO1, CO2, CO3, CO4
6	Examples on Newton's interpolation formula, Lagrange's & Stirling's Interpolation formula.	CO1, CO2, CO3, CO4
7	Numerical solution of ordinary differential equations using Euler's and modified Euler's methods.	CO1, CO2, CO3, CO4
8	Numerical solution of ordinary differential equations using the Runge-Kutta and predictor-corrector methods.	CO1, CO2, CO3, CO4
9	Solve differential equations using computational software tools.	CO4
10	Evaluate definite integrals using computational software tools.	CO4
11	Examples on double and triple integrations.	CO1, CO2, CO3, CO4,
12	Examples on applications of double and triple integration.	CO1, CO2, CO3, CO4,



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

F. Y. B. Tech. Pattern 2026 Semester: I/II 2600106-Applied Chemistry		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Theory: 03hrs/week Practical : 02hrs/week	03 01	Continuous Assessment: 20Marks InSem Exam: 20Marks EndSem Exam: 60Marks TermWork: 50Marks

Prerequisites for the course:

HSC Science concept: Basic Electrochemistry, Types of titrations, volumetric analysis, structure property relationship, types of crystals, periodic table, classification and properties of polymers, electromagnetic radiation, galvanic series.

Course Outcomes (COs)

	Course Outcomes	Bloom's Level
On completion of the course, students will be able to–		
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	Analyze 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 Content:

Unit-I	Cells, Batteries and Electro analytical Techniques	8 hr.	COs mapped- CO1, CO4
Introduction: Dry cell, Lithium ion battery. Reference electrode (Calomel electrode), Definition and examples of ISE, 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, Numerical based on Absorption laws, that is Molar absorptivity and concentration.			

Unit-II	Fuels	8 hr.	COs mapped-CO1, CO4, CO5
Fuels: 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 CNG, Hydrogen gas as a fuel. Alternative fuels: Power Alcohol, Biodiesel, Knocking in engines, Octane number and Cetane number. Fuel cell H₂O₂.			
Unit- III	Analytical Aspects of Fluids	8 hr.	COs mapped- CO1, CO2, CO3, CO4, CO5
Liquid Fluid- Water and Oil, Smart fluids, Water: hardness of water: Types, Determination of hardness by EDTA method, Chloride content in water by Mohr's method, Numerical. Ill effects of hard water: Sludge and Scale, External Treatment of water ii) Demineralization method. Purification of water: Reverse osmosis. Oil: Aniline point, Flash Point, Fire point, Smart Fluids: definition, types (MR fluid and ER fluid) and its applications, Gaseous fluids: Gas Sensors, Different types of Sensors, Types of Gas sensors.			
Unit- IV	Advanced Engineering Materials	8 hr.	COs mapped- CO1, CO2
Metallurgy Extraction Methods-Concentration of ore by froth floatation and magnetic separation, Ores and Minerals, Alloys- classification. Composition, brass, Bronze, Gun Metal woods metal, Preparation of alloys by fusion and powder method. Introduction of polymer: Terms- Specialty polymers: Introduction, structure, properties and applications of the polymers: Introduction, polymer, monomer, polymerization, DP and functionality of monomer. 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-V	Corrosion Science	8 hr	COs mapped- CO3, CO5
Introduction, Types of corrosion – Dry corrosion, its mechanism, nature of oxide films and Pilling-Bedworth's rule, Wet Corrosion, Condition of wet corrosion in daily life, hydrogen evolution and oxygen absorption, Factors influencing rate of corrosion. Numerical on rate of corrosion. Methods of corrosion control: cathodic protection, Metallic coatings and its types, Electroplating, Electroless plating, 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. 3. Dr. Sunita Rattan, "Theory and Practical of Engineering Chemistry", S.K. Kataria & Sons publisher			

