



ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SEMESTER VII

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks				Minimum Passing Marks	No. of Hours for MSE
				L	T	P		Mid Sem Examination	Continual Assessment	End Sem Examination	Total		
1	PCC	23ET701T	Microwave Theory and Technique	3	-	-	3	15	15	70	100	45	3
2	PCC	23ET701P	Microwave Theory and Technique Lab	-	-	2	1	-	25	25	50	25	-
3	PCC	23ET702T	Embedded System	3	-	-	3	15	15	70	100	45	3
4	PCC	23ET702P	Embedded System Lab	-	-	2	1	-	25	25	50	25	-
5	PCC	23ET703T	VLSI Design	3	-	-	3	15	15	70	100	45	3
6	PCC	23ET703P	VLSI Design Lab	-	-	2	1	-	25	25	50	25	-
7	PEC	23ET704T	Program Elective Course – III	3	-	-	3	15	15	70	100	45	3
8	ELC	23ET705P	Project – II	-	-	8	4	-	50	50	100	50	-
9	ELC	23ET706P	Summer / Winter Internship*	-	-	-	2	-	50	-	50	25	-
10	MDM	23ET731M	Multidisciplinary Minor – V	3	-	-	3	15	15	70	100	45	3
Total				15	-	14	24	75	250	475	800	370	-

* Summer / Winter Internship (Evaluation of Four Weeks Internship Completion till 6th Semester)

Multidisciplinary Minor – V	
23ET731M	Introduction to Embedded System and Applications

Program Elective- I	
23ET704T(i)	Optical Fiber Communication
23ET704T(ii)	Digital Image Processing

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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET701T	Microwave Theory and Techniques	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none">Understand basics of microwave engineering and applications.Learn working of microwave devices and components.Analyse and measure microwave systems.	After completion of this unit, the student will be able to: <ol style="list-style-type: none">Explain microwave concepts and applications.Understand operation of microwave tubes and devices.Analyse passive and active microwave components.Apply transmission and microstrip line concepts.Perform basic microwave measurements.

UNIT 1: Introduction to Microwaves & Microwave Tubes	[10 Hrs]
History and development of microwave engineering, Microwave frequency bands and their classification, Applications of microwaves in communication, radar, and industry, Microwave Tubes: Limitations of conventional electronic devices at high frequencies, Construction and working principles (with relevant expressions) of: Two-cavity klystron, Reflex klystron, cylindrical cavity magnetron, Traveling Wave Tube (TWT)	
UNIT 2: Passive Microwave Components	[10 Hrs]
Microwave tees (E-plane, H-plane, Magic Tee), Power dividers and combiners, Directional couplers, Microwave Filters Types: Low-pass, High-pass, Band-pass, Band-stop, Basic design concepts, Other Components: Attenuators, RF switches, Phase shifters	
UNIT 3: Active Microwave Devices	[9 Hrs]
Microwave diodes: Gunn diode, IMPATT diode, PIN diode, Microwave transistors, Amplifiers and Oscillators: Small signal amplifiers, Low Noise Amplifiers (LNA), Microwave oscillators, Mixers	
UNIT 4: Microstrip Lines	[8 Hrs]
Introduction to wave propagation modes (TE & TM modes), Microstrip Line Basics: Structure: conducting strip, dielectric substrate, and ground plane, Comparison with stripline and coaxial transmission lines, Advantages and limitations. Characteristic impedance, Losses in parallel microstrip lines	
UNIT 5: Microwave Measurements	[8 Hrs]
Measurement of microwave power, Frequency and wavelength measurement techniques, VSWR (Voltage Standing Wave Ratio) measurement, Attenuation measurement, Measurement of impedance and quality factor (Q-factor), Applications of microwave measurements in communication and radar systems.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Microwave Devices and Circuits	S.Y. Liao	2	Prentice Hall India
2	Principles of Radar Engineering	Skolnik	1	McGraw Hill Publications
3	Microwave Engineering	David M. Pozar	2	John Willey & Sons.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Microwave Engineering	G.S.Raghuwanshi	-	Cengage India
2	Microwave Engineering	R.S. Rao	-	PHI Publications
3	Microwave and Radar Engineering	M.Kulkarni	-	Umesh Publication

