KURUKSHETRA UNIVERSITY
KURUKSHETRA

("A^{++}" Grade Accredited by NAAC)

Scheme of Examination and Syllabus for

Under-Graduate Programme

(Subject: Electronic Equipment & Maintenance)

5th & 6th Semester

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020 w.e.f. 2024-25

THIRD YEAR: SEMESTER-5									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A, B & C	**CC-5 MCC-9 4 credit**	B23-EEM-501	Computer Hardware & Maintenance-I	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**MCC-10 4 credit**	B23-EEM-502	Microprocessor Interfacing & its applications	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**DSE-2* 4 credit Select one Option**	B23-EEM-503	Electronic Communication-2	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23-EEM-504	Electronic Instrumentation-2	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**DSE-3 4 credit Select one Option**	B23-EEM-505	Introduction to Mechatronics and its applications	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23-EEM-506	Embedded Systems	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A & C	**CC-M5 (V) 4 credits**	From Available CC-M5(V) of 4 credits as per NEP							
Scheme A, B & C	**Internship 4 credits**	Internship#4 credit after 4th semester							
THIRD YEAR: SEMESTER-6									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A, B & C	**CC-6 MCC-11 4 credit**	B23-EEM-601	Computer Hardware & Maintenance-II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**MCC-12 4 credit**	B23-EEM-602	Mobile Communication	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**DSE-4 4 credit Select one Option**	B23-EEM-603	Artificial Intelligence & Machine Learning	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23-EEM-604	IOT basics and applications	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**DSE-5 4 credit Select one Option**	B23-EEM-605	Advanced Embedded Systems	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23-EEM-606	Advanced Microprocessors	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A only	**CC-M6 4 credits**	From Available CC-M6 of 4 credits as per NEP							
Scheme A only	**CC-M7(V) 4 credits**	From Available CC-M7(V) of 4 credits as per NEP							
Scheme B only	**CC-M5(V) 4 credits**	**From Available CC-M5(V) of 4 credits as per NEP**							
Scheme C only	**CC-M6(V) 4 credits**	**From Available CC-M6(V) of 4 credits as per NEP**							
Scheme C only	**SEC-4 2 credit**	From Available SEC-4 of two credits as per NEP							

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	Computer Hardware & Maintenance-I		
Course Code	B23-EEM-501		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**CC-5 MCC-9**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the basic concepts of the working of a PC system and functions of its main parts. 2. Familiarize with the importance of BIOS, Bus System, and primary and secondary memories in a PC. 3. Learn the functions and mechanism of different types of computer peripheral devices. 4. Understand the software in a PC System. 5. Learning the above through practicals		
	Theory	Practical	Total
Credits	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.

2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit. A student is required to attempt 5 questions in all.

Unit	Topics	Contact Hours
I	**Personal Computer:** Evolution PC through Pentium; specifications of different styles of PCs, Functional Block diagram, System Unit and its various parts, Introduction to peripheral parts, Input/output ports (serial port, parallel port, USB port).Motherboard, Motherboard Layouts with specifications, Motherboard items, SMPS and linear power supply (Brief Idea and comparison).	12
II	**Basic Input/ Output System (BIOS):** services,features and functional parts of BIOS, Bus Standards: BUS Architecture with basic specifications (XT, ISA, EISA, MCA, VL, PCI) **On Board Memory & Magnetic Media:** PC Memory Organization, Types of RAM, Memory Packages, Magnetic Storage (Fundamentals, Diskette basics, FDD Types and capacity, HDD, FDD &HDD sub-assemblies, HDD controller & interface types) Disk organization in DOS.	11

III	**Input Devices**: Keyboard (basics, operation, types, functions, signals, interface logic); Mouse (principle of operation, types, signals); Scanner (principle of operation, types). **Output Devices**: VDU (Video basics, types of display adaptors, Basic mechanism of CRT Controller); Printer (printing mechanism, types: DMP, Inkjet, Laser Printer, MFP, Data transfer b/w PC & Printer).	12
IV	**CD-ROM Drive**: Principle of operation, merits and demerits, CD/DVD Diskette construction and R/W mechanism, Comparison of CD and DVD, Caring for CD and DVD discs, front and rearview details of CD/DVD drives. **Software Concepts:** System software, application software, operating systems, MSDOS and Windows	10
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Installation of Windows operating system and other software. 2. Installation of peripheral devices in a PC system. 3. Maintenance and cleaning of diskette drives, keyboard, mouse. 4. To identify various cards, assembly and disassembly of a PC system. 5. Study the mechanism of CD-ROM/DVD Drive by noting voltages at various check points and its installation. 6. Installation of peripheral devices (Scanner, Printers) in a PC system. 7. To study setting up of network on PC and sharing of printer.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: (5Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5Marks) • Mid-Term Exam: (10Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. IBM PC Clones by Govindarajalu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	Microprocessor Interfacing & its applications		
Course Code	**B23-EEM-502**		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**MCC-10**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the fundamental concepts of interfacing of 8085 microprocessor with Programmable Interval Timer 8253. 2. Learning the programming of 8085 microprocessor. 3. Interfacing of 8085 microprocessor with Direct Memory Access Controller 8257. 4. Learn the fundamental concepts of interfacing and to design basic applications being interfaced with 8085 microprocessor. 5. Learning the above concepts through practicals		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical	Exam Time: 3 Hours each for Theory & Practical		