Reference Books	
1. “Principles of Physical Chemistry”, By Puri Sharma Pathania, Vishal publications. 2. Wiley Editorial, “Engineering Chemistry”, Wiley India Pvt. Ltd 3. Shriver and Atkins, “Inorganic Chemistry”, 5th ed, Oxford University Press, 4. S. M. Khopkar, “Basic Concept of Analytical Chemistry”, 2ed, New Age-International Publisher 5. Polymer Science by V.R. Gowarikar, N.V.Vishvanathan, JaydevShreedhar New Age International Ltd. Publisher 1996. (Reprint 2012). 6. Polymer Chemistry by Charles E. Carraher (Jr.), 6th Edn, (First Indian Print 2005), New York- Basel. 7. “The Chemistry of Nanomaterials”, C. N. R. Rao, A. Muller, A. K. Cheetham (Eds.) WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2004.	
Research papers	
1. Nguyen, T. H., Fraiwan, A. and Choi, S. (2014). Paper-based batteries: A review. Biosensors and Bioelectronics, 54, 640–649. https://doi.org/10.1016/j.bios.2013.11.007 2. Kuperkar, K., Atanase, L. I., Bahadur, A., Crivei, I. C. and Bahadur, P. (2024). Degradable polymeric bio(nano)materials and their biomedical applications: A comprehensive overview and recent updates. Polymers, 16, 206. https://doi.org/10.3390/polym16020206 3. Stanchev, P. and Hinov, N. (2025). Comparative techno-economic and life cycle assessment of stationary energy storage systems: Lithium-ion, lead-acid, and hydrogen. Batteries, 11, 382. https://doi.org/10.3390/batteries11100382 4. Zhou, X.-Q., Hayat, Z., Zhang, D.-D., Li, M.-Y., Hu, S., Wu, Q., Cao, Y.-F., and Yuan, Y. (2023). Zinc oxide nanoparticles: Synthesis, characterization, modification, and applications in food and agriculture. Processes, 11, 1193. https://doi.org/10.3390/pr11041193 5. Maheshwari, K., Sharma, S., Sharma, A., and Verma, S. (2018). Fuel cell and its applications: A review. International Journal of Engineering Research & Technology (IJERT), 7(6). http://www.ijert.org 6. Ingin, Y. P., Mahringer, D., and El-Athman, F. (2024). Hardness properties of calcium and magnesium ions in drinking water. Applied Food Research, 4, 100600.	

Guidelines for Continuous Assessment of Theory Course		
Sr. No.	Components for Continuous Assessment	Marks Allotted
1	Assignment on Unit 1	05
2	Variable time fixed result test on Unit 2	05
3	Group presentations on Unit 3/4/5	05
4	LMS test on each unit	05

List of Laboratory Experiments		
Sr. No.	Laboratory Experiments	COs Mapped
1	Introduction to Applied Chemistry laboratory and safety guidelines	CO1
2	Construct the Daniel cell and find its potential	CO1
3	To determine concentration of strong acid using pH meter.	CO2

4	To determine maximum wavelength of absorption and find unknown concentration of given sample by colorimeter.	CO4
5	Proximate analysis of coal.	CO5
6	Preparation of biodiesel from oil.	CO1
7	To determine hardness of water by EDTA method	CO4
8	Estimation of chloride content by Mohr's method	CO4
9	Preparation of nanomaterials.	CO1
10	Estimation of Cu from given brass alloy	CO4
11	To determine alkalinity of water	CO5
12	Conductometric titration of Strong Acid versus Strong Base	CO2
13	ECE - To coat copper and zinc on iron plate using electroplating.	CO3
14	Determine the calorific value of given solid fuel by using Bomb Calorimeter	CO2