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ET701P	Microwave Theory and Techniques Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To understand the working of microwave components and devices through experiments.To develop skills in measurement techniques using microwave test bench.To analyse the performance of microwave systems and parameters.	<p>After completing the lab, students will be able to:</p> <ol style="list-style-type: none">Operate microwave test bench and instruments effectively.Measure parameters like power, frequency, VSWR, and impedance.Analyse characteristics of microwave devices such as klystron, diodes, and couplers.Evaluate performance of passive and active components.Interpret experimental results and relate them to theoretical concepts.

List of the Practical:

Minimum 8 practical based on the following,

- Study of microwave test bench setup and its components
- Characteristics of Reflex Klystron (mode chart / frequency vs Repeller voltage)
- Study of Gunn diode oscillator (as microwave source)
- Measurement of attenuation using attenuator
- Study of Directional Coupler (coupling factor, insertion loss, directivity)
- Verification of Magic Tee / Microwave Tee characteristics
- Study of Power Divider/Combiner
- V-I characteristics of Gunn diode / PIN diode
- Study of Microwave Amplifier (LNA) characteristics
- Study of Microwave Oscillator / Mixer basics
- Study of Microstrip line structure and parameters (simulation or hardware)
- Measurement of characteristic impedance using slotted line method
- Based on UNIT 5 (Measurements)
- Measurement of VSWR using slotted line method
- Measurement of guide wavelength and frequency
- Measurement of microwave power using power meter
- Measurement of impedance using Smith chart

Text Books

S.N	Title	Authors	Edition	Publisher
1	Microwave Devices and Circuits	S.Y. Liao	2	Prentice Hall India
2	Principles of Radar Engineering	Skolnik	1	McGraw Hill Publications
3	Microwave Engineering	David M. Pozar	2	John Willey & Sons.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Microwave Engineering	G.S.Raghuwanshi	-	Cengage India
2	Microwave Engineering	R.S. Rao	-	PHI Publications
3	Microwave and Radar Engineering	M.Kulkarni	-	Umesh Publication

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET702T	Embedded Systems	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none">Understand the architecture and features of STM32, MSP430, and PIC microcontrollers.Develop embedded applications using Embedded C across multiple platforms.Interface sensors, actuators, and communication modules for real-time applications.Analyze and compare performance and power efficiency of different microcontrollers.Design interdisciplinary embedded solutions for IoT and smart systems.	<p>After completion of this unit, the student will be able to:</p> <ol style="list-style-type: none">Understand PIC microcontroller architecture with basic programsInterface peripherals and external devices with simple embedded SystemsAnalyze ARM architecture and implement applications using STM32Interface sensors and actuators with embedded systemsDesign IoT-enabled embedded applications

