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

Curriculum

TY B. Tech(2023 Pattern)

Electronics and Telecommunication Engineering

w.e.f. AY 2025-2026

T.Y. B.Tech Electronics and Tele-Communication Engineering															
SEM-V															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**IN SEM**	**END SEM**	**CCE**	**TUT/ TW**	**PR/ OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2302301	PCC	Electromagnetic Engineering	3	-	-	20	60	20			100	3		-	3
2302302	PCC	Digital Signal Processing	3	-	-	20	60	20			100	3		-	3
2302303	PCC	VLSI design and Technology	3	-	-	20	60	20			100	3		-	3
2302304	PCC	Lab work in Digital signal processing	-	-	2	-			25	25	50	-		1	1
2302305	PCC	Lab work in VLSI design and Technology	-	-	2	-			25	25	50	-		1	1
2302306	PEC	Elective 1	3	-	-	20	60	20			100	3		-	3
2302307	PEC	Lab work Elective 1	-	-	2	-			25	25	50	-		1	1
2302308	OE	OE3: Digital Business Management	2	-	-	-		50			50	2		-	2
2302309	MDM	MDM3: Cyber Security Tools Techniques and Counter Measures	3	-	-	20	60	20			100	3		-	3
		MDM3:Data Science using Python	3	-	-	20	60	20			100	3		-	3
2302310	RM	IPR	-	1	2	-			TUT-25, TW-25		50	-	1	1	2
TOTAL			17	1	8	100	300	150	125	75	750	17	1	4	22

Elective Stream	**Elective 1:**
Communication	Elective -1 Software Defined Radio
Automation	Elective -1 Mechantronics
Embeded System	Elective -1 Interfacing Techniques
Artificial Intelligence	Elective -1 Foundation course in ML

T.Y. B.Tech Electronics and Tele-Communication Engineering															
SEM-VI															
Course Code	**Couse Type**	**Title of Course**	**Teaching Scheme**			**Evaluation Scheme and Marks**						**Credits**			
			TH	**TU**	**PR**	**INSEM**	**ENDSEM**	**CCE**	**TUT/TW**	**PR/OR**	**TOTAL**	**TH**	**TU**	**PR**	**TOTAL**
2302311	PCC	Embedded Systems	3	-	-	20	60	20	-	-	100	3	-	-	3
2302312	PCC	Power Electronics	3	-	-	20	60	20	-	-	100	3	-	-	3
2302313	PCC	Lab work in Embedded systems and Power Electronics	-	-	2	-	-	-	25	25	100	-	-	1	1
2302314	PEC	Elective 2	3	-	-	20	60	20	-	-	50	3	-	-	3
2302315	PEC	Elective 3	3	-	-	20	60	20	-	-	100	3	-	-	3
2302316	PEC	Lab work Elective-2	-	-	2	-	-	-	25	25	100	-	-	1	1
2302317	MDM	MDM 4	3	-	-	20	60	20	-	-	50	3	-	-	3
2302318	OE	OE 4	2	-	-	-	-	50	-	-	50	2	-	-	2
2302319	VSEC	Web Design	-	1	2	-	-	-	25	25	50	-	1	1	2
2302320	CEP	Project Phase-1	-	-	2	-	-	-	50	-	50	-	-	1	1
		TOTAL	17	1	8	100	300	150	125	75	750	17	1	4	22

Elective Stream	**Elective-2**	**Elective Stream**	**Elective-3**
Communication	Microwave Engineering	**Signal Processing**	Advanced DSP
Automation	Process Instrumentation	**Advanced VLSI Design**	FPGA Based System Design
Embeded System	Advanced Processor	**Recent Trends**	Circular economy
Artificial Intelligence	Neural network and Fuzzy Control	**E-Mobility**	Automotive Electronics

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

T. Y. B. Tech. Pattern 2022 Semester: V

2302301: Electromagnetics Engineering

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

Prerequisite Courses, if any: Applied Physics, Applied Mathematics

Companion course, if any: Nil

Course Objectives:

1. To study basic electrostatic and magnetostatic laws and theorems.
2. To learn Maxwell's equations and apply them to basic electromagnetic problem.
3. To make the students able to apply Maxwell's equations in practical applications.
4. To introduce the students to transmission lines and propagation of uniform plane waves.
5. To make the students aware of basics of microwaves and antenna.

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

	Course Outcomes	**Bloom's Level**
CO1	Study electrostatic field parameters and their distributions in different media and Apply it to solve the problems related to the electrostatic field.	2 - Understand
CO2	Study magnetostatic field parameters and their distributions in different media and Apply it to solve the problems related to the electrostatic field.	2 - Understand
CO3	Interpret the electromagnetic problem and solve using Maxwell's equations.	3 - Apply
CO4	Analyze problems related to transmission lines and uniform plane wave propagation	4 - Analyze
CO5	Elaborate the basic concepts of microwaves and antennas	2 - Understand

COURSE CONTENTS

Unit I	**Electrostatics**	**(08 hrs)**	**COs Mapped - CO1**

Coulomb's Law & Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence theorem, Electric potential, Relationship between E & V, Potential Gradient, Poisson's and Laplace's equation, Application of Poisson's and Laplace's equations, Boundary Condition.

Unit II	**Magnetostatics**	**(08 hrs)**	**COs Mapped – CO2**

Biot-Savart's Law, Ampere's Circuital Law, magnetic flux density, Magnetic potentials, Derivations of Biot-savart's law and Ampere's law based on Magnetic Potential, Forces due to magnetic field, Magnetic boundary condition.

Unit III	**Time Varying Fields & Maxwell's Equations**	**(06 hrs)**	**COs Mapped – CO3**

Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current, Maxwell's Equations in Point Form and Integral Form, Time-Varying Potentials, Time Harmonic Fields, Maxwell's Equations in Phasor Form.

Unit IV	**Transmission Lines and Uniform Plane Waves**	**(06 hrs)**	**COs Mapped – CO4**

Introduction, Transmission Line parameters, Propagation constant, Characteristic Impedance, Reflection Coefficient, VSWR, Transmission line equation Lossless and Distortion less line, Wave Equation, Wave Propagation in Free Space and Good Conductors, Skin Depth, Electromagnetic Power and Poynting Theorem

Unit V	**Antennas**	**(08 hrs)**	**COs Mapped – CO5**

Microwave Frequency Bands, Advantages and Applications of Microwaves, Fundamental Equation for Free Space Propagation, Introduction to Antenna, Types of Antenna, Radiation Mechanism, Antenna Terminology: Radiation Pattern, Radiation Power Density, Radiation Intensity, Directivity, Gain, Antenna Efficiency.

Case study Antenna design, (Self study radiation Hazards)

Text Books

1. Principles of Electromagnetics, Mathew N. O. Sadiku, Oxford University Press Inc.
2. Networks, Lines and Fields, J. D. Ryder, PHI
3. Antenna & Wave Propagation, K. D. Prasad, Satya Prakashan, New Delhi
4. Microwave and Radar Engineering, M. Kulkarni, Umesh Publications
5. Antenna Theory - Analysis and Design, C. A. Balanis, John Wiley

Reference Books

1. Engineering Electromagnetics, William H. Hayt and John A. Buck, Tata McGraw Hill
2. Electromagnetic Waves and Radiating Systems, Jordan and Balmain, PHI
3. Microwave Engineering, David M. Pozar, Wiley

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2022 Semester: V
2302302:Digital Signal Processing

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

Prerequisite Courses: - Engineering Mathematics III

Companion course, if any: Lab work in DSP and CS

Course Objectives:

1. To understand the mathematical description of continuous and discrete time signals and systems and classify signals into different categories.
2. To analyze Linear Time Invariant (LTI) systems in time and transform domains.
3. To introduce students with transforms for analysis of discrete time signals and systems.
4. To introduce students with transforms for analysis using Fast Fourier Transform
5. To design IIR and FIR filters.

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

	Course Outcomes	**Bloom's Level**
CO1	**Understand** mathematical description and representation of continuous and discrete time signals and systems.	2-Understand
CO2	**Develop** input output relationship for linear shift invariant system and **understand** the convolution operator for continuous and discrete time system	3- Apply
CO3	**Analyze** discrete time signals and systems using Discrete Fourier transforms.	4 -Analyze
CO4	**Develop** algorithms for linear filtering of signals.	3- Apply
CO5	**Design** different types of IIR and FIR digital filters	4 -Analyze

COURSE CONTENTS

Unit I	**Introduction and Classification of signals**	**(09 hrs + 2 hrs Tutorial)**	**COs Mapped - CO1**

Definition of signal and systems, communication and control systems as examples. Sampling of analog signals, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power.

Elementary signals used for testing: reasons for using standard test signals, exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc.

Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding.

Unit II	**Representation of LTI systems in time domain:**	**(08 hrs+ 2hrsTutorial)**	**COs Mapped CO2**

Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non-

causal, static and dynamic, stable and unstable, invertible.

System modeling: Input-output relation, definition of impulse response, convolution integral, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential, unit step to rectangular and rectangular to rectangular only. Properties of convolution. System properties in terms of impulse response, step response in terms of impulse response.

Unit III	**Basics of DSP and Discrete Fourier Transform**	**(08 hrs+ 2hrsTutorial)**	**COs Mapped CO3**

Sampling, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing. mapping between analog frequencies to digital frequency, DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, Linear filtering using overlap add and overlap save method.

Unit IV	**Fast Fourier Transform**	**(08 hrs+ 2hrsTutorial)**	**COs Mapped CO4,**

FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm, Comparison between finding DFT of signals using direct method and using FFT algorithm**.** In- place computation and memory requirement. Goertzel and Chirp-Z algorithm.

Unit V	**IIR and FIR filter design**	**(09 hrs+ 2hrsTutorial)**	**COs Mapped CO5,**

Design of IIR filters from analog filters.IIR filters design by impulse invariance method, Bilinear transformation method, warping effect. Characteristics of Butterworth filters, Chebyshev filters and elliptic filters, Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows..

TextBooks

1.Simon Haykins and Barry Van Veen, “Signals and Systems”, Wiley India, 2 nd Edition.
2. John G. Proakis“Digital Signal Processing: Principles”, Pearson publication

Reference Books

1. A. Nagoor Kanni ``Signals and Systems”, McGraw Hill,
2. Dr. Shaila Apte, “Digital Signal Processing” Wiley India Publication

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**

1	Assignments on each unit	10
2	Tests on each unit	10

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

T. Y. B. Tech. Pattern 2023 Semester: V

2302303: VLSI Design and Technology

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

Prerequisite Courses, if any: - Digital System Design using HDL

Companion course, if any: Lab work in VLSI Design and Technology

Course Objectives:

1. To Understand the architecture of PLD
2. To implement combinational and sequential circuits
3. To get the knowledge about properties of CMOS circuits
4. To Understand the concept behind ASIC design
5. To Get an Idea of Testability Approach

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

	Course Outcomes	**Bloom's Level**
CO1	Understand the basic architecture of various PLDs	2- Understanding
CO2	Explain the role of Verilog in digital system design	2- Explain
CO3	Develop effective HDL coding for digital design and Model digital circuit with HDL, simulate, synthesis and prototype in PLDs	3,6- Design
CO4	Design CMOS circuits for specified applications and Implement subsystem using CMOS Technology	4 -Analyze
CO5	Apply knowledge of chip level issues , faults and testability in design	3- Apply

COURSE CONTENTS

Unit I	**PLD Architectures and applications**	**(06hrs)**	**COs Mapped - CO1**

Study of Programmable Logic Devices (PROM, PAL, PLA) and comparison, Complex Programmable Devices: Various families, Features, Specifications, CPLD Architecture Applications, Field Programmable Gate Arrays: Various families, Features, Specifications, FPGA Architecture Applications, Implementing functions in PLA, PAL and FPGA, Study of latest FPGA Devices

Unit II	**Introduction to Verilog HDL**	**(08hrs)**	**COs Mapped - CO2**

Overview of Digital Design with Verilog HDL, Hierarchical Modelling Concepts, Basic Concepts, Modules and ports, Initial and always block, Modelling Styles: Gate-Level Modelling

Unit III	Design Elements in Verilog	(08hrs)	COs Mapped – CO3
Dataflow Modelling, Behavioural Modelling, Switch level Modelling. Tasks and functions, Verilog Test bench			
Unit IV	**CMOS Logic Design**	**(07hrs)**	**COs Mapped – CO4**
CMOS Inverter and DC transfer Characteristics, Inverter with capacitive load and its effects, CMOS Logic gates (All gates) and Multiplexer , Combinational circuit design using CMOS , Sequential circuit design using CMOS Transmission gates, example of TG for combinational circuit.			
Unit V	**Digital Design Issues and Testability**	**(07hrs)**	**COs Mapped - CO5**
Metastability and solutions, Timing considerations and Skew, Clock distribution and jitter, Supply and ground bounce, Power distribution techniques and optimization, Need of Design for Testability (DFT), DFT Guideline, Testability, Types of fault and fault models, Hazards, Test pattern generation, Sequential circuit test, Built-in Self-Test, JTAG & Boundary scan, TAP Controller.			

Text Books

1. Charles H. Roth, "Digital systems design using VHDL", PWS.
2. Wyane Wolf, "Modern VLSI Design (IP-Based Design)", 4E,Prentice Hall.
3. Steve Kilts "Advanced FPGA Design Architecture, Implementation and Optimization", Wiley.

Reference Books

1. E. Weste, David Money Harris, "CMOS VLSI Design: A Circuit & System Perspective", Pearson Publication.
2. R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation", 3E, Wiley-IEEE Press
3. John F. Wakerly, "Digital Design Principles and Practices" , 3E, Prentice Hall
4. M. Morris Mano , "Digital Design", 3E , Pearson
5. Cem Unsalan, Bora Tar, "Digital System Design with FPGA: Implementation Using Verilog and VHDL", McGraw-Hill
6. VHDL Programming by Douglas.L.Perry , McGraw-Hill 4th 2002

Strength of CO-PO Mapping

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments on Unit-1, Unit-2, Unit-3 Unit-4, Unit-5	10
2	LMS Test on Each Unit	10
	Total	**20**

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

T Y. B. Tech.Pattern 2023 Semester: V **2302304: Lab work in Digital Signal Processing**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02 hrs/week	**01**	**Continuous Comprehensive** **Practical Exam: 25 Marks** **TW: 25 Marks**
Prerequisite Courses, if any:		

Course Objectives:

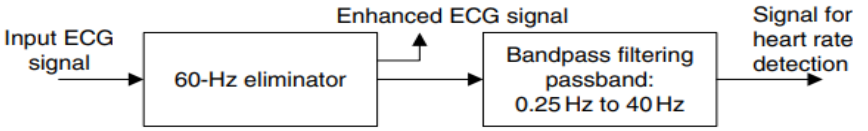
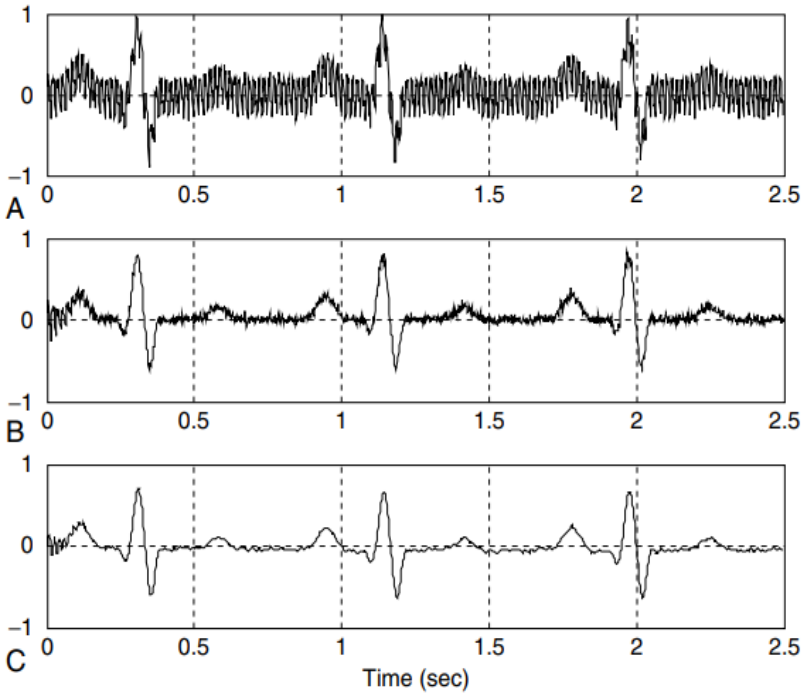
1. To develop practical skills in signal processing using MATLAB and mobile-based tools, including sampling, system response, spectral analysis, and filter design for real-time signals like audio and ECG.
2. To design and implement signal processing applications such as equalizers, speech recognition systems, and sensor-based DSP on embedded and mobile platforms, bridging theory with real-world systems.