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 2026 2601102: AI Essentials (ESC)			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 01hr/week Tutorial: 01hr/week		01 01	CCE: 25 Marks Tutorial: 25 Marks
Prerequisite Courses, if any: - Basic Programming Skills			
Course Objectives: - Understand the fundamentals of Artificial Intelligence and appreciate its significance, opportunities, and applications across diverse engineering disciplines. - Develop an AI-based problem-solving approach by understanding the role of data, AI tools, and engineering workflows in addressing real-world problems. - Acquire practical experience in using modern AI tools to explore, analyze, and generate solutions for simple engineering problems through guided activities and mini-projects. - Develop awareness of ethical, legal, and societal aspects of AI, promoting responsible, safe, and professional use of AI technologies			
Course Outcomes: On completion of the course, students will be able to–			
CO	Course Outcomes		Bloom's Level
CO1	Identify engineering problems, identify relevant data, and use appropriate AI tools to generate possible solutions.		1- Knowledge
CO2	Explain the fundamental concepts of Artificial Intelligence and identify its applications in various engineering domains.		2- Understand
CO3	Review AI-generated outputs with respect to correctness, reliability, ethics, privacy, and responsible use.		2- Understand
CO4	Demonstrate an AI-enabled solution for an engineering problem by integrating problem identification, data, AI tools, and effective communication.		3- Application
COURSE CONTENTS			
Unit I	Basic AI Concepts	(5 hrs)	COs Mapped – CO1 & CO2
Evolution of Artificial Intelligence, What is Artificial Intelligence? AI vs Conventional Programming, AI vs Machine Learning vs Deep Learning (conceptual comparison), Components of an AI system - Problem, Data, Model & Decision, AI in everyday life - Search engines, Navigation systems, Recommendation systems, Voice assistants, Autonomous systems and others.			
Unit II	Data as the Core of AI	(6 hrs)	COs Mapped – CO1 & CO2
Why Data is the Fuel of AI, What is Data?, Types of Data, Data Collection Methods, Characteristics of Good Data, Problems with Data, Engineering Data Across Disciplines - Examples: Mechanical - Temperature, Vibration, Speed Civil - Traffic density, Bridge images, Survey data, Computer/IT - User logs, Text, Images			
Unit III	AI Tools for Engineers	(5 hrs)	COs Mapped – CO1, CO2 & CO4
The Engineering AI Workflow - Problem Identification, Data Collection, AI-based Analysis,			

Decision Making, Validation, Presentation of Results Selecting the appropriate AI Tool such as ChatGPT, Gemini, Claude, Co-pilot, Notebooklm Prompt Engineering - Characteristics of Good Prompts, Types of Prompts, Verifying and Improving AI Outputs			
Unit IV	Case Studies for AI in Multidisciplinary Engineering Domains	(6 hrs)	COs Mapped –CO4
AI as an Engineering Problem-Solving Tool - Characteristics of engineering problems, Which engineering problems are suitable for AI?, The Engineering AI Workflow, Introduction to problem identification and design thinking, Engineering case studies from different disciplines - Attendance analysis, Smart timetable, Energy consumption, Parking prediction, Crop recommendation, Chatbot, Resume analyzer, Traffic study, Water consumption analysis, Waste segregation			
Unit V	Ethics, IPR, and Responsible AI	(4 hrs)	COs Mapped – CO3
Ethical Use of AI, Bias and Fairness, Privacy and Data Protection, Intellectual Property, Academic Integrity, Human Accountability			
Text Books			
Text Books: AI For Engineers, Mayur Patel, Megha Patel, Pooja Patel, Nilam Patel, Kajal Modi, Heena Patel, Aqua Publication, 2026, ISBN13 9789347184161			

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Course		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	LMS Test 1	5 Marks
2	LMS Test 2	5 Marks
3	Group Presentation on Case Studies for AI in Multidisciplinary Engineering Domains: Case studies report	5 Marks
4	Group Presentation on Case Studies for AI in Multidisciplinary Engineering Domains : Content & Presentation	5 Marks
5	Group Presentation on Case Studies for AI in Multidisciplinary Engineering Domains: Teamwork & Management	5 Marks

Guidelines for Tutorial of Theory Course		
Sr. No.	Components for Tutorial	Marks Allotted
1	Two Assignments	15 Marks
2	Exploration of AI tools	10 Marks