UNIT 1: PIC Microcontroller Architecture & Programming Tubes	[10 Hrs]
Introduction to embedded systems and PIC family, Overview of PIC microcontroller architecture: CPU, memory (Flash, RAM, EEPROM), Harvard architecture concept, Registers and special function registers (SFRs), Instruction set and addressing modes, Introduction to Embedded C for PIC, Development tools: MPLAB IDE, XC8 compiler, Basic Programming: -Digital I/O programming, LED blinking and switch interfacing, Delay generation techniques.	
UNIT 2: Interfacing, Peripherals & Applications using PIC microcontroller	[10 Hrs]
Timers and counters, Interrupts and ISR, ADC (Analog to Digital Conversion), PWM generation, Serial communication: -UART, SPI, I2C, Device Interfacing: -LEDs, switches, relays, seven segment display / LCD, Sensor interfacing (temperature, light), Applications: -Temperature monitoring system, Digital voltmeter, Motor control using PWM, Simple automation system.	
UNIT 3: ARM Microcontroller Architecture & Programming	[10 Hrs]
Introduction to ARM architecture, Overview of ARM Cortex, Instruction Set Architecture (ISA), Assembly language basics, Embedded C programming for ARM, ARM-based development boards (STM32, etc.) Programming environments and tool chains, Interfacing Concepts, Sensors and actuators, DC, DAC interfacing, Digital and analog signal processing.	
UNIT 4: ARM-Based Embedded Applications & IoT Systems	[8 Hrs]
Sensor-based systems: Temperature, Light, Sound sensing, Actuator control: Relay, motor, appliances, Feedback control systems, PS and GSM-based tracking systems, Smart home automation, IoT Integration, Introduction to IoT systems, Communication via wireless modules, Motion sensing using accelerometer, Remote control using mobile/SMS	
UNIT 5: MSP430 Microcontroller	[7 Hrs]
MSP430 Architecture & Programming, memory organization, Programming using Embedded Code Composer Studio (CCS) environment, Interfacing & Peripherals, Digital I/O: LEDs, switches, Displays: Seven Segment, LCD, Timer, PWM generation, DC & analog interfacing, Interrupt handling and ISR design, Communication & Applications, ART, SPI, I2C communication, Timer capture for frequency measurement, Low power modes.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	MSP430 Microcontroller Basics	John H. Davies	1st Edition	Newnes (Elsevier)
2	Embedded System Design: A Unified Hardware/Software Approach	Frank Vahid, Tony Givargis	1st Edition	Wiley India
3	PIC Microcontroller and Embedded Systems	Muhammad Ali Mazidi, Rolin McKinlay, Danny Causey	1st Edition	Pearson Education

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programming Embedded Systems in C and C++	Michael Barr	1st Edition	O'Reilly Media
2	Designing Embedded Hardware	John Catsoulis	2nd Edition	O'Reilly Media

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ET701T	Embedded Systems Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To understand the architecture and programming of PIC, ARM, and MSP430 microcontrollers.To develop embedded applications using Embedded C with peripheral interfacing.To design real-time and IoT-based systems using modern microcontroller platforms.	<p>After completion of this unit, the student will be able:</p> <ol style="list-style-type: none">to program and interface peripherals with PIC, ARM, and MSP430 microcontrollers.to design and implement embedded and IoT-based applications.to analyze system performance and apply suitable microcontroller for real-world problems.

Minimum 8 practical based on the following topics,

1: PIC Microcontroller Architecture & Programming Tubes
2: Interfacing, Peripherals & Applications using PIC microcontroller
3: ARM Microcontroller Architecture & Programming
4: ARM-Based Embedded Applications & IoT Systems
5: MSP430 Microcontroller

Text Books

S.N	Title	Authors	Edition	Publisher
1	MSP430 Microcontroller Basics	John H. Davies	1st Edition	Newnes (Elsevier)
2	Embedded System Design: A Unified Hardware/Software Approach	Frank Vahid, Tony Givargis	1st Edition	Wiley India
3	PIC Microcontroller and Embedded Systems	Muhammad Ali Mazidi, Rolin McKinlay, Danny Causey	1st Edition	Pearson Education

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programming Embedded Systems in C and C++	Michael Barr	1st Edition	O'Reilly Media
2	Designing Embedded Hardware	John Catsoulis	2nd Edition	O'Reilly Media

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ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET703T	VLSI Design	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> To introduce students to the fundamentals and scope of VLSI systems. To familiarize students with the VLSI design flow and abstraction levels. To enable understanding of combinational and sequential building blocks in VLSI. To introduce physical design concepts including layout and design rules. 	<p>After successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> Explain the VLSI design flow and various abstraction levels. Design basic combinational and sequential digital circuits. Analyze timing, area, and power aspects of VLSI circuits. Interpret physical design concepts including layout and stick diagrams. Relate VLSI design concepts to modern semiconductor technologies.