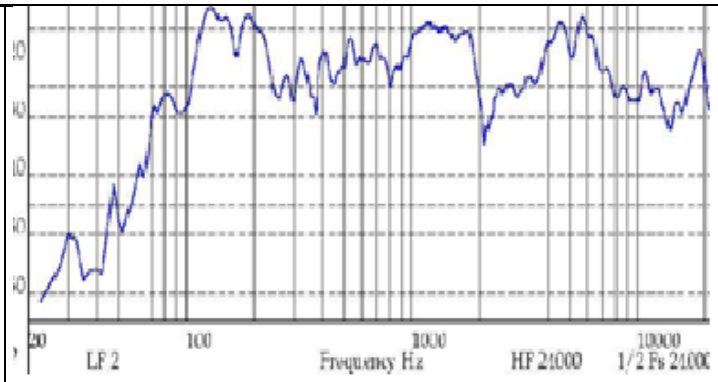
Course Outcomes: On completion of the course, students will be able to–

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Students will be able to analyze and process real-world signals using MATLAB and mobile-based tools, demonstrating an understanding of sampling, filtering, and frequency domain analysis.	4-Analyze	3- Mechanism
CO2	Students will be able to design and implement basic DSP applications such as audio equalizers, ECG enhancement systems, and speech recognition interfaces for embedded and mobile platforms.	3-Appply	5-Complex Overt Response

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	To verify sampling theorem in MATLAB and Demonstrate the effects of aliasing arising from improper sampling	1
2	Find the response of LTI system for unit step signal x1(t) and exponential signal	2

	x2(t)	
3	Record or use the recorded music samples of different instruments (at least four) and analyze the major frequency components included in music signal. Also try to solve this using Prat compare and comment on the results.	**3**
	Design an appropriate filter for ECG signal enhancement and heart rate detection.  **ECG signal enhancement system.**  **Results of ECG signal processing. (a) Initial corrupted ECG data; (b) ECG data enhanced by removing 60 Hz; (c) ECG data with DC blocking and noise removal for heart rate detection.**	**4**
5	**Design Loudspeaker Equalizer** The objectives of this equalization is to reduce the variations in the overall frequency response, extend the low frequency response, and improve the power handling of low frequency information	**4**

		
6	Implement a speech recognition algorithm for voice driven system. Use voice commands to drive a digital output, When a user speaks “on”, the device will start to operate; it will stop working when a user speaks “stop”. Try the same for multiple users. Interested students can implement it on hardware.	**3,4**
7	Android based Plots: Using A-JDSP App, determine the frequency response andpole-zero plot for Kaiser filter. (use achartengine library for Android)	**4**

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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Lab 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)

T Y. B. Tech.Pattern 2023 Semester: V **2302305: Lab work in VLSI Design and Technology**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Continuous Comprehensive Practical Exam: 25 Marks** **TW: 25 Marks**
Prerequisite Courses, if any: DSD with HDL		
Course Objectives: To simulate, test and verify any digital circuit on FPGA		
Course Outcomes: On completion of the course, students will be able to–		

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Develop programs using HDL &handle the hardwareproficiently by writing &simulating for combinational &sequential circuits in various modeling styles andimplementation of programs in PLDs.	4	4 (Mechanism)
CO2	Design CMOS circuits for specified applications andImplement subsystems using CMOS Technology.	4	5 (Complex Overt Response)
CO3	Apply knowledge of chip level issues, faults andtestability in design of Digital circuits.	2	3 (Guided Response)

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Implementation of Full Adder using all modeling styles	C01,CO2, CO3
2	Design a lift controller for 4 floors building Assume suitable data. Also write test bench for it.	C01,CO2, CO3
3	Design a washing machine controller Assume suitable data. Also write test bench for it. (Operation: When start is pressed, goes through wash, spin, rinse, spin cycles. If "double rinse" is selected, an extra rinse and spin cycle is added. Details: Must fill the tub with water before washing or rinsing – output the signal "fill tub" to do this. A timer is provided that gives the appropriate amount of time for a wash, rinse, or spin	C01,CO2, CO3

	cycle.)	
4	Design a Traffic Light Controller, assume suitable data. Also write test bench for it. (A busy highway is intersected by a little used farm road. Detectors C sense the presence of cars waiting on the farm road ,with no car on farm road, light remain green in highway direction, if vehicle on farm road, highway lights go from Green to Yellow to Red, allowing the farm road lights to become green, these stay green only as long as a farm road car is detected but never longer than a set interval, when these are met, farm lights transition from Green to Yellow to Red, allowing highway to return to green, even if farm road vehicles are waiting, highway gets at least a set interval as green)	C01,CO2, CO3
5	To simulate Logic Gates using CMOS	C04
6	To simulate Combinational/ Sequential circuit Using Conventional method and Transmission Gates(TG)	C04
7	To simulate CMOS combinational logic for minimum four variable inputs	C04
8	Simulate Stuck at fault model of given function	C05

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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Lab 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)

T. Y. B. Tech.Pattern 2023 Semester: V
2302306A: Software Defined Radio

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

Prerequisite Courses, if any: Analog and DigitalCommunication

Companion course, if any: Lab work in Software Defined Radio

Course Objectives:

1. To understand how SDR platform provides easy access to wireless network system
2. To understand Digital Modulation Techniques for SDR.
3. To understand the concept of Cognitive Radio and Spectrum sharing

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

	Course Outcomes	**Bloom's Level**
CO1	Discuss digital modulation techniques for SDR	2- Understand
CO2	Understand RF implementation	2- Understand
CO3	Understand SDR Architecture	2- Understand
CO4	Understand Cognitive radio architecture	2- Understand
CO5	Explore the applications of SDR	2- Understand

COURSE CONTENTS

Unit I	**Digital communication fundamentals for SDR/cognitive radio**	**(06 hrs)**	**COs Mapped - CO1**

Data Transmission ,Digital Modulation Techniques :Representation of Signals , Euclidean Distance between Signals , Decision Rule , Power Efficiency , M-ary Phase Shift Keying , M-ary Quadrature Amplitude Modulation Probability of Bit Error , Derivation of Probability of Bit Error , Probability of Bit Error of M-ary Phase Shift Keying ,Spread spectrum techniques

Unit II	**Introduction to SDR and RF Implementation**	**(06 hrs)**	**COs Mapped - CO2**

Introduction to SDR required hardware specifications, Software/Hardware platform, Radio frequency spectrum and regulation Purpose of RF front End, Dynamic Range ,RF receiver Front End topologies, Flexibility of RF chain with software radio, Duplexer ,Diplexer ,RF filter ,LNA ,Image reject filters , IF filters , RF Mixers Local Oscillator , AGC, Transmitter Architecture and their issues, Reconfigurable computing architecture

Unit III	SDR Architecture	(06 hrs)	COs Mapped – CO3
Architecture of SDR-Open Architecture, Software Communication Architecture, Transmitter Receiver Homodyne/heterodyne architecture, RF front End, ADC, DAC, DAC/ADC Noise Budget, ADC and DAC Distortion, Role of FPGA/CPU/GPU in SDR, Applications of FPGA in SDR, Design Principles using FPGA, Trade –offs in using DSP, FPGA and ASIC, Power Management Issues in DSP, ASIC, FPGA			
Unit IV	**Cognitive Radio Architecture**	**(06 hrs)**	**COs Mapped – CO4**
Cognitive Radio Architecture, The Technologies Required : Radio Flexibility and Capability, Available Technologies for Cognitive Radios, Cognitive Geo-location Applications, Update of CR-Specific Technologies, Spectrum Sensing in CR, Spectrum Awareness and Access Considerations, CR Network, OFDM Modulator and Demodulator, Benefits of OFDM in CR,			
Unit V	**Applications of SDR**	**(06 hrs)**	**COs Mapped – CO5**
Applications of SDR in Advance Communication System-Case Study, Challenges and Issues, Implementation, Parameter Estimation –Environment, Location, other factors, Vertical Handoff, Network Interoperability. Case Study : 1)CR for Public Safety –PSCR , Modes of PSCR, Architecture of PSCR 2)Beagle board based SDR 3)Embedded PCSR using GNU radio			

Text Books

1. Jeffrey.H.Reed ,"Software Radio : A Modern Approach to Radio Engineering ", Pearson , LPE
2. Alexander M. Wyglinski, Worcester Maziar Nekovee., Thomas Hou, "Cognitive Radio Communications and Networks Principles and Practice", 2010 ELSEVIER

Reference Books

1. Markus Dillinger , KambizMadani ,Nancy Alonistioti, "Software Defined Radio : Architectures , Systems and Functions" ,Wiley
2. Tony .J. Rouphael , "RF and DSP for SDR", Elsevier Newness Press ,2008
3. SDR –Handbook , 8th Edition , PENTEK
4. Bruce a. Fette , "Cognitive Radio Technology, Newness", Elsevier

Strength of CO-PO Mapping

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester: V **2302306B : Mechatronics**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any: Basic Electronics Engineering, Mechanical Processes & systems, Control System (Sensors & actuators), Electrical Circuits & Machines, Basics of Microcontrollers		
Companion course, if any: -Lab work in Mechatronics Mechatronics		
Course Objectives: 1. To introduce basics of mechatronics system. 2. To expose different sensors & actuators. 3. To explain designing of hydraulic circuit. 4. To explain designing of pneumatic circuit. 5. To explore applications of mechatronics.		

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

	Course Outcomes	**Bloom's Level**
CO1	Explain fundamentals of mechatronics.	2
CO2	Describe the operation of sensors and actuators.	2
CO3	Explain components of hydraulic circuit and its applications	2
CO4	Explain components of pneumatic circuit and its applications	2
CO5	Illustrate applications of mechatronics.	2

COURSE CONTENTS

Unit I	**Introducing Mechatronics**	**(08 hrs)**	**COs Mapped - CO1**

Mechatronics: Definitions, Elements, Design Process, Levels Design Approach: Functions, Ways of Integration, Information Processing Systems, Concurrent Design Procedure, Integrated Design Issues Mechatronics System: Input & Output Signals, Signal Conditioning, Microprocessor & Software Control, Testing & Instrumentation, Gear and gear trains Applications: CNC Machines, Flexible Manufacturing System, Computer Integrated Manufacturing, Humanoid Robot, Advanced Vehicle Control System, etc.

Unit II	**Sensors & Actuators**	**(08 hrs)**	**COs Mapped - CO2**

Transducers: Types, Characteristics Parameters Displacement Sensors, Position Sensors, Proximity Sensors, Velocity Sensors, Motion Sensors, Force Sensors, Acceleration Sensors,

Torque Sensors, Fluid Pressure Sensors Liquid Flow Sensors, Liquid Level Sensors, Temperature Sensors, Light Sensors, Digital Transducer, Selection of Sensors, Concept of electrical actuator, single acting and double acting cylinder.			
Unit III	**Hydraulic Systems**	**(06 hrs)**	**COs Mapped – CO3**
Basic Principles of Hydraulics, Hydraulic Pumps, Hydraulic Actuators, Pressure-Control Valves, Accumulators, Directional Control Valves, Design of simple hydraulic circuit			
Unit IV	**Pneumatic Systems**	**(07 hrs)**	**COs Mapped – CO4**
Basic Principles, Compressors, Dryers, and Tanks, Pressure Regulators, Pneumatic Control Valves, Pneumatic Actuators, Comparison of Hydraulic & Pneumatic Systems, Flow Control Valves, Design of simple pneumatic circuit			
Unit V	**Case Studies of Mechatronics systems**	**(07 hrs)**	**COs Mapped – CO5**
Case study of mechatronics systems from various domains such as automotive electronics, automation., Illustrative examples: Boat Autopilot, High-Speed Tilting Trains, Automatic Car Park System, Coin Counter, Engine Management System, Autonomous Mobile System, Antilock Brake System Control, Timed Switch, Pick-and-place robot, Bar code reader, Hard Disk Drive and others.			

Text Books

1. The Mechatronics Handbook, R H Bishop, CRC Press, Edition First
2. Mechatronics: Integrated Mechanical Electronic Systems, G.K. Vijayaraghavan, M.S. Balasundaram K. P. Ramachandran, Wiley, First Edition
3. Modern Control Technology, Christopher T. Kilian, Delmar Thomson Learning, First Edition

Reference Books

1. Mechatronics: Electronic control systems in mechanical and electrical engineering, W. Bolton Pearson, First
2. Introduction to Mechatronics and Measurement Systems (Mechanical Engineering), David G. Alciatore and Michael B. Histand, Mc Graw Hill Education, Fourth Edition
3. Mechatronics System Design, Devdas Shetty, Richard Kolk, Cengage Learning, Second Edition

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

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

2302306C: Interfacing techniques

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

Prerequisite Courses, if any: Microcontrollers

Companion course, if any: Lab work in Interfacing Techniques

Course Objectives:

1. To understand the architecture of the PIC microcontroller and develop basic assembly programs using arithmetic, logic instructions, and various addressing modes.
2. To learn PIC microcontroller I/O port programming, timer configurations, and interrupt mechanisms and apply this knowledge to simple interfacing tasks such as LED control.
3. To explore the fundamentals of serial communication and gain familiarity with standard serial communication protocols including RS232, RS485, I2C, and USB.
4. To develop an understanding of peripheral interfacing techniques such as memory vs I/O interfacing, data transfer methods, and interfacing of peripherals like LCD, keypad, ADC, DAC, and stepper motors.
5. To gain hands-on experience with Arduino for sensor interfacing and explore communication technologies like Zigbee and Wi-Fi, including their relevance to cloud-connected IoT systems.

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

	Course Outcomes	**Bloom's Level**
CO1	Explain the PIC18 microcontroller architecture, arithmetic and logic assembly instructions and C Data types.	Understand
CO2	Apply I/O port programming using TRIS registers, and configure timers, interrupts, and INTCON register and Demonstrate basic hardware interfacing such as LED control using the PIC microcontroller.	Apply
CO3	Apply serial communication protocols for efficient data handling and peripheral communication using PIC microcontrollers.	Apply
CO4	Apply interfacing techniques for LCD, keypad, ADC, DAC, and stepper motors, and understand memory vs I/O interfacing, buses, and data transfer methods like polling, interrupts, and DMA.	Apply
CO5	Apply interfacing with Arduino for sensors and communication modules, and compare Zigbee and Wi-Fi	Apply

	technologies in IoT systems, including sensor classification and cloud platform integration.	

COURSE CONTENTS

Unit I	**PIC Microcontroller Architecture and Assembly Programming**	**(07 hrs)**	**COs Mapped - CO1**
PIC architecture, Introduction to PIC assembly programming, Arithmetic and logic instructions, ,Addressing Modes, Oscillator configurations of PIC, Reset circuits of PIC 18,C Data types for PIC 18			
Unit II	**PIC I/O & Timers**	**(07 hrs)**	**COs Mapped - CO2**
PIC I/O Port Programming ,TRIS Register, Timers basics, Interrupts in PIC, INTCON, Introduction to interfacing ,LED Interfacing			
Unit III	**Serial Communication**	**(08 hrs)**	**COs Mapped – CO3**
Basics of serial communication , Basics of Serial Communication Protocol: Study of RS232, RS 485, I2C,USB			
Unit IV	**Peripheral Interfacing**	**(07 hrs)**	**COs Mapped – CO4**
Memory Interfacing vs I/O Interfacing , Introduction to Parallel and Serial Interfacing, Data Transfer Techniques-Polling, Interrupts, DMA, Block transfer and byte transfer ,LCD Interfacing, 4 X 4 Matrix Keypad , ADC, DAC interfacing , Stepper motor interfacing,			
Unit V	**Interfacing in Embedded and IoT Systems**	**(07 hrs)**	**COs Mapped – CO5**
Arduino- Interfacing with LEDs, buttons, sensors, **Zigbee, Wi-Fi**- Comparison. The role of cloud platforms in IoT (Internet of Things), Introduction to sensor types: Analog vs Digital sensors, Active vs Passive sensors, Interfacing of arduino with sensors			

Text Books

1. Embedded microcomputer systems: real time interfacing (3^{rd} edition), Jonatham W. Valvano.
2. Embedded system: An integrated approach, Lyla B.Das.
3. Introduction to embedded system: A cyber physical systems approach(2^{nd} edition), Edward Ashford Lee and Sanjit Arunkumar Seshia

Reference Books

1. Embedded Systems Architecture - A Comprehensive Guide- T. Noergaard (Newnes, 2005)
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers Series in Communication 2. “Internet of Things: Case Studies”, Libelium Inc, White papers, Spain

Strength of CO-PO/PSO Mapping (Sample):

Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped.

Each Course Outcome addresses a sub-set of POs and PSOs to varying levels.

(Strengths: 1- Low, 2 – Medium, 3 - Strong)

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

B. Tech. Pattern 2022 Semester: VII **2302306D : Foundation course in ML**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any:.Basic knowledge Programming (Python), and Data Structures.		
Companion course, if any: Lab work in Foundation course in ML		

Course Objectives:

1. Introduce core machine learning concepts and various types of learning paradigms.
2. Develop skills in data preprocessing and feature engineering for improved model performance.
3. Enable training and evaluation of ML models using suitable techniques and validation methods.
4. Apply unsupervised learning algorithms for clustering and dimensionality reduction.
5. Interpret model results using standard performance metrics for better decision-making.