F. Y. B. Tech. (E&TC)			
Pattern 2026 Semester: II			
2608103: Object Oriented Programming using C++			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 2 Hrs/week		2	In-Sem Exam: 20 Marks
Practical: 2 Hrs/week		1	End-Sem Exam: 30 Marks
			Term Work: 50 Marks
Prerequisite Courses: Data Structure in C			
Course Objectives:			
- To study the fundamentals of Object-Oriented Programming - To Understand and implement inheritance in C++ to establish class hierarchies and achieve code reusability using different types of inheritance. - Understand and apply polymorphism using function overloading, operator overloading, virtual functions, pointers, and abstract classes to develop flexible and reusable programs. - Apply generic programming and exception handling using function templates, class templates, and try-catch-throw mechanisms to develop robust and reusable C++ programs. - Understand and implement file handling techniques in C++ using streams			
Course Outcomes: On completion of the course, students will be able to			
CO No.	Course Outcome		Bloom's Level
CO1	Explain the concepts of Object-Oriented Programming and their application in solving computing problems using C++.		L2 – Understand
CO2	Use the concept of inheritance for reusability of class.		L3 – Apply
CO3	Apply polymorphism to solve problems.		L3 – Apply
CO4	Use template and exception handling to solve problems.		L3 – Apply
CO5	Develop programs using the concepts of files.		L3 – Apply
COURSE CONTENTS			
Unit I	Fundamentals of Object Oriented Programming	5 Hrs	COs Mapped- CO1
Introduction & Need of OOP, Fundamentals: objects, classes, characteristics of OOP, Benefits of OOP, C++ as object oriented programming language.			
Abstraction mechanism: Classes, objects, access specifiers (private, public, protected), constructors, destructors, member data, member functions, Static members: variable and functions, inline function, friend function.			
Self Study : C++ as extension of C - Comments, Global scoping operator			
Unit II	Inheritance	5 Hrs	COs Mapped- CO2
Inheritance: Class hierarchy, derived classes, types of inheritance , constructor and destructor execution in inheritance, base initialization using derived class constructors, Ambiguity in Multiple Inheritance,, Virtual Base Class, Abstract class, Friend Class, Nested Class			
Self Study : Class hierarchy with "IS - A" and "Has-a" relationships			

Unit III	Polymorphism	5 Hrs	COs Mapped- CO3
Introduction to Pointers: Introduction (Basic Concepts) Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Operator Overloading-Overloading Unary, Binary Operators. Dynamic (Run Time) Polymorphism- Pointers to Base class, virtual function and its significance in C++, pure virtual function, abstract base class			
Unit IV	Generic Programming and Exception handling	6 Hrs	COs Mapped- CO4
Templates- The Power of Templates, Function template, overloading Function templates, and class template, Generic Functions. Exception handling: Fundamentals of error handling, try, catch, throw, Simple exception handling examples. Self study : STL vector, list			
Unit V	File handling	6 Hrs	COs Mapped- CO5
Data hierarchy, Stream and files, Stream Classes, Disk File I/O with Streams, File Pointers, File I/O with Member Functions. Self Study : Formatted I/O, command line arguments			
Text Books			
1. “C++ How to Program” by Deitel, 4th Edition, Pearson Education 2. “Object-Oriented Programming in C++” by Robert Lafore, 4 th edition, Sams Publishing			
Reference Books			
1. “C++-The complete reference” by Paul Horowitz, 3 rd Edition, Cambridge University Press 2. “Sensors and Transducers” by Herbert Schildt, McGraw Hill Professional, 2011			

List of Laboratory Experiments		
Sr. No.	Experiment Title	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	CO1
2	Write a C++ Program to Create class DM which stores the value of distances in meters and centimeters. Read values for the class objects and add one object of DM with another object and find greater distance from two objects. Use a friend function to carry out the addition operation. The display should be in the format of meters and centimeters.	CO1

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

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

Guidelines for Term Work Assessment

- Each experiment will be assessed continuously for 30 marks based on following rubrics.
 - R1: Timely completion (10 marks)
 - R2: Understanding (10 marks)
 - R3: Presentation / clarity of journal writing (10 marks)
- Total marks of all experiments will be converted into 50 marks of term work.