UNIT- I: Introduction to VLSI Design	[9 Hrs]
Introduction to VLSI systems and applications, evolution of integrated circuit technology, SSI, MSI, LSI, VLSI and ULSI classification, Moore's law and its implications, levels of integration, VLSI design hierarchy, abstraction levels in VLSI design (system, architecture, RTL, logic, circuit and layout levels), top-down and bottom-up design methodologies, overview of VLSI design flow from system specification to fabrication and testing, role of EDA tools in VLSI design.	
UNIT- II:- Digital VLSI Building Blocks	[8Hrs]
Combinational logic blocks: design and functionality of adders (half adder, full adder, ripple carry adder concept), multiplexers and decoders, logic block representation and basic performance considerations. Sequential logic blocks: latches and flip-flops (SR, D, JK), registers, counters, state storage elements, clocked sequential circuits. Clocking strategies: single-phase and multi-phase clocking, clock skew and jitter (basic concepts), introduction to timing parameters such as propagation delay, setup time and hold time.	
UNIT- III:- HDL-Based VLSI Design	[10 Hrs]
Introduction to Hardware Description Languages and their role in VLSI design, comparison of behavioral, dataflow and structural modeling styles, Verilog HDL syntax and constructs, module definition, continuous and procedural assignments, RTL design methodology, design of combinational and sequential circuits using Verilog, testbench development, functional simulation and waveform analysis, introduction to logic synthesis, technology mapping concepts, basic timing analysis and interpretation of synthesis reports.	
UNIT- IV: Physical Design Concepts	[9 Hrs]
Introduction to physical design in VLSI, layout design concepts and layout planning, CMOS layout layers and their functions, design rules and scalable design rules, stick diagram representation for CMOS circuits, introduction to floorplanning, placement and routing concepts, area estimation techniques, parasitic effects due to interconnects and devices, introduction to power dissipation in VLSI circuits (dynamic and static power), basic strategies for reducing area and power.	
UNIT--V: VLSI Technology and Performance Issues	[9 Hrs]
Overview of CMOS technology for VLSI circuits, CMOS fabrication process overview, technology scaling trends and challenges, short channel effects (conceptual overview), interconnect issues in deep submicron technologies, low power design concepts and techniques, introduction to advanced VLSI technologies such as FinFETs and multigate devices, performance metrics in VLSI design (speed, power, area, reliability), overview of VLSI industry ecosystem, role of foundries and fabless companies, introduction to EDA tools and VLSI career pathways.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	CMOS VLSI Design: A Circuits and Systems Perspective	Neil H. E. Weste, David Harris	4th	Addison-Wesley
2	Digital Integrated Circuits	Jan M. Rabaey	2nd	Prentice Hall

Reference Books

S.N	Title	Authors	Edition	Publisher
1	CMOS Digital Integrated Circuits: Analysis and Design	Sung-Mo Kang, Yusuf Leblebici	2nd	McGraw-Hill
2	VLSI Design Techniques for Analog and Digital Circuits	R. Geiger et al.	1st	McGraw-Hill

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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ET703P	VLSI Design Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To provide hands-on experience in RTL-based VLSI design.To familiarize students with EDA tools for simulation and layout.To expose students to front-end and back-end VLSI design concepts.	<p>After successful completion of the laboratory, students will be able to:</p> <ol style="list-style-type: none">Design and simulate digital circuits using HDL.Analyze timing behavior using simulation tools.Implement basic physical layouts and verify design rules.Relate theoretical VLSI concepts with practical design flow.

Minimum 8 practical based on the syllabus.

Sr.No.	List of the experiment
1	Implement basic logic gates using Verilog HDL and verify functionality using simulation.
2	Design and simulate a combinational circuit (Half/Full Adder/Multiplexer) using Verilog.
3	Implement and verify a sequential circuit (Flip-Flop or Counter) using Verilog.
4	To generate schematic and layout for an inverter using DSCH & MICRO WIND Tool
5	To generate schematic and layout for an NAND Gate using DSCH & MICRO WIND tool.
6	To generate schematic and layout for NOR Gate using DSCH & MICRO WIND tool.
7	To generate schematic for FULL ADDER using DSCH & MICRO WIND Tool.
8	To generate schematic for a Full Subtractor using DSCH & MICRO WIND Tool.
9	To generate schematic for decoder using DSCH & MICRO WIND Tool.
10	To generate schematic for D LATCH using DSCH & MICRO WIND Tool.
11	To generate schematic and layout for a JK Flip-flop using DSCH & MICRO WIND Tool.
12	To generate schematic Differential Amplifier using DSCH & MICRO WIND Tool.