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

	Course Outcomes	**Bloom's Level**
CO1	Explain core ML concepts and differentiate between supervised, unsupervised, and reinforcement learning problems.	2-Understand
CO2	Preprocess and engineer features from raw data to optimize model performance.	3-Apply
CO3	Train and evaluate models using appropriate loss functions, regularization, and validation techniques.	3-Apply
CO4	Apply unsupervised learning algorithms like k-Means and PCA for clustering and dimensionality reduction.	3-Apply
CO5	Evaluate and interpret model performance using metrics like accuracy, precision, recall, ROC, and AUC.	4-Analyze

COURSE CONTENTS

Unit I	**Introduction to Machine Learning and Types of Learning**	**COs Mapped - CO1**

History and Evolution of Machine Learning Applications of ML in Real-world Domains Machine Learning Lifecycle Types of Learning: Supervised, Unsupervised, Semi-

supervised, Reinforcement Learning Instance-based vs Model-based learning Batch vs Online Learning, Overview of AI vs ML, Challenges in ML: Overfitting, Underfitting, Bias-Variance Tradeoff Training, Testing, and Validation Sets Cross-validation Techniques (Hold-out, K-Fold)

Unit II	**Data Preprocessing and Feature Engineering**	**COs Mapped - CO2**

Understanding ML Datasets: Attributes, Labels, Features Data Preprocessing: Handling Missing Values Feature Scaling: Normalization & Standardization Encoding: One-Hot, Label Encoding Feature Engineering Basics Feature Selection Techniques Dimensionality Reduction: Concept of Subset Selection Principal Component Analysis (PCA) Entropy, Information Gain, Gini Index

Unit III	**Supervised Learning Techniques**	**COs Mapped – CO3**

Regression: Linear Regression: Hypothesis, Cost Function, Least Squares, Gradient Descent Performance Metrics: MSE, MAE, R^2 Classification: Logistic Regression k-Nearest Neighbors (k-NN) Naïve Bayes Classifier Support Vector Machines (SVM): Maximal Margin Classifier, Kernel Trick, Decision Trees for Classification and Regression Introduction to Random Forests Binary vs Multiclass Classification (One-vs-Rest, One-vs-One)

Unit IV	**Unsupervised Learning Techniques**	**COs Mapped – CO4**

Difference Between Supervised and Unsupervised Learning Applications of Unsupervised Learning Clustering Algorithms: k-Means Clustering Hierarchical Clustering, Dimensionality Reduction using PCA and Applications, Use Cases: Market Segmentation, Image Compression, etc.

Unit V	**Model Evaluation and Optimization**	**COs Mapped – CO5**

Model Evaluation Metrics: Accuracy, Precision, Recall, F1-Score Confusion Matrix ROC and AUC Curve Overfitting and Underfitting: Causes and Solutions Regularization Techniques: L1 (Lasso), L2 (Ridge) – Basic Concepts Cross-Validation: K-Fold, Stratified Hyperparameter Tuning: Grid Search – Conceptual Introduction VC Dimension and Generalization (Introductory)

Text Books

1. **Deep Learning** – Ian Goodfellow, Yoshua Bengio, Aaron Courville.
2. **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow** – Aurélien Géron.
3. . Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall
4. J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition , 2016
5. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.

Reference Books
1. **Learning Spark** – Jules Damji, Matei Zaharia. 2. **Natural Language Processing with Transformers** – Lewis Tunstall. 3. .Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning, Springer, ISBN 978-1-4614-7137-0 2. 4. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622 2. 5. Tom Mitchell "Machine Learning" McGraw Hill Publication, ISBN :0070428077 9780070428072

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T Y. B. Tech.Pattern 2023 Semester: v **2302307A: Lab work in Software Defined Radio**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Continuous Comprehensive Practical Exam: 25 Marks** **TW: 25 Marks**
Prerequisite Courses, if any: Analog and DigitalCommunication		
Course Objectives: 1. To understand how SDR platform provides easy access to wireless network system 2. To understand Digital Modulation Techniques for SDR.		
Course Outcomes: On completion of the course, students will be able to–		

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	**Understand** the fundamental principles of communication, including modulation techniques, transmission schemes, and spectrum analysis.	2- Understand	1-Imitation
CO2	**Demonstrate** the ability to set up and configure SDR hardware and software platforms for different applications.	3- Apply	3-Precision

List of Laboratory Experiments		
Sr. No.	**Laboratory Experiments**	CO Mapped
1	SDR Hardware Setup: Setting up SDR hardware (e.g., RTL-SDR dongle) and software (e.g., GNU Radio).	CO1
2	Design and implement an FM radio receiver using SDR hardware and software, including tuning, demodulation, and audio playback.	CO2
3	Build a simple AM radio transmitter and receiver using SDR, exploring the principles of amplitude modulation.	CO2
4	Develop a QAM modulation system for digital data transmission using SDR, investigating its advantages in high-speed communication.	CO2
5	Design a satellite communication system using Binary Phase Shift Keying (BPSK) modulation with SDR, focusing on its applications in space communication.	CO2
6	Design a Radio Frequency Identification (RFID) system using Frequency Shift Keying (FSK) modulation with SDR, exploring its applications in tracking and identification.	CO2

7	Implement Quadrature Phase Shift Keying (QPSK) modulation for digital television broadcasting using SDR, exploring its role in modern TV standards.	CO2
8	Design a Radio Frequency Identification (RFID) system using Frequency Shift Keying (FSK) modulation with SDR, exploring its applications in tracking and identification.	CO2

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Equipment and kits 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 assistants.
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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Termwork Assessment

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

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

T. Y. B. Tech. Pattern 2023 Semester: V **2302307B : Lab work in Mechatronics**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Pr.: 2 Hrs / Week	**01**	**Continuous Comprehensive Evaluation** **Practical : 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: Basic Electronics Engineering, Mechanical Processes & systems, Control System (Sensors & actuators), Electrical Circuits & Machines, Basics of Microcontrollers		
Companion course, if any: --		

Course Objectives:

1. To Apply the fundamental principles of various transducers (resistive, capacitive, optical, thermoelectric) for the measurement of physical quantities
2. To utilize a data acquisition system to measure electrical signals (voltage and current) from sensors and analyze the operation of basic electromechanical and fluid power systems, including position control and pneumatic circuits.
3. Evaluate different measurement techniques for flow and proximity sensing, and design and simulate basic fluid power circuits for specific applications.

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

	Course Outcomes	**Bloom's Level**	**Bloom's Level (Psychomotor domain)**
CO1	Analyze the principles of operation and apply various transducers (strain gauge, capacitive, resistive, optical, thermoelectric) for the measurement of physical parameters like weight, liquid level, displacement, velocity, and temperature.	3- Applying	4- Manipulation
CO2	Design and implement basic data acquisition systems for measuring electrical quantities and understand the principles of flow and position control systems, including pneumatic and hydraulic circuits, and proximity sensors.	3- Applying	4- Manipulation

Sr. No.	List of Experiments
1.	Weight measurement using strain gauge.
2.	Liquid level measurement using capacitive transducer.
3.	Displacement measurement using sliding potentiometer.
4.	Velocity measurement using photo interruptive sensor and photo reflective sensor.
5.	Temperature measurement using thermocouple / RTD.
6.	To use data acquisition system for DC voltage & DC current measurement.
7.	Flow measurement using rotameter & ultrasonic sensor.
8.	Position control using servomechanism with photo electric pickup.
9.	Design of pneumatic circuits.
10.	Verify operation of proximity sensors.
11.	Simulation of hydraulic / pneumatic circuits.

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Equipment and kits 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 assistants.
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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Termwork Assessment

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

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

T. Y. B. Tech. Pattern 2023 Semester: I **2302307C: Lab work in Interfacing techniques**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Practical: 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: Microcontrollers		
Course Outcomes: On completion of the course, students will be able to–		

	Course Outcomes	**Bloom's Level**	**Psychomotor domain**
CO1	Apply knowledge of digital I/O configuration to interface basic components such as LEDs, push buttons, buzzers, relays, and LCDs with PIC18FXXXX microcontroller.	Apply	6. Adaptation
CO2	Apply programming skills to interface peripheral devices like keypads, stepper motors, and analog sensors using internal modules such as ADC and timers in PIC18FXXXX.	Apply	6. Adaptation
CO3	Apply embedded system concepts to interface and control sensors and actuators using Arduino platform.	Apply	6. Adaptation

List of Laboratory Experiments / Assignments

Sr. No	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Write a program to interface multiple LEDs with the PIC18FXXXX microcontroller to create lighting patterns used in applications like status indicators, home automation, and digital displays.	CO1
2	Design a control system using a PIC microcontroller to simulate a basic security or automation alert mechanism. When Button 1 is pressed, it activates a relay (simulating a device), triggers a buzzer for audible alert, and initiates a forward LED chasing sequence to indicate system activation. When Button 2 is pressed, the relay and buzzer turn off, and the LEDs chase in reverse direction, signaling system deactivation. This application demonstrates user-triggered control for safety or automation scenarios.	CO1
3	Develop a program to interface a 16x2 LCD with the PIC18FXXXX microcontroller to display system messages or real-time data.	CO1
4	Develop a user input system by interfacing a 4x4 matrix keypad with the PIC18FXXXX microcontroller to capture numeric or command inputs. This setup is commonly used in applications such as digital door locks, menu-driven embedded systems, and user authentication panels where secure and efficient input handling is required.	CO2

5	Design a waveform generation system using the PIC18FXXXX microcontroller to produce a square wave signal by configuring timers with interrupts. This technique is essential in applications such as tone generation, digital clock signals, pulse generation for motor control, or triggering external circuits in timing-critical embedded systems	CO2
6	Develop a data acquisition system using the PIC18FXXXX microcontroller by interfacing an analog sensor, such as a potentiometer or LM35 temperature sensor, through the built-in ADC module. This forms the core of applications like temperature monitoring systems, smart thermostats, and analog signal-based automation where real-time analog data is converted to digital for processing and control.	CO2
7	Implement a motion control system by interfacing a stepper motor with the PIC18FXXXX microcontroller to achieve precise rotational movement. This application is widely used in CNC machines, 3D printers, robotic arms, and automated positioning systems where accurate control of angular displacement is essential.	CO2
8	Develop an embedded control system using Arduino by interfacing various sensors (e.g., temperature, light, motion) and actuators (e.g., motors, relays, buzzers) to enable real-time monitoring and automated response. This setup is fundamental in smart home automation, environmental monitoring, and robotics applications where sensor data triggers actuator actions for intelligent control.	CO3

Guidelines for Laboratory Conduction

1. Teacher will brief the given interfacing of embedded system to students
2. Microcontroller Kits and interfacing modules will be provided in the Lab
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 interfacing and programming students will check their results 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, interfacing diagram, algorithm, procedure, calculations, waveform, conclusion and questions, if any

Guidelines for Term work Assessment

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

Strength of CO-PO/PSO Mapping (Sample):

Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped.

Each Course Outcome addresses a sub-set of POs and PSOs to varying levels.

(Strengths: 1- Low, 2 – Medium, 3 - Strong)

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

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

B. Tech. 2023 Pattern Semester: V **2302307D: Lab work in Foundation course in ML**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Practical Exam: 25 Marks** **Term Work: 25Marks**
Prerequisite Courses, if any:		
Companion course, if any:		
Course Objectives: 1. Implement and compare core deep learning components 2. Develop and train CNN and RNN models 3. Evaluate model performance.		

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

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Understand and implement basic deep learning concepts such as neural networks and activation functions.	L2: Understand	1-Imitation
CO2	Develop and train convolutional and recurrent neural network models for classification and prediction.	L3: Apply	1-Imitation
CO3	Evaluate model performance using appropriate deep learning metrics and tools.	L4: Analyze	1-Imitation

List of Laboratory Experiments

Sr. No.	**Laboratory Experiments**	**CO Mapped**
1	Implement and compare ReLU, Sigmoid, and Tanh on the same dataset; visualize activation outputs and training convergence.	CO1
2	Implement a basic neural network using Keras or PyTorch for a binary classification task (e.g., classifying spam vs. non-spam emails or IRIS dataset).	CO1
3	Train a Convolutional Neural Network on MNIST or CIFAR-10 dataset and evaluate accuracy.	CO2
4	Use VGG16, ResNet50, or MobileNet to classify custom images using	CO2

	transfer learning and fine-tuning.	
5	Implement RNN or LSTM to perform time series prediction (e.g., stock prices) or text classification (e.g., IMDB sentiment analysis).	CO2
6	Experiment with different combinations of optimizers (SGD, Adam, RMSProp) and loss functions; plot and compare convergence curves.	CO3
7	Compute and visualize confusion matrix, precision, recall, F1-score, and ROC curve for a classification model.	CO3
8	Mini Project – Design an integrated project combining big data tools and deep learning models.	CO1,2,3

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Equipment and kits 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 assistants.
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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Teamwork Assessment

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

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

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

T. Y. B. Tech. Pattern 2023 Semester: V **2302308: Digital Business Management**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory: 02hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks**
Prerequisite Courses, if any: Project Management.		
Companion course, if any: --		
Course Objectives: 1. To familiarize with digital business concept. 2. To acquaint with E-commerce. 3. To give insights into E-business and its strategies.		

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

	Course Outcomes	**Bloom's Level**
CO1	Understand fundamentals of Digital Business.	2-Understand
CO2	Identify drivers of digital business.	2-Understand
CO3	Illustrate various approaches and techniques for E-business and management.	2-Understand
CO4	Identify security threats in e-business.	2-Understand
CO5	Prepare E-business plan.	3-Apply

COURSE CONTENTS

Unit I	**Introduction to Digital Business**	**(04 hrs)**	**COs Mapped - CO1**
Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts. Difference between physical economy and digital economy.			
Unit II	**Drivers of digital business**	**(04 hrs)**	**COs Mapped - CO2**
Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things (digitally intelligent machines/services), Opportunities and Challenges in Digital Business.			
Unit III	**Overview of E-Commerce**	**(08 hrs)**	**COs Mapped – CO3**
E-Commerce: Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement, B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals. Other E-C models and applications, innovative EC System-From E- government and learning to C2C, mobile commerce and			

pervasive computing EC Strategy and Implementation EC strategy and global EC, Economics and Justification of EC, Using Affiliate marketing to promote your e- commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC.

Unit IV	**Managing E-Business**	**(07 hrs)**	**COs Mapped – CO4**

Managing Knowledge, Management skills for e- business, Managing Risks in e –business. Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications.

Unit V	**E-Business Strategy**	**(07 hrs)**	**COs Mapped – CO5**

E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy, E-business strategy into Action, challenges and E-Transition,From Idea to Realization-Business plan, Case Studies.

Text Books

1. Urmi Dutta, Neha Somani, "E-Commerce & Business Communication", Oxford University Press
2. Elias M. Awad, "E-commerce from vision to fulfilment" 3rd Edition, Prentice Hall India
3. Dave Chaffey, "Digital Business and E-Commerce Management", 6th Edition, Pearson
4. Colin Combe, "Introduction to E-business: Management and Strategy", 1st Edition , Elsvier
5. Eloise Coupey, "Digital Business Concepts and Strategy", 2nd Edition , Pearson

Reference Books

1. Vinocenzo Morabito, "Trend and Challenges in Digital Business Innovation" Springer
2. Erika Darics, "Digital Business Discourse", Palgrave Macmillan
3. "E-Governance-Challenges and Opportunities", Proceedings in 2nd International Conference theory and practice of Electronic Governance
4. "Perspectives the Digital Enterprise –A framework for Transformation", TCS Consulting Journal Vol. 5

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Activity	20
2	Presentation	30
	Total	**50**

Tut. No.	Title of Tutorial
1	Compare conventional business with e- business based on structure, mechanisms and economics.
2	Discuss the role of Big Data and Data Analytics in Digital Business Management.
3	Review various Opportunities and Challenges in Digital Business.
4	Prepare a report on societal impacts of Digital Business.
5	Review various security aspects of Digital Business.
6	Discuss the various steps for executing the business plan digitally.
7	Develop a strategy for E-Business for selling a product online.
8	Discuss a typical case study of any one Digital Business.

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

T. Y. B. Tech. E&TC Pattern 2023

2302309A: MDM3: Cyber Security, Tools, Techniques and Counter Measures

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

Prerequisite Courses, if any: Introduction to Computer Science / Programming, Python, C/C++, Introduction to Cyber Security / Information Security Fundamentals

Companion course, if any: Cybersecurity Laws, Ethics & Policy

Course Objectives:

1. Understand core principles of cybersecurity and common threat landscapes.
2. Identify and analyze various types of cyberattacks and vulnerabilities.
3. Apply security tools and techniques to protect networks, systems, and data.
4. Evaluate and implement countermeasures against malware, phishing, and intrusion.
5. Demonstrate awareness of ethical, legal, and compliance issues in cybersecurity.