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

F. Y. B. Tech. (E&TC) Pattern 2026 Semester: II 2602102: Electrical Circuits and Machines			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 2 Hrs/week Practical: --		2	Continuous Comprehensive Evaluation: 20 Marks In-Sem Exam: 20 Marks End-Sem Exam: 60 Marks
Prerequisite Courses: Physics, Mathematics			
Course Objectives: 1. To teach systematic DC circuit analysis techniques and network theorems for solving complex electrical circuits. 2. To introduce phasor based AC circuit analysis, power calculations, and resonance concepts in single-phase networks. 3. To explain the modeling, parameter evaluation, and conversion techniques for two-port networks. 4. To cover the construction, operating principles, and practical applications of various electrical motors.			
Course Outcomes: On completion of the course, students will be able to			
CO No.	Course Outcome		Bloom's Level
CO1	Explain the fundamental concepts and characteristics of DC and AC circuits, two-port networks, and electrical motors.		L2 – Understand
CO2	Apply circuit analysis techniques, network theorems and concepts of phasor diagrams, power relations and resonance concepts to solve electrical circuit problems.		L3 – Apply
CO3	Apply motor characteristics and speed-control methods of DC, PMDC, and single-phase induction motors to select appropriate motors for specific applications.		L3 – Apply
COURSE CONTENTS			
Unit I	DC Circuits	8 Hrs	COs Mapped- CO1, CO2
DC Circuits: Types of Networks, Source transformation, Star-Delta transformation, Formation of matrix equation, Mesh current method, Nodal voltage method Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem			

Unit II	AC Circuits	8 Hrs	COs Mapped- CO1,CO2
Average value and RMS value, Form factor, Phasor representation, Power calculations: -Real power, Reactive power, Apparent power, Power factor Single Phase AC Circuits: Pure R circuit, Pure L circuit, Pure C circuit, Series RL circuit, Series RC circuit, Series RLC circuit, Parallel AC Circuits, Series resonance, Parallel resonance			
Unit III	Linear Two-Port Network Parameters	8 Hrs	COs Mapped- CO1,CO2
Two-port networks introduction, Parameters: Impedance (Z parameters), Admittance (Y parameters), Transmission (ABCD parameters), Hybrid parameters (h parameters), Image parameters, Short circuit admittance parameters, Open circuit impedance parameters, Applications of two-port networks			
Unit IV	Introduction to Motor Operation and Applications	8 Hrs	COs Mapped- CO1,CO3
DC Motors: Basic construction, Working principle, Types: Shunt motor, Series motor, Compound motor, Torque-speed relations, Voltage-speed relations, Characteristics of DC motors, Basic speed control methods PMDC Motors: Construction, Working principle, Applications Single Phase Induction Motors: Construction, Working principle, Types: Split phase motor, Capacitor start motor, Capacitor run motor, Characteristics, Applications			
Text Books			
1. B. L. Theraja and A. K. Theraja, "A Textbook of Electrical Technology: Volume I (Basic Electrical Engineering)", 24th Edition, S Chand Publishing 2. D. Roy Chaudhuri: Networks and Systems, New Age Publishers.			
Reference Books			
1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", 4 th Edition, McGraw-Hill Education 2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. 3. H. Cotton, "Electrical Technology", 7 th Edition, CBS Publications and distributors.			

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Courses		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignment – (Units 1 to 2, before the in-semester exam)	5 Marks
2	Written Test – (Units 3 to 4, after in-semester exam)	5 Marks
3	VTFR Test	5 Marks
4	Virtual lab	5 Marks



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

F. Y. B. Tech. (All Branches) Pattern 2026 2600109: Indian Knowledge System			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Tutorial: 02 hrs/Week		02	CCE: 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 and key 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 Artifacts, 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, Munshiram Manoharlal 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			

Guidelines for Continuous Comprehensive Evaluation (CCE):

1.	Assignment 01 (Unit 01 and 02)	10 Marks
2.	Assignment 02 (Unit 03 and 04)	10 Marks
3.	LMS test/Quiz on each unit	10 Marks
4.	Group Presentation (group of 5 students)	10 Marks
5.	Field visit	10 Marks