Text Books

S.N	Title	Authors	Edition	Publisher
1	CMOS VLSI Design: A Circuits and Systems Perspective	Weste & Harris	4th	Addison-Wesley
2	Digital Integrated Circuits	Rabaey	2nd	Prentice Hall
3	Microwind & DSCH User Manual	-	Latest	Microwind

Reference Book: Lab Manual

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET704T(i)	PE – III Optical Fiber Communication	3	-	-	3				
						15	15	70	100

Course Objectives	Course Outcomes
1. To understand optical fiber technology to sophisticated modern telecommunication systems. 2. To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber. 3. To measure & analyze different measurements, parameters & properties of optical fiber.	After completion of the course students will be able to, 1. Illustrate the basics of optical communication through 2. Infer different kinds of losses, signal distortion in optical wave guides & other signal degradation factors 3. Apply concepts of optical communication to different transmission components like LEDs, LASER diodes & their performance 4. Apply concepts of optical communication to different reception components like PIN & APD diodes & their performance. 5. Explain different analytical aspects of transmission techniques through optical fibers

UNIT- I: OVERVIEW OF OPTICAL FIBER COMMUNICATION	[9Hrs]
Introduction, advantages, disadvantages and applications of optical fiber communication, Skew rays, classification of Optical Fibers, Electromagnetic mode theory of optical propagation, EM Waves, Modes in Planar guide.	
Unit –II:- TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS	[9Hrs]
Fiber manufacturing & Fiber materials, manufacturing methods, Attenuation, Absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.	
Unit –III:- OPTICAL SOURCES AND COUPLERS & CONNECTORS OF FIBER	[9 Hrs]
Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. Optical sources: LED's, LASER diodes, Injection LASER Diode Structure, Comparison of LED and ILD	
UNIT- IV: OPTICAL DETECTORS AND RECEIVER	[9 Hrs]
Photo detectors, Photo detector noise, Response time, comparison of photo detectors Optical Receiver Operation, receiver sensitivity, quantum limit, coherent detection, burst mode receiver operation, Analog receivers	
Unit -V: ANALOG AND DIGITAL LINKS	[9Hrs]
Analog links – overview of analog links, CNR, multichannel transmission techniques, Digital links – point-to-point links, System considerations, link power budget, rise time budget, transmission distance for single mode links, Operational Principles of WDM, basic applications and types of optical amplifiers, semiconductor optical amplifiers, EDFA.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Optical fiber Communication	Gerd Keiser	3	McGraw Hill
2	Optical Fiber Communications	John M. Senior	3	Pearson Education

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Fiber Optic Communication	Joseph C Palais	4	Pearson Education
2	Text- Book on Optical Fiber Communication & its Application	S.C. Gupta		PHI Publications
3	Optical Communication & Networks	M.N. Bandopadhyay		PHI Publications

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET704T (ii)	PE –III Digital Image Processing	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To introduce the fundamental concepts of digital images, image acquisition systems, and basic pixel relationships.To develop understanding of image enhancement techniques such as gray-level transformations, histogram processing, and spatial filtering.To explain the principles of image coding and compression, including redundancy reduction and basic compression techniques.To provide knowledge of basic image segmentation techniques for detecting edges, regions, and boundaries in images.	<p>After completion of this unit, the student will be able to:</p> <ol style="list-style-type: none">Explain the fundamental concepts of digital images, image acquisition systems, and basic pixel relationships.Apply basic image enhancement techniques in the spatial domain using gray-level transformations and histogram processing.”Implement image filtering techniques for smoothing and sharpening of images.Apply basic image coding techniques to achieve efficient image compression for storage and transmission.Apply basic image segmentation techniques to detect edges, boundaries, and regions in images.