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

	Course Outcomes	**Bloom's Level**
CO1	**Identify** common cyber threats and vulnerabilities in information systems.	1-Remember
CO2	**Describe** key cybersecurity tools and techniques used for system protection.	2-Understand
CO3	**Apply** appropriate countermeasures to secure networks and devices.	3- Apply
CO4	**Analyze** security incidents to determine causes and potential impacts.	4-Analyze
CO5	**Demonstrate** the use of ethical hacking tools in a controlled environment.	3- Apply

COURSE CONTENTS

Unit I	**Introduction to Cyber Security and Threat Dynamics**	**(07hrs)**	**COs Mapped CO1**

Cyber Security Essentials-What is Cyber Security Essentials, Indian Cyberspace, Security Concept, Basic Cryptography. Attack Vectors, Threat, Risk and Vulnerability. Advance Persistent Threat and cyber kill chain

Unit II	**Cyber Security Frameworks and Network Defense Mechanisms**	**(08hrs)**	**COs Mapped – CO2**

Cyber Security Framework: Cyber Security Policy, Cyber Security Regulations in INDIA, Cyber Security Regulations in other countries, Cyber Security Policy Framework. Firewall And Packet Filters:

Firewall, Packet Filtering, IDS, IPS, Security Information and Event Management

Unit III	Network and Application Security Tools and Techniques	(07hrs)	COs Mapped - CO3
Introduction to WindowsFirewall, Introduction to Linux Firewall, Attacks On Wireless Networks: Basics of Wireless Networks, Standards in Wireless Networks, Wireless Networks Attack. Application Inspection Tools : ZAP, SQLMap, DVWA, WebGoat.			
Unit IV	**Web-Based Attacks, Cyber Crimes, and Incident Response**	**(07hrs)**	**COs Mapped - CO4**
Web Attack- Browser Attack, Web Attacks Targeting Users, Obtaining user for website data, Email Attacks.Cyber Crimes – Types of Cyber Crime, Hacking, Cyberspace and Criminal Behaviour, Classification of Terms, Traditional Problems associated with computer crime, Introduction to Incidence Response, Digital Forensic			
Unit V	**Foundations of Cyber Law and Computer Crime**	**(07hrs)**	**COs Mapped - CO5**
Computer language, Network Language, Realms of Cyber World, Internet crime and Act : A brief history of Internet, Recognizing and defining computer crime, Contemporary Crimes, Indian IT Act 2000, Digital Evidences and chain of custody.			

Text Books

1. Principles of Cyber Security Course Code: PGDCS-101 Published by Dr. Babasaheb Ambedkar
2. Open University Cyber Security Techniques: PGDCS-103 Published by Dr. Babasaheb AmbedkarOpenUniversity

Reference Books

1. Cyber Security – Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Author: Nina Godbole, Sunit Belapure, Publisher: Wiley India
2. Information Systems Security – Security Management, Metrics, Frameworks and Best Practices Author: Nina Godbole, Publisher: Wiley India.

NPTEL Link

https://onlinecourses.swayam2.ac.in/nou24_ge65/preview

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

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

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

T. Y. B. Tech. E&TC Pattern 2023

2302309: MDM3: Data Science Using Python

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

Prerequisite Courses, if any: prior knowledge of programming language would be helpful

Companion course, if any: understanding of Python,MATLAB

Course Objectives:

1. To introduce the core concepts and ecosystem of Data Science.
2. To establish a solid foundation in statistical and probabilistic reasoning.
3. To develop proficiency in Python programming.
4. To equip learners with skills in data handling and visualization.
5. To prepare students to build end-to-end data science solutions.

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

	Course Outcomes	**Bloom's Level**
CO1	Utilize Python programming and core data structures to handle and manipulate data for data science applications.	**3**
CO2	Apply statistical analysis, probability theory, hypothesis testing, and exploratory techniques to extract meaningful insights from data.	**3**
CO3	Perform essential data preprocessing, dimensionality reduction, and apply supervised learning algorithms for predictive analytics.	**3-Apply & 4-Analysis**
CO4	Implement deep learning and unsupervised learning techniques to solve complex data science problems such as classification, clustering, and anomaly detection.	**3-Apply & 6-Implementation**
CO5	Design and execute end-to-end data science projects, from data collection to model deployment, using Python and MATLAB.	**3-Apply& 5-Evaluation**

COURSE CONTENTS

Unit I	**Introduction to Data Science**	**(08hrs)**	**COs Mapped - CO1**

Introduction to data science, Difference in AI, Machine Learning and Data Science, Basic introduction of python, Google Colab and their features

Python Data Types, Input/Output, Operators: Precedence and Associativity, Decision

Making and Looping, Function and its syntax, Positional arguments, Keyword arguments etc, Exercises on Loops, decision making and functions, String: Operations & Functions, List: Accessing List, Slicing, Cloning/Copy etc,Set and Tuple: Accessing, Slicing, Operations & Functions,Dictionary: Properties, Accessing Dictionary, Problems on Dictionary,Exercises on String, Set, Tuple and Dictionary

Unit II	Statistics, Probability & Data Exploration	**(07hrs)**	**COs Mapped - CO2**

Measures of centrality, dispersion, skewness, and kurtosis , Data distributions and estimation, Exploratory Data Analysis (EDA): visualization, outliers, correlation, Hypothesis testing: t-tests, chi-square, ANOVA, p-values, Probability theory fundamentals, Hands-on exercises using Python (NumPy, Pandas, Seaborn/Matplotlib, SciPy)

Unit III	Data Pre-processing and Supervised learning	**(07hrs)**	**COs Mapped - CO3**

Data Preprocessing, Handling missing values, Class Imbalance and its remedies,Feature Scaling, Transformation, Discretization, Image and Text Preprocessing,Dimensionality Reduction, Feature Ranking, Feature Selection and Feature Extraction,Exercises on Data Preprocessing and Dimensionality Reduction

Performance measures: Error, Accuracy, Precision, Recall, Confusion Matrix and AUC Score
Exercises on supervised learning algorithms: Linear Regression – Predict Housing Prices, Logistic Regression – Binary Classification, KNN Classifier – Handwritten Digit Recognition, Decision Tree Classifier – Play Tennis Dataset, Random Forest – Customer Churn Prediction
Project 1: Student Performance Prediction, Project 2: Email Spam Classifier, Project 3: Multi-Class Classification – Iris Dataset

Unit IV	Advanced Neural Networks & Unsupervised Learning	**(07hrs)**	**COs Mapped - CO4**

Overview of modern Deep Learning frameworks: TensorFlow, Keras, PyTorch

Applications of Unsupervised Learning: Clustering, anomaly detection, dimensionality reduction
Deep Learning: Image Classification and Convolutional Neural Networks,Text Classification and Recurrent Neural Networks,
Exercises using deep learning models: Convolutional Neural Networks (CNNs) for Image Classification, Recurrent Neural Networks (RNNs) for Text Classification, Sentiment analysis or SMS spam classification using RNN

Unit V	End to End project using Python and MATLAB	**(07hrs)**	**COs Mapped – CO5**

Steps for end to end machine learning project, End-to-end implementation of various real-life projects using python: Sentiment Analysis using LSTM, Real-Time Object Detection, Image Classification on CIFAR-10

End-to-end implementation of various real-life projects using MATLAB: ECG Signal Classification using ML, Image Segmentation using K-Means
Text Books
1. Grus, J. (2019). Data science from scratch: first principles with python. O'Reilly Media
Reference Books
2. Kroese, D. P., Botev, Z., Taimre, T., & Vaisman, R. (2019). Data science and machine learning: mathematical and statistical methods. CRC Press. 3. Thareja, R. (2022) Data Science and Machine Learning using Python. McGraw Hill.
NPTEL Link
https://onlinecourses.nptel.ac.in/noc24_cs59/preview **https://www.youtube.com/watch?v=tA42nHmmEKw&list=PLyqSpQzTE6M_fFg1zZmeGIkenMDgXKGYi**

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

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

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

T. Y. B. Tech.Pattern 2023 Semester: V **2302310: Intellectual Property Rights (IPR)** **(Branch: E&TC)**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 01hr/week **Practical : 02hrs/week**	**01**	**Tutorial: 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: NA		

Course Objectives:

1. To provide a comprehensive understanding of the patent system and its importance in protecting inventions.
2. To equip students with the knowledge and skills necessary to analyze inventions for patentability.
3. To teach students the principles and techniques of drafting clear, concise, and legally sound patent applications

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

	Course Outcomes	**Bloom's Level**
CO1	Explain the patent system and its requirements.	**2-Understand**
CO2	Determine if an invention can be patented.	**2-Understand**
CO3	Draft a patent application.	**2-Understand**

COURSE CONTENTS

Unit I	**Indian Patent System & Patentability Basics**	**(04 hrs)**	**COs Mapped - CO1**

Overview of the Indian Patent System, Structure and Scope of the Patents Act, 1970 ,Key Provisions of the Patents Rules, 2003 (incl. Amendments)

Patentability Criteria: Novelty, Inventive Step, Industrial Applicability, Statutory Exceptions

Unit II	**Patent Drafting & Filing Procedure**	**(04 hrs)**	**COs Mapped – CO2**

Types of Patent Applications: Ordinary, Convention, PCT, Provisional vs. Complete Specification, Structure of a Patent, Document: Title, Abstract, Description, Claims , Basics of Patent Drafting **Patent Filing Process:** Filing, Publication, Request for Examination (RFE), First Examination Report (FER), Responses & Amendments

Unit III	**Grant, Opposition & Global Aspects**	**(04 hrs)**	**COs Mapped – CO3**

Powers of Controller & FER Decisions, Pre-Grant and Post-Grant Opposition , Patent Grant and Rights, Compulsory Licensing , Patent Enforcement and Infringement , PCT

&Convention Applications , International Filing and Timelines
Text Books
1. Kalyan C. Kankanala, A.K. Narasani, V. Radhakrishnan, “Indian Patent Law and Practice”, Oxford Press.
Reference Books
1. David Bainbridge, “Intellectual Property”, Pearson. 2. **NPTEL Course on Intellectual Property** NPTEL Course on “Patent Law for Scientists and Engineers” by Prof. Feroz Ali IIT Madras Link of the Course: https://onlinecourses.nptel.ac.in/noc20_hs55/preview

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

Guidelines for Tutorial & Teamwork Allocation		
Sr. No.	**Components**	**Marks Allotted**
1	Tutorials	25
2	Performance in Lab	25

List of Tutorials (25 Marks)

1. To write a patent draft.
2. To write a Copyright Registration Draft
3. To Draft a Trademark Application
4. To Prepare an Invention Disclosure Form (IDF)
5. To write a Software Copyright Draft

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

T. Y. B. Tech.Pattern 2023 Semester: V **2302310: Lab work in Intellectual Property Rights (IPR)** **(Branch: E&TC)**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial: 01hr/week **Practical : 02hrs/week**	**01**	**Tutorial: 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: NA		
Companion course, if any: Intellectual Property Rights		

Course Objectives:

1. Understand the Indian Patent System and key legal provisions.
2. Analyze patentability through prior art and trademark searches.
3. Draft provisional and complete patent specifications.

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

	Course Outcomes	**Bloom's Level (Cognitive domain)**	**Bloom's Level (Psychomotor domain)**
CO1	Navigate the Indian Patent Office (IPO) portal and interpret key sections of the Patents Act and Rules.	2- Understand	1-Imitation
CO2	Evaluate the patentability of inventions through novelty, inventive step, and prior art/trademark searches.	5- Evaluate	2- Manipulation
CO3	Draft provisional and complete patent specifications for a given technical idea.	6- Create	3- Precision

List of Laboratory Experiments

Sr. No.	**Laboratory Experiments**	**CO Mapped**
1	Introduction to Patent System : Practical overview of Indian Patent Office (IPO) website	**CO1**
2	Understanding Patent Acts & Rules: Identify major sections and amendments	**CO1**
3	**Patentability Analysis (Novelty, Inventive Step, etc.)**and Copyright - Compare two similar patents - Identify novelty and inventive step	**CO2**
4	Prior Product / circuit Design Search Activity (Trademark , etc)	**CO2**

5	**Understanding Patent Specifications** - Dissect a sample patent (Title, Abstract, Claims, Description)	**CO3**
6	**Patent Drafting Exercise – Part 1** - Draft a Provisional Specification for a given project idea	**CO3**
7	**Patent Drafting Exercise – Part 2** - Convert the provisional into a Complete Specification	**CO3**
8	Evaluation & Presentation	**CO3**

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations, calculation, and outcome of this experiment.
2. Lab assistants will provide access to patent databases, project ideas, templates, and required tools.
3. Students will perform the activity (e.g., draft a patent, compare patents, dissect a sample patent) in groups under supervision.
4. Submit your work (search results/drafts/comparisons) to the faculty for review and feedback.
5. Based on feedback, write a brief conclusion summarizing your understanding and final outcome.

Guidelines for Student's Lab Journal

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

Guidelines for Termwork Assessment

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

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

SEMESTER VII

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

T. Y. B. Tech. Pattern 2023 Semester: VI

2302311: Embedded System

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous ComprehensiveEvaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: Microcontrollers

Companion course, if any:

Course Objectives:

1. To make the students aware of the need of Embedded C and programming in Embedded C.
2. To get the students acquainted with the need and applications of ARM Microprocessors in Embedded systems.
3. To get insight of architecture and features of basic microcontrollers.
4. To enhance the capabilities of students to interface of various I/O devices, sensors and communication devices.

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

	Course Outcomes	**Bloom's Level**
CO1	Explain the basics of embedded system	2-Understand
CO2	Apply different peripherals of ARM 7 based microcontrollers	3-Apply
CO3	Interface different real time devices ARM 7 based microcontrollers	3-Apply
CO4	Select software architecture for embedded system	3-Apply
CO5	Implement embedded system using 32 bit microcontroller	3-Apply,

COURSE CONTENTS

Unit I	**Embedded System Overview**	**(06 hrs)**	**COs Mapped - CO1**

Embedded System Introduction, Hardware and software architectures of Embedded System, Classification and Characteristics of Embedded System ,Design metrics(technical and techno- economical), Embedded processor technology, Selection of microcontroller and memory , Embedded system life cycle

Unit II	**ARM 7 based Microcontroller**	**(07 hrs)**	**COs Mapped - CO2**

ARM core data flow model, Programmers model, Registers, CPSR and SPSR, Processor

modes, ARM Nomenclature. LPC2148: Features, Block Diagram and Description, System Control Block, Memory Map, System Control Block (PLL and VPB divider), Pin Connect Block, GPIO, Timer Block for Delay Generation

Unit III	**ARM Peripheral**	**(07 hrs)**	**COs Mapped – CO3**

LPC 2148 Interfacing with LED, Switches and RelayLPC 2148 interface with LCD , on-chip DAC for waveform generation, Interfacing with ARM 7 with DHT 11 sensor and servomotor, on-chip ADC, Vector Interrupt Controller(VIC)

Unit IV	**Software aspects of embedded systems**	**(07 hrs)**	**COs Mapped – CO4**

Programming Embedded C,OS used in embedded system, Real time OS:Usage of Shared resources and related issues**,** Concept of RTOS, Types of RTOS, differences from GPOS, real time scheduling

Unit V	**Latest trend in embedded system and Case Studies**	**(06 hrs)**	**COs Mapped – CO5**

Latest trend in embedded system**,** Vending Machine, Digital Camera, Robotics Arm Control
Text Books
1.K.V. Shibu, “Introduction to Embedded Systems”, McGraw Hill Education India Private Limited, 2n d Edition 2. Lyla B Das “Embedded Systems” Pearson publication 3. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide – Designing and Optimizing System Software”, Elsevier, 1st Edition
Reference Books
1.UM10139 LPC214x User manual, NXP Semiconductor

Strength of CO-PO Mapping														
	PO													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	2	3
CO2	3	2	-	-	3	-	-	-	-	-	-	3	2	3
CO3	3	2	3	-	3	-	-	-	-	-	-	3	3	3
CO4	3	2	3	-	3	-	-	-	-	-	-	3	2	2
CO5	3	3	3	-	3	-	-	-	-	-	-	3	3	3

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	5 Quiz	10
	Total	**20**

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

B. E. B. Tech. Pattern 2023 Semester: VII **2302312: Power Electronics**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**02**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any: Basic Electronics		
1. To introduce different power devices viz. SCR, GTO, MOSFET and IGBT with construction,characteristics, repetitive and non-repetitive ratings and typical triggering/driver circuits. 2. To understand working, design and performance analysis and applications of various power converter circuits such as ac to dc converters, inverter and chopper To know various protection circuit requirements of power electronic devices.		