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 2026 Semester: II			
2602103: PCB Making			
Teaching Scheme:		Credit Scheme:	Examination Scheme:
Theory: 01 Hrs/week		1	Continuous Comprehensive Evaluation: 25 Marks Term Work: 25 Marks
Practical: 02 Hrs/week		1	
Prerequisite Courses: Fundamentals of Electronics Engineering			
Course Objectives: - To learn PCB designing basics. - To study different types of electronic components. - To study PCB design tools. - To design PCB layout. - To fabricate PCB.			
Course Outcomes: On completion of the course, students will be able to			
CO No.	Course Outcome		Bloom's Level
CO1	Explain fundamentals of PCB, its types, materials and EDA tools.		2 – Understand
CO2	Describe different types of component packages and flow of surface mount technology process.		2 – Understand
CO3	Use appropriate PCB design tools to create schematic diagrams and PCB layouts for electronic circuits.		3 – Apply
CO4	Develop PCB layouts using PCB design software by applying design rules and verification techniques.		3 – Apply
CO5	Fabricate and test a PCB by applying standard PCB manufacturing and assembly procedures.		3 – Apply
COURSE CONTENTS			
Unit I	Introduction to PCB designing concepts	3 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, Different EDA tools, Introduction to SPICE and PSPICE Environment, Introduction of PROTEUS			
Unit II	Component introduction and their categories	2 Hrs	COs Mapped- CO2

Component Package Types: Through Hole Packages: Axial lead, Radial lead, Single inline package (DIP), Transistor outline (TO), Pin Grid Array (PGA) SMT Package: Metal Electrode Face (MELE), Leadless Chip Carrier (LCC), Small outline integrated circuits (SOIC), Quad Flat Pack (QFP), and Thin QFP (TQFP), Ball Grid Array (BGA), Plastic SMT Line Process: Magazine Loder, Distractor, Laser Printer, solder paste printing, SPI, Pick and Place, Reflow soldering, AOI, Manual Inspection			
Unit III	Introduction to Development Tools	3 Hrs	COs Mapped- CO3
Introduction to PCB Design using EasyEDA, PROTEUS, KiCAD, Altium tools			
Unit IV	Detailed description of PCB designing	2 Hrs	COs Mapped- CO4
PCB Designing Flow Chart: Schematic Entry, Net Listing, PCB Layout Designing, Prototype Designing, Design Rule Check (DRC), Design for Manufacturing (DFM), PCB Making, Assembly of component Description of PCB Layers: Electrical Layers, Mechanical layers, Documentation layers, Keyword & their description PCB Material: Standard FR-4 Epoxy Glass, Multifunctional FR-4, Tetra Function FR-4, NelcoN400-6, GETEK, BT Epoxy Glass, Cyanate Aster, Polyimide 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	2 Hrs	COs Mapped- CO5
Understanding the schematic Entry, Creating Library & Components, drawing a Schematic, Flat Design hierarchical Design, setting up Environment for PCB, Design a Board, 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			
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			

Guidelines for Continuous Comprehensive Evaluation (CCE) of Theory Courses		
Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	LMS Test on Unit 1 and 2	5 Marks
2	LMS Test on Unit 3, 4 and 5	5 Marks
3	Industrial Visit	5 Marks
4	Fault Detection in Circuit	5 Marks
5	Presentation on Micro Project	5 Marks

List of Laboratory Experiments		
Sr. No.	Experiment Title	COs Mapped
1	Creation and simulation of circuit schematics using different software.	CO3
2	Design of PCB layout using different software.	CO3
3	Fabrication of a Printed Circuit Board (PCB) using the manual method.	CO4
4	Demonstration of PCB fabrication using a PCB milling machine.	CO4
5	Component mounting, soldering and testing of the circuit.	CO5
Guidelines for Laboratory Conduction		
- Experiments should be performed in a group of two students only. - Avoid contacting circuits with wet hands or wet materials. - Double check circuits for proper connections and polarity prior to applying the power. - Observe polarity when connecting polarized components or test equipment. - 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, Objective, Hardware / Software requirement, Theory, Circuit diagram, Observation table, Calculations, Results, Conclusion and Assignment questions		
Guidelines for Term Work Assessment		
- Each experiment will be assessed continuously for 30 marks based on following rubrics. ➤ R1: Timely completion (10 marks)		
➤ R2: Understanding (10 marks) ➤ R3: Presentation / clarity of journal writing (10 marks) - Total marks of all experiments will be converted into 25 marks of term work.		