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Programmable Interval Timer 8253: Block diagram of 8253, control word format for 8253, Interfacing & programming of 8253, Programming of 8253 in various modes.	12
II	Direct Memory Access Controller 8257: Block diagram, Programming of 8257, Programmable Interrupt Controller Intel 8259, Internal Registers of 8259 Programmable communication Interface (Intel 8251)	12
III	To generate Square Wave or pulse using Microprocessor, Microprocessor-Based Control of Firing Circuit of a Thyristor , Interfacing of Digital Multiplexer/ Data Selector, Interfacing of Digital De-multiplexer/ Decoder	11

IV	Applications to illustrate the use of Microprocessor in: 1. Traffic light 2. Temperature control 3. Stepper Motor control 4. Washing machine control	10
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Generate a time delay through software on Microprocessor-Kit. 2. Program to generate Square wave or pulse using SOD Line. 3. Program to generate Sine wave using Microprocessor-Kit. 4. Program to generate Square waves using Microprocessor-Kit. 5. Program to generate triangular wave using Microprocessor-Kit. 6. Study the Traffic Light Controller application using Microprocessor-Kit. 7. Study the IC Tester application on 8085 Microprocessor- kit. 8. Study the Stepper Motor control application using Microprocessor-Kit. 9. Study the interface connections of 7-segment display.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation (5Marks) • Seminar/presentation/assignment/quiz/class test etc. (5 Marks) • Mid-Term Exam (10 Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.(10 Marks) • Mid-Term Exam:		**End Term Examination:** 50 marks 20 marks
Part C-Learning Resources		
Recommended Books/e-resources/LMS: 1. Microprocessor Architecture, programming and application with the 8085 by R S Gaonkar 2. Fundamentals of Microprocessors and Microcontrollers by B.RAM		

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	**Electronic Communication-2**		
Course Code	B23-EEM-503		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-2**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the use of antenna and its parameters. 2. Understand the wireless communication systems. 3. Understand the wireless networks. 4. Understand the cellular system. 5. Learning the above through practicals		
	Theory	Practical	Total
Credits	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit.

Unit	Topics	Contact Hours
I	**Antenna & its Parameters:** : Antenna as an element of wireless communication system, Types of Antennas, Antenna parameters: Radiation pattern (polarization patterns, Field and Phase patterns), Field regions around antenna, Radiation intensity, Beam width, Gain, Directivity, Polarization, Bandwidth, Efficiency and Antenna temperature.	11
II	**Wireless Communication Systems:** History of wireless communication, Wireless Generation and Standards, Cellular and Wireless Systems, Current Wireless Systems, Cellular Telephone Systems, Wide Area Wireless Data Services, Broadband Wireless Access, Satellite Networks, Examples of Wireless Communication Systems.	12
III	**Wireless Networks**: Second Generation (2G) Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANs). Idea about Wi-Fi, 4G and LTE, 5G	12

IV	**Cellular System**: Cellular Concept and Cellular System Fundamentals, Frequency Reuse, Channel Assignment Strategies, Handoff strategies, Interference and System Capacity, Trunking and Grade of Service. Improving Coverage& Capacity in Cellular Systems, Cell Splitting and Sectoring, Cellular Systems design Considerations (Qualitative idea only).	10
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Measurement of radiation pattern of all wired and aperture antennas using AMS Kit 2. Measurement of radiation pattern of planar antennas using AMS kit. 3. Measurement of radiation pattern of reflector antenna using AMS kit. 4. Measurement of signal strength using Wi-Fi analyzer software. 5. Measurement of Antenna parameters using Network analyzer. 6. Demonstrate how obstacles such as building and trees affect the Cellular signals. 7. Design and simulation of micro strip antenna using CST tool. 8. Network Performance Testing :Measurement of Network Bandwidth and latency using tools like iPerf.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: (5Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5Marks) • Mid-Term Exam: (10Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Ballanis, Antenna Theory, John Wiley & Sons, (2003) 2nd Ed.
2. Jordan and Balmain, E. C., Electro Magnetic Waves and Radiating Systems, PHI, 1968 Reprint (2003) 3rd Ed.
3. Andrea Goldsmith, Wireless communications, (2015) Cambridge University Press
4. D. Tse and P. Viswanathan, Fundamentals of Wireless Communication, (2014) Cambridge University Press.
5. Wireless communication and Networks, Upena Dala, 2015, Oxford University Press.
6. Antenna and Wave Propagation, Yadava, PHI Learning.
7. Haykin S. & Moher M., Modern Wireless Communication, Pearson, (2005) 3rd Ed.