	Course Outcomes	**Bloom's Level**
CO1	**Select power devices for different power power conversion applications. Design & Implement gate drive circuits for power devices**	3- Apply 2-Understand
CO2	Understand the operation of Controlled rectifiers & Single phase AC voltage controller. Analyze performance parameters of Controlled rectifiers	4-Analysis, 2-Understand
CO3	Understand the operation of Choppers and Analyze performance parameters of choppers	4-Analysis, 2-Understand
CO4	Understand the operation of Inverters and Analyze performance parameters of Inverters	4-Analysis, 2-Understand
CO5	Utilize power converters in different industrial applications.	3-Apply

COURSE CONTENTS

Unit I	**Power Devices**	**(08 hrs)**	**COs Mapped - CO1**
SCR: Construction, Operation & characteristics, different ratings, Triggering Methods, Snubber Circuits. Power MOSFET: Construction, Operation, Static characteristics, Switching characteristics, Breakdown voltages, Safe Operating Area. IGBT: Construction, Operation, Steady state characteristics, Switching characteristics, Safe operating area, applications, Typical Gate drive circuits for Power MOSFET / IGBT			
Unit II	**Controlled Rectifiers & Single phase AC voltage controller**	**(07 hrs)**	**COs Mapped - CO2**

Single phase Semi & Full converters for R, R-L loads, Performance parameters, Three phase Semi & Full converters, Power factor improvement techniques, PWM rectifiers, Single phase AC voltage controller with R load. Typical Gate drive circuits for controlled rectifiers

Unit III	**DC-DC Converters**	**(07 hrs)**	**COs Mapped – CO3**

Step down chopper for R/RL load, Step up chopper, control strategies. 2-quadrant & 4 Quadrant choppers, Performance parameters, Applications of choppers SMPS, SMPS topologies, Flyback converter, Buck regulator TPS40200.

Unit IV	**DC-AC Converters**	**(07 hrs)**	**COs Mapped – CO4**

Single phase full bridge inverter for R & R-L loads, performance parameters, three phase voltage source inverter for balanced star R load. Variable frequency and Voltage control of inverters, Need of PWM inverters. Design of control circuit design for inverters using PWM ICs LM3524.

Unit V	**Power Electronics Applications**	**(07 hrs)**	**COs Mapped – CO5**

UPS, HVDC Transmission System, DC drives, Three phase VFD drive, three phase BLDC drive

Text Books

1. M. H. Rashid, “Power Electronics Circuits Devices and Applications”, PHI, 4th Edition 2017 New Delhi.
2. M. D. Singh and K. B. Khanchandani, “Power Electronics”, TMH, 2nd Edition 2006.

Reference Books

1. Bogdan M. Wilamowski, J. David Irwin, “The Power Electronics and Motor Drives Handbook”, CRC Press, 1st Edition, 2011. eBook: ISBN 9780429165627, 2019.
2. Muhammad H. Rashid, “Power Electronics Handbook”, Academic Press, 2nd Edition, 2001
3. Ned Mohan, T. Undeland & W. Robbins, “Power Electronics Converters Applications and Design,John Willey & sons, Singapore, 2nd Edition Oxford University Press, New Delhi, 2005
4. Ali Emadi Alireza Khaligh Zhong Nie Young Joo Lee, “Integrated Power Electronic Converters and Digital Control”, CRC Press, 1st Edition.
5. Vinod Kumar Khanna “Insulated Gate Bipolar Transistor IGBT Theory and Design”, John Wiley & Sons, Illustrated Edition. Print ISBN: 9780471238454; Online ISBN: 9780471722915, DOI: 10.1002/047172291.
6. L. Ashok Kumar, S. Albert Alexander and Madhuvanthani Rajendran, “Power Electronic Converters for Solar Photovoltaic Systems”, Elsevier, 1st Edition, 2020

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester: I **2302313: Lab work in Embedded Systems and Power Electronics**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical :02hrs/week	01	**Practical : 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: Microcontrollers		
Course Outcomes: On completion of the course, students will be able to–		

	Course Outcomes	**Bloom's Level**	**Psychomotor domain**
CO1	Apply knowledge of digital I/O configuration to interface basic components with LPC2148 microcontroller.	Apply	Adaptation
CO2	Apply programming skills to initialize peripherals and interface sensors and actuators using LPC 2148.	Apply	Adaptation
CO3	Apply serial communication to communicate with outside world.	Apply	Adaptation
CO1	Understand the operating principles of various power electronic devices	Understand	Imitation
CO2	Use power electronic simulation packages & hardware to develop the power converters.	Apply	Adaptation
CO3	Analyze and choose the appropriate converters for various applications	Apply	Adaptation

PART A

List of Laboratory Experiments / Assignments		
Sr. No	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Write a program to interface button, LED, relay and buzzer to LPC 2148	CO1
2	Write a program to interface GLCD to LPC 2148	CO1
3	Generate square wave, triangular and Sawtooth using DAC.	CO2
4	ADC (Analog-to-Digital Converter) Interface using LPC2148: Read data from Temperature Sensor (e.g., LM35) and LDR sensor	CO2
5	Write a program to interface servo motor to LPC2148	CO2
6	Transmit and receive data using serial communication to another Board or PC	CO3
7	Interface a GSM module to LPC2148 and write a program to Send and receive messages using GSM to another user.	CO3
8	Interface a GSM module to LPC2148 and write a program to track the location using GPS.	CO3

PART B

List of Laboratory Experiments / Assignments		
Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	Study static characteristics of SCR and decide in which region it gets turn on.	CO1
2	Plot V-I characteristics of Power MOSFET & understand its application as a Switch.	CO1
3	Study the static characteristics of IGBT and compare it with MOSFET.	CO1
4	Implement the design for single phase full converter using IGBT / SCR with R & R-L load and observe the effect of firing angle on the load.(Bulb)	CO2
5	Implement Step down / step up chopper using power MOSFET and observe the effect of ON time period on the Output.	CO2
6	To study the design for 5V battery charger using IC TPS40200.	CO3
7	Single-Phase PWM bridge inverter.	CO2
8	To study DC motor controller.	CO3
9	Study the application of solar cells for providing electrical energy to the domestic appliances such as lamp, fan and radio.	CO3

Guidelines for Laboratory Conduction
1. Teacher will brief the given interfacing of embedded system to students 2. Microcontroller Kits and interfacing modules will be provided in the Lab 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 interfacing and programming students will check their results 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, interfacing diagram, algorithm, procedure, calculations, waveform, conclusion and questions, if any
Guidelines for Term work Assessment
Each experiment from the lab journal is assessed for thirty marks based on three rubrics. Rubrics R-1 for timely completion R-2 for understanding R-3 for presentation/journal writing where each rubric carries ten marks

Strength of CO-PO/PSO Mapping (Sample):

Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped.

Each Course Outcome addresses a sub-set of POs and PSOs to varying levels.

(Strengths: 1- Low, 2 – Medium, 3 - Strong)

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

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

T. Y. B. Tech. Pattern 2023 Semester: VI **2302314A: Microwave Engineering**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any: Electromagnetic fields, wave propagation, and network theory		
Companion course, if any: --		

Course Objectives:

1. To introduce the fundamental principles of microwave engineering, including microwave transmission lines.
2. To familiarize students with waveguides, impedance matching techniques, and microwave network analysis.
3. To explore microwave components, semiconductor devices, and integrated circuits used in communication and radar systems.

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

	Course Outcomes	**Bloom's Level**
CO1	Understand the fundamentals of microwave technology and the principles governing transmission lines and wave propagation.	2
CO2	Analyse wave propagation in different waveguide structures and understand the application of Smith charts. utilize scattering matrix representations for N-port microwave network analysis.	3
CO3	Analyse scattering matrix representations for microwave networks, design impedance matching circuits, evaluate microwave components, and apply the knowledge in system design.	3
CO4	Study the characteristics and applications of microwave semiconductor devices, including transistors and diodes, design single-stage transistor amplifier and evaluate RF and microwave oscillators	3
CO5	Understand the principles and operation of microwave tubes, ferrite-based components, and microwave integrated circuits, and apply this knowledge to real-world applications in radar, satellite, and communication systems	3

COURSE CONTENTS			
Unit I:	**Fundamentals of Microwave Engineering and Transmission Line Theory**	**(07 hrs)**	**COs Mapped - CO1**
Brief history of microwaves, microwave frequency bands, different applications of microwaves, microwave transmission lines, wave propagation in transmission lines, lossy and distortionless transmission lines.			
Unit II:	**Microwave Network Analysis and Waveguide Fundamentals**	**(07 hrs)**	**COs Mapped - CO2**
Smith chart - fundamentals and applications, introduction to waveguides and wave types - TE, TM, TEM, TE & TM modes in circular and rectangular waveguides, cutoff frequency, attenuation in waveguides, waveguide impedance and equivalent circuits, N-port microwave networks, impedance, admittance and scattering matrix representations.			
Unit III:	**Microwave Network Theory, Impedance Matching, Resonators, and Passive Components**	**(8 hrs)**	**COs Mapped – CO3**
S-parameters and network analysis, properties of S matrix, impedance matching techniques, QWT and applications, microwave resonators, waveguide resonators, resonant frequency, microwave power dividers, T-junction power divider, microwave directional coupler, microwave filter design process.			
Unit IV:	**Microwave Semiconductor Devices, Amplifier Design, and Oscillator Principle**	**(07 hrs)**	**COs Mapped – CO4**
Microwave semiconductor devices - PIN, schottky, tunnel and varactor diodes, PIN Diode-Based Microwave Switching and Phase Control, Negative Resistance Devices and Gunn Diode, Avalanche Transit-Time Devices, Microwave Amplifier Design			
Unit V:	**Microwave Tubes, Ferrite Devices, Integrated Circuits, and Practical Applications**	**(07 hrs)**	**COs Mapped – CO5**
Microwave vacuum electron devices, Microwave Propagation and Non-Reciprocal Components, Microwave Integrated Circuits (MICs) and Planar Technologies, Microwave applications and system relevance.			

Text Books

1. R. E. Collin, Foundations for microwave engineering, second edition, Jan. 2001, Wiley IEEE Press, ISBN: 978-078-03-6031-0
2. David M. Pozar, Microwave Engineering, fourth edition, Jan. 2013, Wiley, ISBN: 978-812-65-4190-4

Reference Books

1. R.S. Rao, Microwave Engineering, second edition, Oct. 2015, PHI Learning Pvt. Ltd, ISBN: 978-812-03-5159-2
2. Ahmad Shahid Khan, Microwave Engineering: Concepts and Fundamentals, 2014, CRC press, ISBN: 978-113-80-7242-8
3. Michael Steer, Fundamentals of microwave and RF design, 2019, North Carlina State University Library, ISBN: 9781469656892
4. Prakash Kumar Chaturvedi, Microwave, Radar and RF engineering, 2018, Springer, ISBN: 978-981-10-7964-1

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester: VI **2302314B : Process Instrumentation**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any: Basic Electronics Engineering, Mechatronics,		
Companion course, if any: --		
Course Objectives: 1. To Make the students familiar with fundamentals of process control and controls schemes 2. To Fundamentals of PLC(Programmable logic controller) and PLC Programming techniques 3. To discuss role of SCADA(Supervisory Control and Data Acquisition), HMI (Human Machine Interface) interfacing with PLC to provide solutions for Process Industries		

Course Outcomes: On completion of the course, students will be able to–		
	Course Outcomes	**Bloom's Level**
CO1	**Explain** fundamentals of process control and control schemes.	2
CO2	**Explain** concepts of PLC, its uses for industrial applications.	2
CO3	**Discuss** basics of SCADA, HMI and communication with PLC	2
CO4	**Make use of** knowledge of Installation, troubleshooting & maintenance of PLC to provide solutions for industrial automation problems.	3
CO5	**Apply** basic and advanced PLC instructions to implement control logic for various industrial applications	3

COURSE CONTENTS

Unit I	**Process control & control schemes**	**(06 hrs)**	**COs Mapped - CO1**
Introduction to process control, objectives and benefits, types of processes, characteristics, and selection of control action for them. Necessity of process modeling Study of flow control, pressure control, liquid level, temperature, Scaling, Feedback, feedforward, cascade, ratio, split range, selective control, adaptive control, and model based control, Multivariable control, discrete state control.			

Unit II	**Fundamentals of PLC (Programmable Logic controller)**	**(06 hrs)**	**COs Mapped - CO2**
PLC Fundamentals - Block diagram of PLC's, Selection of PLC components(Power supply, CPU, I/Os List , Communication bus Various ranges available in PLC's), I/O list selection /li>, Open-Circuit and Short-Circuit Tests, Types of Inputs & outputs / Source Sink Concepts, Wiring of the I/O devices, Architectural Evolution of PLC, PLC advantages & Disadvantages, PLC vs Computers, Introduction to the field devices, Concept of flags and Scan cycle execution.Overview of Conventional ladders vs PLC Ladder logic, Hardwired Logic vs Programmed logic, Programming word level logic instructions, Relation of digital gate logic to contact/coil logic, Relay logic, Relay Sequencers			
Unit III	**SCADA, HMI & Communication between PLC & SCADA**	**(6 hrs)**	**COs Mapped – CO3**
Fundamentals, Comparison of SCADA, DCS, PLC and smart instruments, Remote Terminal Unit (RTU) structure, MTU (Main terminal unit), functions of MTU, Components of a SCADA system, HMI (Human Machine Interface, Interfacing technique of PLC with HMI. Communication between PLC & SCADA system : Industrial Ethernet, TCP/IP,, Fieldbus, Modbus, LAN connectivity: bridges, routers and switches, SCADA network security, P&ID's fundamentals			
Unit IV	**PLC Installation, troubleshooting and Maintenance**	**(06 hrs)**	**COs Mapped – CO4**
Installation : Consideration of operating environment, Receiving test, check & assembly, Electrical Noise, Leaky inputs & outputs, Grounding, voltage variations & surges, Circuit protections & wiring, Program Editing & Commissioning. Troubleshooting: Processor module, Input & Output malfunctions, Ladder logic program. PLC Maintenance.			
Unit V	**PLC Programming**	**(06 hrs)**	**COs Mapped – CO5**
Processor memory organization, PLC Programming languages, Ladder diagrams, Relays, contactors, switches, sensors, output control devices, latching relays, ladder diagram elements. Instructions: Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Basic Functions : PLC Timer & Counter functions, Timer & Counter Industrial applications, Arithmetic functions, Comparison functions, Jump functions, Data handling functions, Digital Bit functions, PLC matrix Functions, Advanced PLC Functions: Analog PLC operation, PID control of Continuous processes.			
Text Books			
"Programmable Logic Controllers" Frank D. Petruzella McGraw-Hill Education Fourth Edition, Optimization of Industrial Unit Processes - Bela G. Liptak "Programmable Logic Controllers", W. Bolton, Elsevier, Fourth Edition,2015			
Reference Books			
Process Control Instrumentation Technology, C. D. Johnson "Programmable Logic Controllers, Principles & Applications" John W. Wobb, Ronald, A. Rais, PHI publishing, Fifth Edition E-Material : Virtual lab : https://plc-coep.vlabs.ac.in/ PLC manual : http://www.plcmanual.com/			

Learning PLC basics : https://www.youtube.com/watch?v=iF_vvp2kXWg PLC Handbook (practical guide to programming PLC) : www.automationdirect.com

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech.Pattern 2023 Semester: VI

2302314C: Advanced Processor

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

Prerequisite Courses, if any: Embedded system

Companion course, if any:

Course Objectives:

1. To make the students aware of the need of Embedded C and programming in Embedded C.
2. To get the students acquainted with the need and applications of ARM Microprocessors in Embeddedsystems.
3. To get insight of architecture and features of ARM 7 microcontrollers.
4. To enhance the capabilities of students to interface of various I/O devices, sensors and communicationdevices.

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

	Course Outcomes	**Bloom's Level**
CO1	Explain the architectures of ARM Cortex	2-Understand
CO2	Explain different peripherals interface of STM32F4xx	
CO3	Implement the real world interfacing external peripherals and programming of ARM cortex based microcontroller	2-Understand
CO4	Implement serial interface using ARM cortex based microcontroller	3-Apply
CO5	Program ARM cortex using CUBE IDE and embedded C	3-Apply,

COURSE CONTENTS

Unit I	**Embedded Processor Fundamentals**	**(06 hrs)**	**COs Mapped - CO1**

Introduction to ARM CORTEX series: CORTEX A, R, M processors, survey of ARM cortex microcontroller, Firmware development using CMSIS Standard. Introduction to ARM CORTEX M4 microprocessor core, programmer model, Processor Modes, Memory Map

Unit II	**STM32F4xx Peripherals**	**(07 hrs)**	**COs Mapped - CO2**

Introduction Arm Cortex-M cores, STM32F4xx Architecture, ARM STM Bus Architecture,

STM32F4xx Clock and SYSCLK, Peripheral Clock, PLL clock, Interrupts and Exceptions in STM32F4xx.			
Unit III	**STM32F4xx Interfacing**	**(07 hrs)**	**COs Mapped – CO3**
STM32F4xx GPIO Programming, Interfacing seven segment LED, LDR and MQ3 sensor, STM32F4xx: Counters and Timers: Timer and Delay Generation, UART Programming, on chip ADC and Onchip DAC for waveform generation			
Unit IV	**STM32F4xx Interfacing**	**(07 hrs)**	**COs Mapped – CO4**
STM32F4xx Interfacing with accelerometer MPU 6050, Ultrasonic Sensor HC-SR04, PWM: Controlling speed and direction of DC Motor, STM32 interfacing with TFT			
Unit V	**CUBE IDE software and CAN bus**	**(06 hrs)**	**COs Mapped – CO5**
CUBE IDE software , Different STM 32 board, sequence of transmitting and receiving data on CAN Bus, Raspberry PI board and interfacing for different application			

Text Books

1. Shujen Chen, Muhammad Ali Mazidi, Eshragh Ghaemi, "STM32 Arm Programming for Embedded Systems: Using C Language with STM32", Nucleo, Micro DigitalEd., Illustrated Edition,2018

Reference Books

1. RM0390 Reference manual, STM32F446xx advanced Arm®-based 32-bit MCUs
2. Joseph Yiu, "The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors", Newnes, 3rd Edition

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

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

23022314D: Neural Network and Fuzzy Control

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

Prerequisite Courses, if any: Fundamental of Computing

Companion course, if any: NA

Course Objectives:

1. To understand the basic concept of fuzzy sets, fuzzy logic & defuzzification
2. To learn basics of Artificial Neural of theory and programming of Microprocessors
3. To analyze various techniques in feedback and feed forward Neural networks.
4. To Understand the principle of competitive neural networks and Adaptive resonance theory
5. To learn the architecture and algorithm of Cognitron, Neo cognitron The concepts of fuzzy associative memory and fuzzy systems.