UNIT I: Digital Image Fundamentals	[10 Hrs]
Image formation model, Components of image processing system, Image sensing & acquisition, Sampling & quantization, Spatial & gray-level resolution, Basic pixel relationships	
UNIT II: Image Enhancement – Basic Operations	[9 Hrs]
Basic Gray-level transformations: Negative, Brightness & contrast, Log, power-law, Histogram processing: Histogram concept, Histogram equalization, Arithmetic & logical operations	
UNIT III: Image Enhancement – Spatial Filtering	[9 Hrs]
Concept of spatial filtering, Neighborhood processing, Smoothing filters: Mean filter, Median filter, Sharpening filters: Laplacian, Gradient	
Unit IV: Image Coding and Compression	[9 Hrs]
Image Coding Fundamentals, - redundancy: coding, interpixel, psychovisual, fidelity criteria, Huffman coding, Arithmetic coding, LZW coding, Bit-plane coding. Fundamentals of JPEG .	
UNIT V: Image Segmentation	[8 Hrs]
Segmentation: Thresholding, Point, Line, Edge detection, Region Based segmentation, Boundary detection and representation by chain codes.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Digital Image Processing	Gonzalez, R. C., & Woods, R. E	4	Pearson Education.
2	Fundamentals of Digital Image Processing	Jain, A. K	-	Pearson Education.
3	Digital Image Processing	Jayaraman, S., Esakkirajan, S., & Veerakumar,	2	McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Digital Image Processing	Pratt, W. K	4	John Wiley &
2	Digital Image Processing	Castleman, K. R.	-	Pearson Education.
3	Image Processing, Analysis, and Machine Vision	Milan Sonka, Vaclav Hlavac, & Roger Boyle	4	Cengage Learning.

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
23ET731M	MDM -V Introduction to Embedded System and Applications	3	-	-	3	15	15	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To introduce the basic concepts and architecture of embedded systems.To familiarize students with microcontrollers and embedded programming.To demonstrate real-world applications of embedded systems across engineering domains.	<p>After completion of the course students are able to,</p> <ol style="list-style-type: none">Understand the fundamentals and components of embedded systems.Explain basic microcontroller architecture and programming concepts.Identify applications of embedded systems in various engineering fields.Develop simple embedded programs and interface basic peripherals.Analyze and select suitable embedded solutions for real-world problems.

Unit I: Introduction to Embedded Systems	[9 Hrs]
Definition and characteristics of embedded systems, General purpose vs embedded systems, Components of embedded systems (Hardware & Software), Classification: Real-time, standalone, networked systems, Applications in daily life and engineering fields.	
Unit II: Basics of Microcontrollers	[9 Hrs]
Introduction to microprocessors vs microcontrollers, Overview of popular microcontrollers (PIC, MSP430, ARM Cortex-M) Basic architecture: CPU, memory, I/O ports, Introduction to development tools (IDE, compiler, debugger)	
Unit III: Embedded Programming Concepts	[9 Hrs]
Basics of Embedded C programming, Data types, variables, control structures, GPIO programming concepts, Simple programs (LED blinking, switch interfacing – conceptual)	
Unit IV: Interfacing and Communication	[9 Hrs]
Interfacing basics: sensors and actuators, Communication protocols (overview): UART, I2C, SPI, Introduction to ADC and DAC, Example applications	
Unit V: Embedded Systems Applications	[9 Hrs]
Applications in different domains: Mechanical (automation, robotics), Electrical (smart grid, energy systems), Civil (smart infrastructure), Computer/IT (IoT, smart devices), Case studies: Smart home, wearable devices, industrial automation	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Embedded System Design: A Unified HW/SW Approach	Frank Vahid	1	Wiley
2	Programming Embedded Systems in C and C++	Michael Barr	1st Edition	O'Reilly Media

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programming Embedded Systems in C and C++	Michael Barr	1st Edition	O'Reilly Media
2	Designing Embedded Hardware	John Catsoulis	2nd Edition	O'Reilly Media

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