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

F. Y. B. Tech. Pattern 2026 2600110: Engineering Exploration		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Tutorial : 02hrs/week	02	Tutorial/Term Work: 75Marks
Prerequisite Courses, if any: ----		
Course Objectives: 1. To promote learning through interdisciplinary and student-centric activities. 2. To inculcate independent learning by problem solving. 3. To engage students in rich experiential learning. 4. To provide opportunity to get involved in a group so as to develop team skills and learn professionalism.		
Course Outcomes: On completion of the course, students will be able to–		
	Course Outcomes	Bloom's Level
CO1	Apply principles from several disciplines.	3-Apply
CO2	Demonstrate long-term retention of knowledge and skills acquired.	3-Apply
CO3	Function effectively as a team to accomplish a desired goal.	3-Apply
CO4	Explore an Engineering Product and prepare its Mind map	4-Analysis
CO5	Enhance their learning ability to solve practical problems.	5-Synthesis
Reference Books		
1. Project-Based Learning, Edutopia, March 14, 2016. 2. What is PBL? Buck Institute for Education.		

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%)**



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

F. Y. B. Tech. (All Branches) Pattern 2026 Semester: I/II 2600111: Innovation and Prototyping Lab Semester I: Civil, Chemical, Mechanical, Electrical, and R&A Semester II: Computer, CSD, AIDS, IT, and E&TC		
Teaching Scheme:	Credit Scheme:	Examination Scheme:
Practical: 2 hrs/week	Audit Course	In-Sem Exam: NA TW: 50 Marks
Course Objectives: The course objectives are to 1. Introduce the tools, devices, machines, and equipment required for project making. 2. Provide exposure to the CAD software and demonstrate its application 3. Encourage prototyping culture for product validation		
COs	Course Outcomes: At the end of this course, students will be able to	Bloom's Level
1	Identify tools, machines, and equipment and state their application	2- Understand
2	Operate machines like 3-D Printers, 3-D scanners, PCB machines, Laser Cutting, etc. at a basic or beginner level	2- Understand
3	Develop CAD models using various software and programming languages	3- Apply
4	Integrate software and hardware tools, techniques, and machines for simple model making	4-Analyze
5	Develop small working models for different project ideas using the AICTE-IDEA lab facility	6- Create

Sr. No.	List of Laboratory Experiments	COs Mapped
1	Introduction and Overview of Innovation and Prototyping Lab	CO1
2	Introduction, demonstration and hands-on training on 3-D printers and design of a small project component	CO1, CO2, CO3
3	Introduction, demonstration and hands-on training of laser cutting machine and design of a small project component	CO1, CO2, CO3
4	Introduction, demonstration and hands-on training of PCB milling and drilling machines and design of a small project component	CO1, CO2, CO3
5	Introduction, demonstration and hands-on training of the 3-D Scanning machine	CO1, CO2, CO3
6	Arduino Programming for simple project applications.	CO1, CO2, CO4
7	Introduction to Drone Technology and drone programming	CO1, CO2
8	Introduction and demonstration of the Electric Two-Wheeler Trainer Kit	CO1, CO2
9	Demonstration of AR/AR Technology	CO1, CO2, CO4
10	Mini-Project making in groups (4 students in each group)	CO2, CO3, CO4, CO5

Guidelines for Laboratory Conduction
➤ The whole class of 60 students will be divided into three batches (around 20 students in a batch). ➤ In each laboratory session, all the students in a batch will observe and understand only one demonstration. ➤ Assessment will be done based on timely submission, quizzes submitted on each experiment, attendance, lab work and project development using the knowledge gained by attending all the lab sessions. ➤ Best projects must be displayed for demonstration or display.
Guidelines for Students' Lab Journal
The students are instructed to carry a journal and note all the points discussed during the presentation and demonstration, and take the signature of the lab teacher at the end of the laboratory session. Submit the additional assignments in the next lab session. Audit course for Innovation and Prototyping Lab is a mandatory but non-credit course. Performance evaluation of this course will be done similarly to TW as for the other courses. The AC grade will be awarded for successful completion, and the ACN grade will be awarded for unsatisfactory performance of this course.