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

	Course Outcomes	**Bloom's Level**
CO1	Describe the concept of fuzziness involved in various systems Apply the knowledge of fuzzy set theory.	L2
CO2	Understand the difference between learning and programming, Explore different neural network architectures	L2
CO3	Explore practical applications of Neural Networks (NN).	L2
CO4	Explain the fundamental principles of competitive learning in neural networks.	L2
CO5	Describe the basics of genetic algorithms, the use of GA operators, and their applications.	L2

COURSE CONTENTS

Unit I	**Fundamentals of Fuzzy Logic**	**(06 hrs)**	**COs Mapped - CO1**

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union intersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems

Unit II	**Architecture of Neural Networks**	**(08 hrs)**	**COs Mapped - CO2**

Architectures: motivation for the development of natural networks-artificial neural

networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functions Basic learning rules- Mcculloch-Pitts neuron-Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

Unit III	**Basic Neural Network Techniques**	**(07 hrs)**	**COs Mapped – CO2**

Back propagation neural net: standard back propagation-architecture algorithm- derivation of learning rulesnumber of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

Unit IV	**Competitive Neural Networks**	**(06 hrs)**	**COs Mapped – CO3**

Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

Unit V	**Special Neural Networks**	**(07 hrs)**	**COs Mapped – CO4**

Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.

Text Books

1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

Reference Books

1. Bart Kosko, ―Neural network and Fuzzy System‖ - Prentice Hall-1994.
2. J.Klin and T.A.Folger, ―Fuzzy sets‖ University and information- Prentice Hall -1996. J.M.Zurada, ―Introduction to artificial neural systems‖-Jaico Publication house,Delhi 1994.
3. VallusuRao and HayagvnaRao , ―C++ Neural network and fuzzy logic‖-BPB and Publication, New Delhi,1996.
4. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

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

Strength of CO-PO Mapping	CO-PSO

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester: VI

23022315A: Advanced DSP

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous ComprehensiveEvaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**

Prerequisite Courses, if any: Digital Signal Processing

Companion course, if any: NA

1. To understand Multirate Signal Processing fundamentals and applications.
2. To introduce wavelet transforms and digital filter implementation of wavelets and applications
3. To study Adaptive Filters, LMS and RLS algorithms and Linear Prediction Filters
4. To introduce different methods for power Spectrum estimation of signals.
5. To understand application of signal processing to real world problems.

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

	Course Outcomes	**Bloom's Level**
CO1	**Design** of practical sampling rate converters, and applications.	L6
CO2	**Understand** theory of wavelets and capable of **Designing** wavelet filters.	L6
CO3	**Implement** adaptive filters for given applications.	L3
CO4	**Estimate** power spectrum of signals using different methods.	L4
CO5	**Apply** signal processing tools to Biomedical and Telecommunication Applications	L2

COURSE CONTENTS

Unit I	**Multirate DSP**	**(06 hrs)**	**COs Mapped - CO1**

Down sampling, Up sampling, Relation between the Fourier transform of the input and output of the down sampling and up sampling, Representation of decimator and interpolator, Changing the sampling rate by noninteger factor, Multistage approach to sampling rate conversion, Design of practical sampling rate converters, Polyphase decomposition of decimator and interpolator, Oversampling ADC analysis, Two channel QMF bank structure, Analysis of Two-Channel QMF Bank. Design of perfect reconstruction M-channel filter banks, Tree structured filter banks, Application examples

Unit II	**Wavelet transforms**	**(08 hrs)**	**COs Mapped - CO2**

Time frequency representation of signals, short-time Fourier transform (STFT), Scaling functions and wavelets, Discrete wavelet transform (DWT), Multi-resolution analysis

(MRA), Wavelet reconstruction, design of decomposition and reconstruction filters for Haar, Daubechies and biorthogonal wavelets, Digital filter implementation of wavelets, Application examples

Unit III	Adaptive Digital Filters	(07 hrs)	COs Mapped – CO2

Adaptive Filter Structures, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm, Application Examples. Linear Prediction & Optimum Linear Filters: Linear prediction, forward-backward linear prediction filters, solution of normal equations, Wiener Filters.

Unit IV	Power Spectrum Estimation	(06 hrs)	COs Mapped – CO3

Nonparametric Methods and parametric Methods for Power Spectrum Estimation, Minimum-variance spectral estimation, Eigen analysis Algorithms for Spectrum Estimation...

Unit V	Application of Signal Processing	(07 hrs)	COs Mapped – CO4

1. Biomedical Applications
2. Audio Applications
3. Telecommunication Applications (Radar)
4. Applications to astronomy

Text Books

1. K. Deergha Rao and MNS Swamy, "Digital Signal Processing Theory and Practice", Springer, 2018.
2. Sanjit K. Mitra, "Digital Signal Processing", 3/e, Tata McGraw-Hill Edition, 2006.

Reference Books

1. J.G.Proakis and D.G. Manolakis," Digital signal processing: Principles, Algorithm and Applications", 4th Edition, Prentice Hall, 2007..
2. S.Haykin, "Adaptive Filter Theory", 4th Edition, Prentice Hall, 2001. Steven M Kay, "Modern Spectral Estimation Theory and Application", Prentice Hall,1988.

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10

	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester: VI

2302315B: FPGA Based System Design (Elective 3)

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

Prerequisite Courses, if any: VLSI design technology

Companion course, if any: -

Course Objectives:

1. To make the students understand basic architecture of FPGA
2. To make the students Understand various parameters of design abstraction used in IC technology.
3. To make the students Understand importance of FPGA for implementing FPGA based system
4. To Study and apply various design algorithms for placement and routing.
5. To Acquire knowledge of sequential machine design styles.
6. To Study of latest SOC devices

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

	Course Outcomes	**Bloom's Level**
CO1	Demonstrate semiconductor IC design using FPGA	3-Apply
CO2	Analysis of design rules and layout diagram	3-Apply, 4-Analysis
CO3	Demonstrate working principle of power and energy optimization	6-Design 4-Analysis
CO4	Analyze the performance of digital system	4-Analysis
CO5	Explore latest trends in SOC devices	2-Understand

COURSE CONTENTS

Unit I	**Introduction to System Design**	**(07 hrs)**	**COs Mapped - CO1**

Introduction, Basic concepts , Boolean Algebra, schematic and Logic symbols, Digital Design and FPGAs,the role of FPGAs, FPGA types, types of ASICS, FPGA Vs. Custom VLSI, FPGA Based system Design, goals and techniques, hierarchical Design, Design abstraction, Methodologies.

Unit II	**Chip Technology**	**(07 hrs)**	**COs Mapped - CO2**

IC Technology, Economics, CMOS Technology overview, Power consumption, Hierarchical design, Design Abstraction, EDA tools. MOSFET model, parasitics, latch up, advanced transistor structures; Wire parasitics; Design rules, Scalable design rules, process parameters; stick diagrams, Layout design tools; Layout synthesis, layout analysis.

Unit III	**Chip Construction**	**(08 hrs)**	**COs Mapped – CO3**

The logic design process, Combinational Network Delay, Power and energy optimization, Logic implementation for FPGAs, Physical design for FPGAs, design of algorithms for Placement and Routing, Placement algorithms: Mincut, Eigenvalue. Routing algorithms: Left edge, clock routing, power routing.

Unit IV	**Architecture**	**(07 hrs)**	**COs Mapped – CO4**

The sequential machine design process, Sequential Design styles, rules for Clocking, Performance analysis.

Behavioral Design, Design methodologies and Design examples

Unit V	**Current State of the Field**	**(07 hrs)**	**COs Mapped – CO5**

SOC, IP Design, Design methodology, System Modeling, Hardware Software Co-design, Application Domains, Study of latest SOC device (Zinq 7000), Create a Zynq Hardware design, Fundamentals of Zynq design in Xilinx SDK, Structure of processing Logic, Difference between Processing Logic (PL) and processing Systems(PS)

Text Books

. FPGA Based System Design by Wanye Wolf , Pearson Publication.

Reference Books

1. Kamaran Eshraghian, “Principles of CMOS VLSI Design”, Pearson Education
2. Rabey, Chandrakasan, “Digital IC Design”, Pearson Publication.

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10

2	Performance in LMS Tests (5 tests, one on each unit)	10
	Total	**20**

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

(Autonomous from Academic Year 2022-23)

T. Y. B. Tech. E&TC Pattern 2023

ETC223015: Elective III: Circular Economy

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

Prerequisite Courses, if any: None

Companion course, if any:

Course Objectives:

1. To provide students with exposure to real-time industrial environments, enabling them to understand current technologies, tools, and practices that are beyond classroom simulation.
2. To develop and enhance students' technical and managerial skills through hands-on experience,making them industry-ready professionals.
3. To foster the ability to apply academic knowledge to practical problems, including exposure toengineering ethics, responsibilities, and professional conduct.
4. To improve students' communication skills and documentation abilities through writing technicalreports and project summaries based on industrial experiences.
5. To create an understanding of organizational structures, socio-economic factors, quality controlprocesses, and worker psychology in industrial setups.

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

	Course Outcomes	**Bloom's Level**
CO1	Describe the key characteristics of a circular economy	1-Remember
CO2	Comprehend the concept of circularity and conduct relevant research	2- Understand
CO3	Use the principles of circularity for application to sustainable development	3-Apply
CO4	Apply complexity aspects of circular economy for creating circular business models	3-Apply
CO5	Apply the concept of circular economy to environmental engineering problems	3-Apply

COURSE CONTENTS

Unit I	Introduction to Circular Economy	**(04hrs)**	**COs Mapped – CO2**

Linear Economy and its emergence, Economic and Ecological disadvantages of linear economy, Replacing Linear economy by Circular Economy, Development of Concept of Circular Economy, A differential - Linear Vs Circular Economy

Unit II	Characteristics of Circular Economy	**(04hrs)**	**COs Mapped - CO2**

Material recovery, Waste Reduction, reducing negative externalities, Explaining Butterfly diagram, Concept of Loops			
Unit III	Circular design, innovation and Assessment	**(08hrs)**	**COs Mapped – CO1**
Zero waste: Waste Management in context of Circular Economy, Circular design, Research and innovation, LCA, Circular Business Models			
Unit IV	Case Studies	**(09hrs)**	**COs Mapped – CO3,CO4**
Business models, Solid Waste Management / Wastewater, Plastics: A case study, EPR: polluters pay principle, Industrial symbiosis/ Eco-parks			
Unit V	Legal and policy framework	**(05hrs)**	**COs Mapped – CO3,CO4**
Role of governments and networks, Sharing best practices, Universal circular economy policy goals, India and CE strategy, ESG			

Text Books

1. The Circular Economy A User's Guide Walter R Stahel Routledge; 1st Edition (24 June 2019)
2. Circular Economy: (Re) Emerging Movement Shalini Goyal Bhalla Invincible Publisher
3. The Circular Economy Handbook: Realizing The Circular Advantage Peter Lacy, Jessica Long, Wesley Spindler Palgrave Macmillan UK
4. Waste to Wealth: The Circular Economy Advantage Peter Lacy, Jakob Rutqvist Palgrave Macmillan

Reference Books

1. Towards Zero Waste: Circular Economy Boost, Waste to Resources María-Laura Franco-García, Jorge Carlos Carpio-Aguilar, Hans Bressers. Springer International Publishing 2019
2. Strategic Management and the Circular Economy Marcello Tonelli, Nicolo Cristoni, Routledge 2018.
3. Circular Economy: Global Perspective Sadhan Kumar Ghosh, Springer, 2020
4. The Circular Economy: A User's Guide Stahel, Walter R. Routledge 2019
5. An Introduction to Circular Economy Lerwen Liu, Seeram Ramakrishna, Springer Singapore 2021.

Online Resources

1. https://www.coursera.org/learn/circular-economy
2. https://www.edx.org/course/circular-economy-an-introduction
3. https://www.coursera.org/learn/sustainable-digital-innovation
4. https://online-learning.harvard.edu/course/introduction-circular-economy?delta=0
5. https://www.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-WhatWhy-How-Where.pdf
6. https://ic-ce.com/product/principles-of-circular-economy/
7. https://ic-ce.com/product/circular-business-management/
8. https://ic-ce.com/product/bootcamp/ 9. http://ic-ce.com/journal-on-circular-economy/

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

Sr. No.	Components for Continuous Comprehensive Evaluation	Marks Allotted
1	**Assignment:** Assignment No. 1 - Unit 1 (10 Marks) Assignment No. 2 - Unit 2 (10 Marks) Assignment No. 3 – Unit 3(10 Marks) Assignment No. 4 - Unit 4(10 Marks) Assignment No. 5 - Unit 5(10 Marks)	**10**
2	**Quiz (Using LMS):** Unit No. 1 (10 Questions - 10 Marks) Unit No. 2 (10 Questions - 10 Marks) Unit No. 3 (10 Questions - 10 Marks) Unit No. 4 (10 Questions - 10 Marks) Unit No. 5 (10 Questions - 10 Marks)	**10**

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

T. Y. B. Tech.Pattern 2023 Semester: II

2302315D: Automotive Electronics

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week **Practical : NA**	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **In Sem Exam: 20 Marks** **End Sem Exam: 60 Marks**

Prerequisite Courses, if any: Basic electronics engineering, basic electrical engineering Instrumentation system, control system, Microcontroller

Companion course, if any: Fundamentals of Basic electronics

Course Objectives:

1. The student should comprehend the physics & underlying principle behind vehicle control system, batteries, ignition systems, sensors and actuators &other electrical systems
2. To introduce about automotive telematics & invehicle infotainment systems
3. At the end of the course, students are exposed to various automotive communication systems

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

	Course Outcomes	**Bloom's Level**
CO1	Explain the concept of batteries, starting systems, charging systems.	2-Understand
CO2	Explain fuel injection, ignition systems, and lightning system of automotive applications.	2-Understand
CO3	Make use of fundamental knowledge of instrumentation system &control System to explain different types of automotive control systems.	2-Understand
CO4	Recognize need of telematics and infotainment systems in automotive Applications.	2-Understand
CO5	Explain the concept of ECU and design application of automotive electronics using model base development.	3-Apply

COURSE CONTENTS

Unit I	**Batteries & Charging systems**	**(06 hrs)**	**COs Mapped - CO1**

Batteries: Principles and construction of lead-acid battery. Characteristics of battery, rating capacity and efficiency of batteries. Various tests on battery condition, charging methods. Constructional aspect of alkaline battery.

Starting System: Condition at starting. Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Starter Switches.

Charging System: Generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cutout. Voltage & current regulators.

Unit II	Ignition systems and Lightning system	(06 hrs)	COs Mapped - CO2

Fuel Injection, **Ignition Systems:** Introduction, feedback carburetor systems. Throttle body injection and multi-port or point fuel injection, fuel injection systems, Injection system controls. , Types, Construction & working of battery coil and magneto ignition systems. Electronic ignition systems.

Lighting System & Accessories: Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Headlight dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system

Unit III	Automotive control system	(06 hrs)	COs Mapped – CO3

Power train Control Systems: Air–Fuel Ratio Control, Control of Spark Timing, Idle-Speed Control,Transmission control, Cruise control: analog cruise control, adaptive cruise control, advanced cruise control, traction control, antilock braking system (ABS), Electronics steering control, control for lightning, wiper control, air conditioning/Heating, Ignition systems, Remote keyless entry and anti theft systems, method of improving engine performance

Unit IV	Telematics & Infotainment systems	(06 hrs)	COs Mapped – CO4

Global positioning system, Geographical information systems, navigation systems, automotive vision systems, road recognition, driver assistance systems,

In vehicle infotainment : Introduction, use of operating systems in IVI, GENEVI alliance, traffic announcement, Navigation : points of interest, Routes, waypoints, Dead reckoning position, traffic info, GLONASS, GNSS, RTK, GPS & SBAS.)

Unit V	ECU &Automotive communication systems	(06 hrs)	COs Mapped – CO5

ECU Design Cycle: V-Model development cycle, Components of ECU, Examples of ECU on chassis, and in body electronics.Communication interface with ECUs, Relevance of internet protocols, wireless LAN standards, communications protocols for automotive applications such as, CAN, LIN, Flex Ray, ODBII, MOST, IE, D2B, DSI, Model Base Development using MATLAB

Text Books

1. Navigation and intelligent transportation system- progress in technology, Ronald K Jurgan, SAE,USA,1988
2. Understanding Automotive electronics, William B Ribbons, Butterworth Heinmann, 7th edition- 2012

Reference Books

1. Automotive telematics, Dennis Foy, Red Hat, 2012
2. Intra & inter vehicle communication, Gilbert Held, CRC Press, 2007

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 Tests, one on each unit)	10
	Total	**20**

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

T Y. B. Tech.Pattern 2023 Semester: VI **2302316A: Lab work in Microwave Engineering**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Practical Exam: 25 Marks** **TW: 25 Marks**
Prerequisite Courses, if any: Mechatronics		

Course Objectives:

1. An understanding of microwave waveguides, passive & active devices, tubes and network analysis.
2. To understand and handle microwave equipment.
3. To understand microwave measurements

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

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Operate microwave devices and components.	Apply (L3)	Mechanism (P4)
CO2	Analyze and evaluate microwave characteristics and parameters.	Analyze (L4), Evaluate (L5)	Complex Overt Response (P5)

List of Laboratory Experiments

Sr. No.	**Laboratory Experiments**	**CO Mapped**
1	Familiarization with the Microwave Laboratory Apparatus	1
2	To Study the Characteristics of Reflex Klystron	2
3	To Plot the V-I Characteristics of Gunn Diode	2
4	To Study the Basic Properties of E-plane Tee, H-plane Tee and Magic Tee	2
5	To Measure the Scattering Parameters of Circulator	2
6	To study the characteristics of multi-hole directional coupler by measuring the following parameters: coupling factor and directivity of coupler	2
7	To Study the Properties of Magic Tee and Determining the Scattering Parameters of Magic Tee	2
8	To plot the Radiation pattern and Determining Gain of a Pyramidal Horn Antenna	2

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Equipment and kits 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 assistants.
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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Termwork Assessment

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

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

T Y. B. Tech.Pattern 2023 Semester: VI **2302316B: Lab work in Process Instrumentation**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : **02hrs/week**	**01**	**Continuous Comprehensive** **Practical Exam: 25 Marks** **TW: 25 Marks**
Prerequisite Courses, if any: Mechatronics		

Course Objectives:

1. To define and explain the role of Programmable Logic Controllers (PLCs) within process instrumentation systems, including their function in data acquisition, control, and automation of industrial processes
2. To gain practical experience in designing and simulating ladder logic diagrams for implementing fundamental logic gates and basic motor control circuits using Programmable Logic Controllers (PLCs).
3. To develop proficiency in utilizing PLC timer functions (On-delay, Off-delay, Retentive) within ladder logic to create sequential control programs for automation tasks.

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

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Design and implement basic and combinational logic functions using PLC ladder diagrams, including fundamental logic gates and motor control circuits.	3- Apply	4-Manipulation
CO2	Develop and analyze PLC ladder logic programs utilizing timers to implement sequential control for industrial automation applications.	4-Analyzing	4-Manipulation

List of Laboratory Experiments		
Sr. No.	**Laboratory Experiments**	**CO Mapped**
1	Design and simulate PLC ladder logic circuits that effectively implement the fundamental Boolean logic gates: NOT, AND, and OR. Demonstrate the truth table behavior of each gate using the PLC simulation environment. https://plc-coep.vlabs.ac.in/	**CO1**
2	Develop and simulate a PLC ladder logic program to control an output device (e.g., a motor or indicator light) using two momentary pushbuttons: one for starting the device and another for stopping it. The	**CO1**

	output should remain active after the start button is released until the stop button is pressed. Verify the correct start/stop operation through PLC simulation. https://plc-coep.vlabs.ac.in/	
3	Design and simulate a PLC ladder logic program that uses a single momentary push button to toggle the state of an output device (e.g., a light). Each press of the button should switch the output from its current state (ON to OFF, or OFF to ON). Demonstrate the toggling functionality through PLC simulation. https://plc-coep.vlabs.ac.in/	**CO1**
4	Develop and simulate a PLC ladder logic program where an output device (e.g., a conveyor belt) turns ON a specified time delay after an input signal (e.g., a sensor activation) becomes active. Demonstrate and verify the programmed time delay using the PLC simulation environment. https://plc-coep.vlabs.ac.in/	**CO2**
5	Design and simulate a PLC ladder logic program where an output device (e.g., a cooling fan) remains ON for a specific duration after the input signal (e.g., a process completion signal) becomes inactive. Demonstrate and verify the programmed off-delay using the PLC simulation environment. **(Virtual lab simulation)**	**CO2**
6	Develop and simulate a PLC ladder logic program that utilizes a retentive timer to accumulate the duration for which an input signal is active. The accumulated time should be retained even if the input signal becomes inactive and should only reset upon a separate reset condition. Demonstrate the retentive timing functionality and the reset operation using the PLC simulation environment. https://plc-coep.vlabs.ac.in/	**CO2**
7	Design and simulate a PLC ladder logic diagram for a Direct-On-Line (DOL) starter for a three-phase induction motor. The circuit should include a start pushbutton, a stop pushbutton, a motor contactor, and overload protection. Demonstrate the starting and stopping of the motor, as well as the response to an overload condition, within the PLC simulation environment. **https://plc-coep.vlabs.ac.in/**	**CO2**
8	Design and simulate a PLC ladder logic diagram to control a simplified traffic light system for a single intersection. The traffic light sequence should follow a standard pattern: Green for a set duration, followed by Yellow for a shorter duration, and then Red for a specific duration. Implement this cycle continuously in the PLC simulation environment. You should clearly define the time durations for each light. **(Virtual lab simulation)**	**CO2**

Guidelines for Laboratory Conduction

1. Teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Equipment and kits 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 assistants.

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, and diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, if any.

Guidelines for Termwork Assessment

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

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

T. Y. B. Tech. Pattern 2023 Semester: VI **2302316C: Lab Work in Advanced Processor (Elective II)**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical :02hrs/week	**01**	**Practical: 25 MarksTerm work: 25 Marks**
Prerequisite Courses, if any: Microcontroller and Embedded processor		
Companion course, if any: Advanced Processor		
Course Objectives: 1. Interface different devices with STM32F4xx 2. Write program in embedded C using CUBE IDE		

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

	Course Outcomes	Bloom's Level (Cognitive domain)	Bloom's Level (Psychomotor domain)
CO1	Interface different devices to STM32F4xx microcontroller	3-Apply	2-Manipulation
CO2	Write program for different devices in embedded C using CUBE IDE	3-Apply	2-Manipulation

List of Laboratory Experiments / Assignments

Sr. No.	Laboratory Experiments / Assignments (Any 8)	CO Mapped
1	Develop a digital clock system using the STM32F4xx microcontroller and a Seven Segment LED display. The microcontroller can retrieve real-time data from an external RTC (Real-Time Clock) module or an internal timer to display hours, minutes, and seconds on the Seven Segment display	CO1,CO2
2	Create a wireless keyboard interface system where keystrokes from a wireless keyboard are transmitted via UART to the STM32F4xx microcontroller.	CO1,CO2
3	Utilize the on-chip ADC of STM32F4xx to interface with various sensors such as temperature sensors (e.g., LM35), light sensors (e.g., LDR), or pressure sensors.	CO1,CO2
4	Implement PWM-based speed and direction control with the STM32F4xx microcontroller, precise control over the motion of robotic systems	CO1,CO2

5	Implement a greenhouse monitoring system where the STM32F4xx microcontroller with DHT11 sensors is used to measure temperature and humidity levels inside the greenhouse.	CO1,CO2
6	Implement gesture recognition systems using the STM32F4xx microcontroller and MPU6050 sensor to detect and interpret human gestures and movements.	CO1,CO2
7	Develop a distance measurement and obstacle avoidance system using the STM32F4xx microcontroller and HC-SR04 sensor for robotics platforms, drones, or autonomous vehicles.	CO1,CO2
8	Develop a smart lighting system using the STM32F4xx microcontroller and LDR sensor to automatically adjust the brightness of indoor or outdoor lighting based on ambient light levels.	CO1,CO2
9	Implement obstacle detection system using STM32L452RE (Nucleo Board) microcontroller and an IR sensor.	CO1,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 and equipment 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 assistants.
4. After performing the experiment students will check their readings, calculations. After checking they have to write the conclusion of the final result.

Guidelines for Student's Lab Journal

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

Guidelines for Term work Assessment

1. R1: Timely completion of experiment (10 Marks)
2. R2: Understanding of experiment (10 Marks)
3. R3: Presentation / clarity of journal writing (10 Marks)

Total 30 marks for each experiment and average marks of all experiments will be converted into 25 marks of term work.

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

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

T. Y. B. Tech. Pattern 2023Semester: VI **2302314C: Lab work in Neural Network and Fuzzy Control**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Practical : 02hrs/week	**01**	**Practical : 25 Marks** **Term work: 25 Marks**
Prerequisite Courses, if any: Fundamental of Computing		
Course Outcomes: On completion of the course, students will be able to–		

	Course Outcomes	**Bloom's Level**
CO1	Describe the concept of fuzziness involved in various systems Apply the knowledge of fuzzy set theory.	L2
CO2	Understand the difference between learning and programming, Explore different neural network architectures	L2
CO3	Explore practical applications of Neural Networks (NN).	L2
CO4	Explain the fundamental principles of competitive learning in neural networks.	L2
CO5	Describe the basics of genetic algorithms, the use of GA operators, and their applications.	L2

List of Laboratory Experiments / Assignments

Sr. No.	**Laboratory Experiments / Assignments**	**CO Mapped**
1	A university wants to analyze the enrolment of students on two courses, Course A and Course B, to identify: Students enrolled in both courses. Students enrolled in either course. Students enrolled only in Course A. Students not enrolled in Course A. Students enrolled only in Course B. Students did not enroll in Course B.	**CO1**
2	To design and implement models the tipping behaviour of a customer based on the quality of service and food at a restaurant. The system will determine the appropriate tip percentage, considering the subjective and imprecise nature of human decision-making in evaluating service and food quality. Service Quality: A fuzzy input variable representing the quality of service, categorized as "Poor," "Good," or "Excellent." Food Quality: A fuzzy input variable representing the quality of food, categorized as "Bad," "Decent," or "Delicious". "Tip Percentage: representing the recommended tip percentage, categorized as "Low," "Medium," or "High."	**CO1**

3	To design and implement a system for controlling the temperature in a room. The system will adjust the heating or cooling based on the current room temperature and user preferences. The goal is to maintain a comfortable indoor environment while demonstrating scenarios. IF the Current Temperature is Cold AND User Preference is Warm THEN Increase Heating. IF Current Temperature is Hot AND User Preference is Cool THEN Increase Cooling. IF the Current Temperature is Comfortable THEN Maintain Settings.	**CO3**
4	A company wants to allocate employees to projects based on their skills (fuzzy relation R) and project requirements (fuzzy relation S). However, there are constraints such as limited working hours, budget restrictions, and employee availability. The goal is to determine the best employee-project assignments that maximize skill utilization while satisfying the constraints.	**CO2**
5	Traditional washing machines lack intelligent control mechanisms to optimize washing cycles based on fabric type and dirt levels. This results in inefficient use of resources such as water, electricity, and detergent, and may also lead to suboptimal cleaning or potential damage to delicate fabrics. The aim is to design a controller that can intelligently adjust the washing cycle parameters (e.g., wash time, water temperature, agitator speed, and spin speed) based on the type of fabric and the level of dirt detected. Fabric Type: Categorize fabrics into types such as Delicate, Normal, and Heavy-duty. Dirt Level: Measure the dirt level as Low, Medium, or High. Wash Time: Adjust the duration of the wash cycle. Water Temperature: Control the temperature of the water (Cold, Warm, Hot). Agitator Speed: Adjust the speed of the agitator (Low, Medium, High). Spin Speed: Control the speed of the spin cycle (Low, Medium, High).	**CO2**
6	To design and implement a network that simulates a digital circuit capable of performing the XOR (exclusive OR) operation on two binary inputs. The XOR operation is a fundamental logic gate in digital electronics and simulating it using a network will help in understanding the underlying principles of digital logic and network-based implementations. Two binary inputs, A and B, each of which can be either 0 or 1.A single binary output, Y, which represents the result of the XOR operation on inputs A and B. The XOR operation yields 1 if the inputs are different (A=0, B=1 or A=1, B=0) and 0 if the inputs are the same (A=0, B=0 or A=1, B=1).	**CO3**
7	To design and implement a network that simulates a digital circuit capable of performing the AND operation on two binary inputs. The AND operation is one of the basic logic gates in digital electronics and simulating it using a network will help in understanding the foundational principles of digital logic and	**CO3**

	network-based implementations. Two binary inputs, A and B, each of which can be either 0 or 1. A single binary output, Y, which represents the result of the AND operation on inputs A and B. The AND operation yields 1 only if both inputs are 1 (A=1, B=1); otherwise, the output is 0.	
8	To design and implement an unsupervised learning algorithm that simulates associative memory, a type of neural network capable of storing and recalling patterns based on similarity. Associative memory is a fundamental concept in neural networks and cognitive computing, and its implementation will help in understanding how unsupervised learning can be used for pattern recognition and retrieval tasks.	**CO3**
9	To design and implement a system that accurately identifies the closest matching word from a predefined dictionary when given a misspelled or incorrect word. The system should handle various types of errors, such as insertion, deletion, substitution, and transposition of characters, and efficiently return the most likely correct word. The solution should be robust, scalable, and capable of processing inputs with different levels of distortion or incompleteness.	**CO5**

Guidelines for Laboratory Conduction

•1. Use of coding standards and Hungarian notation, proper indentation and comments.

Operating System recommended:- Linux/Windows or its derivative

Guidelines for Student's Lab Journal

Student's lab journal should contain following related things -

Title, Objectives, Hardware/ Software requirement, Theory, and Conclusion

Guidelines for Term work Assessment

- R1: Timely completion of experiment (10 Marks)
- R2: Understanding of experiment (10 Marks)
- R3: Presentation / clarity of journal writing (10 Marks)

Total 30 marks for each experiment and average marks of all experiments will be converted into 25 marks of term work.

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

T. Y. B. Tech. E&TC Pattern 2023

2302377A: MDM4: Cyber Crime Administration

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

Prerequisite Courses, if any: Introduction to Computer Science / Programming, Python, C/C++, Introduction to Cyber Security / Information Security Fundamentals

Companion course, if any: Cybersecurity Laws, Ethics & Policy

Course Objectives:

1. Understand the basic concepts and types of cyber-crimes.
2. Learn about cyber laws and the legal framework related to cyber-crimes.
3. Explore investigation processes and tools used in cyber-crime cases.
4. Promote cyber safety and preventive measures among users.
5. Develop awareness of the role of cyber-crime administration and career opportunities.

.

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

	Course Outcomes	**Bloom's Level**
CO1	Define and describe the nature, types, and motives behind cyber-crimes.	1- Remember, 2- Understand
CO2	Identify and explain the key sections of the IT Act and legal procedures.	2- Understand, 3- Apply
CO3	Apply basic cyber investigation techniques and use common forensic tools.	3- Apply
CO4	Analyze common cyber threats and suggest appropriate safety practices.	4-Analyze
CO5	Examine administrative roles and preventive strategies in cyber-crime management.	2- Understand, 4-Analyze

COURSE CONTENTS

Unit I	**Introduction to Cyber Crime**	**(07hrs)**	**COs Mapped CO1**

What is Cyber Crime, Types of Cyber Crimes, Cyber Criminals and Their Motives, History and Evolution of Cyber Crime, Difference between Traditional Crime and Cyber Crime, Common Cyber Crime Terminologies, Introduction to Cyber Laws, Importance of Cyber Crime Awareness.

Unit II	**Types of Cyber Crimes**	**(08hrs)**	**COs Mapped – CO2**

Hacking, Phishing and Email Scams, Identity Theft, Cyber Bullying and Harassment, Online Fraud and Financial Scams, Child Exploitation and Pornography, Cyber Terrorism, Cyber Crimes Against Women.

Unit III	Cyber Laws and Legal Framework	(07hrs)	COs Mapped - CO3
Introduction to IT Act 2000, Key Sections of the IT Act, Role of Law Enforcement Agencies, Cyber Forensics and Legal Evidence, Arrest and Investigation Procedures, Rights of the Accused, Cyber Crime Courts and Jurisdiction, Limitations of Existing Laws.			
Unit IV	**Cyber Crime Investigation and Tools**	**(07hrs)**	**COs Mapped - CO4**
Steps in Cyber Crime Investigation, Role of Police and Cyber Cells, Collecting Digital Evidence, Email and IP Tracking, Social Media Investigations, Tools for Cyber Forensics, Writing an FIR in Cyber Crime, Case Study: Simple Cyber Crime Case.			
Unit V	**Cyber Safety and Administration**	**(07hrs)**	**COs Mapped - CO5**
Safe Browsing Practices, Using Strong Passwords, Social Media Safety, Reporting a Cyber Crime, Role of Government in Cyber Safety, Awareness Campaigns, Cyber Crime Prevention Tips, Career Roles in Cyber Crime Administration			

Text Books

1. Cyber Laws by Pawan Duggal
2. **Cyber Crime in India** by Dr. M. Dasgupta
3. Prevention of Cyber Crime and Fraud Management by Indian Institute of Banking and Finance/ M.K Geeta and Mr. Swapna Raman

Reference Books

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.
2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
4. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.

NPTEL Link

Cyber Crime Administration - Course (swayam2.ac.in)

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

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

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

T. Y. B. Tech. Pattern 2022 Semester: V **2302317B: MDM4: Deep Learning**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :03 hrs/week	**03**	**Continuous Comprehensive Evaluation: 20 Marks** **InSem Exam: 20 Marks** **EndSem Exam: 60 Marks**
Prerequisite Courses, if any: Machine Learning for Engineering and Science Applications.		
Companion course, if any: NA		

Course Objectives:

1. To explain neural network theory, algorithms, and methodologies.
2. To design and develop deep learning applications, and analyze their complexity and limitations.
3. To Analyze deep learning case studies.

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

	Course Outcomes	**Bloom's Level**
CO1	**Explain** the concepts of deep learning and its frameworks.	2-Understand
CO2	**Describe** various deep learning architectures, including activation functions, batch normalization, and methods to prevent overfitting.	2-Understand
CO3	**Identify** and **apply** deep learning architectures, specifically Convolutional Neural Networks, to computer vision applications.	3-Apply
CO4	**Explain** and **apply** Recurrent Neural Networks (RNNs) and related architectures like LSTMs and GRUs for Natural Language Processing (NLP).	3-Apply
CO5	**Apply** deep learning methodologies to relevant case studies and applications in computer vision and natural language processing.	3-Apply

COURSE CONTENTS

Unit I	**Introduction to Deep Learning and Frameworks**	**(07 hrs)**	**COs Mapped - CO1**

Deep Learning Basics: Intro, History, capabilities, the perceptron, Multi-Layer Perceptron, ANN architecture. Tensor Flow, Creating and Manipulating Tensor Flow Variables, Tensor Flow Operations, Placeholder Tensors, Managing Models over the CPU and GPU, Specifying the Logistic Regression Model in Tensor Flow, Logging and Training the Logistic Regression, Introduction to Keras, PyTorch.

Unit II	Deep Learning Architecture	(07 hrs)	COs Mapped - CO2
Width and Depth of Neural Networks, Different Activation Functions, Batch-normalization, types of loss, Overfitting and generalization., Dropout, regularization Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications.			
Unit III	**Computer Vision**	**(08 hrs)**	**COs Mapped – CO3**
Types of optimizations (ADAM, SGDM, RMS prop etc.), Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Convolution neural networks (CNNs), convolution, pooling and its variations, different deep CNN architectures - LeNet, AlexNet, VGG, PlacesNet, DenseNet, training a CNNs: weights initialization, batch normalization, hyperparameter tuning . Popular CNN Architectures: ResNet, AlexNet – Applications.			
Unit IV	**Natural Language Processing**	**(07 hrs)**	**COs Mapped – CO4**
recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short-Term Memory Networks. Advanced RNN: LSTM, GRU, introduction to Generative Adversarial Networks (GANs).			
Unit V	**Case Study and Applications**	**(07 hrs)**	**COs Mapped – CO5**
Computer Vision: Image Classification, Image net- Detection-Audio Wave Net. Natural Language Processing: Sentimental Analysis, Text preprocessing and chatBot			

Text Books

1. Nikhil Buduma, “Fundamentals of Deep Learning Designing Next-Generation Machine Intelligence Algorithms”, 1st Edition, O’REILLY.
2. Michael Nielsen, “Neural Networks and Deep Learning”, Determination Press.
3. Ian Goodfellow, YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press.
4. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media.
5. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press.
6. Ethem Alpaydin,"Introduction to Machine Learning”, 3rd Edition, Prentice Hall of India.
7. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding”, Deep Neural Networks” Apress, 2018.

Reference Books

1. Goodfellow. I., Bengio.Y., and Courville, A.,“Deep Learning”, MIT Press.
2. Bishop, C.M., “Pattern Recognition and Machine Learning”, Springer.
3. Satish Kumar, “Neural Networks: A Classroom Approach”, Tata McGraw-Hill Education.

MOOC / NPTEL Courses:

1. NPTEL Course on “Deep Learning”, by Prof. Prabir Kumar Bhiswas, IIT Kharagpur. Link of the Course: https://nptel.ac.in/courses/106105215
2. NPTEL Course on “Deep Learning - Part I”, by Prof. Sudarshan Iyengar, Prof Sanatan Sukhija IIT Ropar Link of the Course: https://nptel.ac.in/courses/106106184

Strength of CO-PO Mapping	CO-PSO

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	10
2	Performance in Unit Tests (5 tests, one on each unit)	10
	Total	**20**

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

T. Y. B. Tech. Pattern 2023 Semester:VI **ETC223018: OEC: Digital Marketing**		
Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Theory :02 hrs/week	**02**	**Continuous Comprehensive Evaluation: 50 Marks**

Abstract: This course provides a comprehensive introduction to digital marketing, emphasizing its importance in the modern era. The course explores social media strategies, including the use of platforms like Facebook, Instagram, and LinkedIn for marketing campaigns. Emphasis is placed on understanding emerging trends in digital marketing, such as voice search and chatbots. Through case studies and practical activities, students will gain hands-on experience in creating and executing digital marketing strategies.

Prerequisite Courses, if any: Knowledge of modern social media platforms.

Companion course, if any:-

Course Objectives:

1. To make the students acquainted with digital marketing & process of website design.
2. To make them aware about the various Digital Marketing Tools, use of social media websites for Digital Marketing.
3. To know the recent trends in Digital Marketing.

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

	Course Outcomes	**Bloom's Level**
CO1	**Explain** the importance of Digital marketing in upcoming era.	2-Understand
CO2	**Design** websites using free tools like Wordpress and explore it fordigital marketing.	3-Apply
CO3	**Apply** various keywords for a website & to perform SEO.	3-Apply
CO4	**Explain** various SEM Tools and Illustrate use of Facebook,Instagram, YouTube and LinkedIn for Digital Marketing in real life.	2-Understand
CO5	**Explain** the importance of recent trends in digital marketing.	2-Understand

COURSE CONTENTS

Unit I	**Introduction to Digital Marketing**	**(05 hrs)**	**COs Mapped - CO1**

What is digital marketing?, Importance of digital marketing, Difference between traditional and digital marketing, Discuss the recent trends and current scenario of the industry ,Digital marketing has been a tool of success for companies, Use digital marketing to increase sales, Case studies on digital marketing strategies.

Unit II	**Website Planning and Creation**	**(05 hrs)**	**COs Mapped - CO2**

WWW, Buying a Domain, Core Objective of Website and Flow, One Page Website, Strategic Design of Products & Services Page, Strategic Design of Landing Page, Contact Us Page, Google Analytics Tracking Code, Designing Wordpress Website. Mobile Friendly Website, Payment Gateway like UPI,
e-Commerce.

Unit III	**Search Engine Optimisation (SEO)**	**(05hrs)**	**COs Mapped – CO3**

Introduction to Search Engine Optimization, How does Search Engine work , On-page SEO – content research, keyword research, meta tags, Off-page SEO – link building ,Keyword Research, Factors affecting the rank of a webpage.

Unit IV	**Search Engine Marketing and S**	**(05 hrs)**	**COs Mapped – CO4**

Features of the Google Ads platform and its algorithm, Creating campaigns, Google Adwords, Ad Creation, Site & Keyword Targeting, CPC, CPA & CPM-based Accounts, Demographic Targeting, Google Keyword Planner , B to C Perspective, B to B Perspective, Major Social Media Platforms for Marketing , Facebook & Instagram Marketing, Youtube Marketing, LinkedIn Advertising, Email Marketing.

Unit V	**Upcoming Trends in Digital Marketing**	**(04 hrs)**	**COs Mapped – CO5**

Podcast, OTT Platforms, Mob-Ad, No Click Searches, Google Verified Listing, Voice Search, Visual Search, Online Reviews, Automated and Smart Bidding, Chatbots, Affiliate Marketing.

Text Books

1. Cory Rabazinsky, “Google-Ad words for Beginners: A Do-It-Yourself Guide to PPC Advertising
2. Oliver J Rich, “Digital Marketing”
3. Jan Zimmerman and Deborah, “Social Media Marketing All-In-One for Dummies”.
4. Ian Brodie, “Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing”.

Reference Books
1. Prof. Seema Gupta, “Digital Marketing”, Mcgraw Hill Publications
2. Judy Strauss, Adel Ansary, Raymond Frost, Prentice Hall, “E- Marketing
3. Cecilia Figueroa, “Introduction To Digital Marketing 101”, BPB Publications.

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

Guidelines for Continuous Comprehensive Evaluation of Theory Course		
Sr. No.	**Components for Continuous Comprehensive Evaluation**	**Marks Allotted**
1	Five Assignments on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	25
2	Five Activities on Unit-1, Unit-2, Unit-3, Unit-4 and Unit-5	25
	Total	**50**

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

T. Y. B. Tech.Pattern 2023 Semester: VI

2302319: Web Design

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Tutorial :01 hrs/week	**01**	**--**

Prerequisite Courses, if any: Basics of Internet

Companion course, if any: NA

Course Objectives:

1. To learn basic principles of CSS and HTML.
2. To learn dynamic web pages creation using JAVA script in HTML forms.
3. To introduce the fundamental concepts of UI and UX, to explain their principles, and to familiarize students with commonly used UI/UX design tools and software.

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

	Course Outcomes	**Bloom's Level**
CO1	Explain HTML and CSS Fundamentals.	Understand
CO2	Explain Java script fundamentals.	Understand
CO3	Apply the basic principles of UI and UX design, and explore standard tools used for designing user interfaces and experiences.	Apply

COURSE CONTENTS

Unit I	**Introduction to HTML & CSS**	**(05hrs)**	**COs Mapped - 1**

Introduction to HTML: What is HTML,HTML Documents, Basic structure of an HTML document ,Creating an HTML document , Mark up Tags , Heading-Paragraphs , Line Breaks ,HTML Tags, Introduction to Cascading Style Sheets: Concept of CSS , Creating Style Sheet , CSS Properties ,CSS Styling(Background, Text Format, Controlling Fonts) ,Working with Lists and Tables ,CSS Id and Class , Box Model(Introduction, Border properties, Padding Properties, Margin properties)

Unit II	**Introduction to Java Script**	**(04hrs)**	**COs Mapped - 2**

Java script engines, Variables and operators, objects, java script conditionals, java scripts arrays, methods of adding interactivity to web pages, concept of java scripting the forms

Unit III	**Introduction to UI/UX Design**	**(03 hrs)**	**COs Mapped - 3**

Definition and differences between UI and UX, UX Design Principles, I Design Principles, Design Tools and Software

Text Books
1. Kogent Learning Solutions, “HTML, JavaScript, PHP, Java, JSP, XML and AJAX” Black Book, Dreamtech Press 2. Thomas Powell and Fritz Schneider, “JavaScript 2.0: The Complete Reference”, 2nd Edition, McGraw Hill
Reference Books
1.Jon Duckett, “JavaScript & J Query: Interactive Front-End Web Development”, John Wiley & Sons. 2. David Flanagan, “JavaScript: The Definitive Guide”, 7 th Edition, O'Reilly Media. 3. Mike Mackgrath, “Javascripts in Easy Steps” Dreamtech Press

Strength of CO-PO/PSO Mapping (Sample):

Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is mapped.

Each Course Outcome addresses a sub-set of POs and PSOs to varying levels.

(Strengths: 1- Low, 2 – Medium, 3 - Strong)

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

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

TY B. Tech. Syllabus 2023 Course

Project Phase 1

Project Phase 1 (2302320)-Credits: 01
Teaching Scheme: Practical 2 Hrs/week
Examination Scheme: TW: 50Marks

Project Phase 2(ETC224009): Credits: 04
Teaching Scheme: Practical 8 Hrs/week
Examination Scheme: OR: 50Marks,
TW: 100 Marks

Prerequisites for the course: Based on knowledge of all subjects

Learning objective for CO1 **Students will be able to:**	
1	Identify specification of the problem.
2	Structure the problem.
3	Identify the appropriate methodology to solve the problem.
4	Define the methodology to solve the problem.
Learning objective for CO2 **Students will be able to:**	
1	Adapt the vital skills of compromise and collaboration.
2	Construct , analyzes and approach problem solution as a team
3	Fully understand the role of each individual in a group to accomplish the goal.
4	Develop leadership skills by aligning with the objective of the project and lead the team towards its goal.
Learning objective for CO3 **Students will be able to**	
1	Plan, co-ordinate and control the complex and diverse activities in project
2	Predict any problems and find solution for it
3	Plan the progress to result in total completion of the project.
Learning objective for CO4 **Students will be able to**	
1	Design appropriately using a modular construction approach to solve the problem as per specifications.
2	Implement the selected methodology to solve the problem.
3	Select the correct hardware according to specifications.
4	Select the correct software for simulation and programming.
5	Validate the result and draw conclusion.
Learning objective for CO5 **Students will be able to**	
1	Present the work done by proper documentation
2	Present paper in national / international conferences, project exhibitions & competitions
Learning objective for CO6 **Students will**	

1	Develop professional practice.
2	Recognize how *to do the project to its best.*
3	Develop ethical Practices.

Course Outcome	**After successful completion of course students will be able to**
CO1	Define, analyze and solve complex real life problem.
CO2	Work in collaborative team as a member or leader.
CO3	Apply project management techniques.
CO4	Identify and apply appropriate tools.
CO5	Communicate effectively in verbal and written form.
CO6	Imbibe ethical practices.

Course context, Relevance, Practical Significance:

Course Content: (Syllabus)

1. **Group Size** The student will carry the project work individually or by a group of students. Optimum group size is in 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work.

2. **Selection and approval of topic**:
    - Topic should be related to real life application in the field of Electronics and Telecommunication OR Investigation of the latest development in a specific field of Electronics or Communication or Signal Processing OR The investigation of practical problem in manufacture and / or testing of electronics or communication equipment OR The Microprocessor / Microcontroller based applications project ispreferable. OR Software development project related to VHDL, Communication, Instrumentation, Signal Processing and Agriculture Engineering with the justification for techniques used / implemented is accepted. OR Interdisciplinary projects should be encouraged.
    - Each project group interacts and discusses their project idea with Head of Department, Academic coordinator and Project Coordinator. (Project Monitoring committee)
    - Students are asked to submit the synopsis on more than one topic according to their area of interest to project coordinator
    - Students give presentation to Project Monitoring committee on Topics they have submitted the synopsis.

- These synopses are discussed among the committee of project guides (Project Committee)
- After the presentation committee members select one project topic for each group
- Project guides are allocated according to area of project
- There is also an external guide from industry for industry sponsored projects
- The scope of project is finalized after discussion with the guide
- Each group presents "project introductory seminar" to project guide and Project Monitoring committee members.

3. The examination is conducted by two examiners (internal and external) appointed by the university. The examiners appointed must have minimum 5 years of experience with UG qualification or 2 years with PG qualification.
4. The assessment is based on Innovative Idea, Depth of understanding, Applications, Individual contributions, presentation, and the grade given by the internal guide based on the work carried out in a semester.
5. A log book/Project book of Work carried out during the semester will be maintained with monthly review remarks by the guide and HoD. It should have entries related to the work done,problems faced, solution evolved etc., duly signed by internal and external guides.
6. Project report must be submitted in the prescribed format only
7. Project Seminarassessment is based on the project topic. It consists of Literature Survey and basic project work during 7^{th} semester
8. The report consists of the Literature Survey, basic project work and the size of the report should be maximum of 30pages.
9. Project Work assessment is based Hardware and /or software designed and prototyping of the problem statement
10. The report consists of the Literature Survey, basic project work, Hardware and software design , Testing and conclusion and the size of the report should be maximum of 50pages during 8^{th} semester
11. A certified copy of both the reports is required to be presented to external examiner at the time of final examination.

Relevance of the projects and their contribution towards attainments of POs and PSOs:

- Projects done by final year students are classified into application (for societal, educational, interdisciplinary), product and research type
- Modern tools and technology are used by the students for implementation of their projects
- Each project is evaluated according to rubrics designed
- Each project topic has contribution towards attainment of most of the POs and PSOs

Strength of CO-PO/PSO Mapping (Sample): Attainment of a PO/PSO depends both on the attainment levels of associated COs of courses and the strengths to which it is

mapped

- Each Course Outcome addresses a sub-set of POs and PSOs to varying levels (strengths: 1- Low, 2 – Medium, 3 - Strong).

	Strength of CO-PO/PSO Mapping													
	PO												**PSO**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	3	3	-	*	*	-	-	-	-	-	*	*
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	3	3	-	3	3	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-	-	-