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	Electronic Instrumentation-2		
Course Code	B23-EEM-504		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-2**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand different chemical and biosensors. 2. Learn about measurement techniques for different physical variables like speed, force, flow etc. 3. Learn how to measure density, viscosity and humidity 4. Understand basic principles of NMR and microscopic techniques. 5. Hand on experience in lab for various measurements.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Chemical sensors: PH sensor, Gas sensor (Fundamental aspects) Biosensors – Types - Calorimetric Biosensors, Potentiometric Biosensors, Amperometric Biosensors, Optical Biosensors, Immunosensors, Smart Sensors - SQUID Sensors	10
II	Measurement of Various parameters: Speed, Force, Acceleration, Measurement of speed- Revolution counter, Drag cup tachometer Measurement of force - Load cell, pneumatic load cell, hydraulic load cell. Measurement of acceleration - Elementary accelerometers, seismic accelerometers Orifice, Venturi meter, Pitot tube, flow nozzle rotameter, Positive displacement meter, turbine flowmeter, electromagnetic flow meter, ultrasonic flow meter	11

III	Measurement of Density, Viscosity, Humidity Hydrometer – continuous weight measurement, liquid densitometer – float principle, air pressure balanced method, using gamma rays – gas density measurements – gas specific gravity measurements – Viscosity terms, say bolt viscometer, rotometer type viscometer, and Industrial consistency meters. Humidity terms – dry & wet bulb psychrometers – hot wire electrode type hygrometer, electrolytic hygrometer, Dew point hygrometer	12
IV	Nuclear Magnetic Resonance and Microscopic Techniques NMR: Basic principles, NMR spectrometer and Applications - Electron spin Resonance spectroscopy: Basic principles, Instrumentation and applications, Basic principles, Instrumentation, and applications: Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM). Mass spectrometers: Different types and Applications.	12
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Measurement of Viscosity using any technique 2. Measurement of humidity using any technique 3. Study of different types of Biosensors (Qualitative) 4. PH meter standardization and measurement of PH value of solutions 5. Measurement of flow using Venturi Meter/ orifice Meter/Rotameter 6. Flow measurement using Electromagnetic flow meter and ultrasonic flow meter. 7. Study of basic principle and detailed instrumentation of Scanning Electron Microscope (SEM) 8. Study of basic principle and detailed instrumentation of Transmission Electron Microscope (TEM) 9. Study of basic principle and detailed instrumentation of Nuclear Magnetic Resonance (NMR)	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation (5Marks) • Seminar/presentation/assignment/quiz/class test etc. (5 Marks) • Mid-Term Exam (10 Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc. (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Sawhney A.K., "Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai Publications,2001
2. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999
3. D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill, 2ndEdition, New Delhi, Reprint 2009.

Session: 2024-25			
Part A – Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	Introduction to Mechatronics and its Applications		
Course Code	B23-EEM-505		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-3**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understanding about the basic elements of a mechatronics system 2. Learning the various blocks that form a Mechatronic System 3. Materials for mechatronic applications 4. Processes used for robot formation 5. Learning the above through practicals		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modelling, Analysis and Simulation, Man-Machine Interface. Sensors and transducers: classification, Development in Transducer technology, Opto-Electronics-Shaft encoders, CD Sensors, Vision System, etc.	11
II	Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servo motor and Stepper motor, Drive circuits, open and closed loop control; Embedded Systems: Hardware Structure, Software Design and Communication, Programmable Logic Devices, Automatic Control and Real Time Control Systems	10
III	Smart materials: Shape Memory Alloy, Piezoelectric and Magneto strictive Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.	12

IV	Micro mechatronic systems: Microsensors, Micro actuators; Micro-fabrication techniques LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology.	12
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Identification and familiarization of the following components: resistors, inductors, capacitors, diodes, transistors, LED's. 2. Familiarization with the following components: CRO, transformer, function generator, Multimeter, power supply. 3. Familiarization with the following electrical machines: Induction motors, DC motors, synchronous motors, single phase motors. 4. Familiarization with the following mechanical components: gears, gear train, bearings, couplings, tachometer 5. To study and design the PN junction diode and its use as half wave and full wave rectifier. 6. To design a voltage regulator using zener diode. Discuss the behavior of the regulator for various loads. 7. To verify truth tables of various logic gates and flip flops. 8. To study various sensors and transducers and compare with ideal characteristics. 9. To measure the characteristics of LVDT using linear displacement trainer kit.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation (5Marks) • Seminar/presentation/assignment/quiz/class test etc.(5 Marks) • Mid-Term Exam (10 Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.(10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.).
2. Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education
3. A Textbook of Mechatronics, R.K. Rajput, S. Chand & Company Private Limited
4. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall.

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIFTH		
Name of the Course	Embedded Systems		
Course Code	B23-EEM-506		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	DSE-3		
Level of the course	300-399		
Pre-requisite for the course (if any)	Familiarity with basic concepts of programming and the ability to write program algorithms in a language of your choice (e.g. C++) in a windows environment.		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: Student will be able to: 1. Understand the Embedded system, Embedded Systems on a Chip (SoC) 2. recognize the need of Embedded system 3. Understand the Embedded firmware 4. Learn about 8051 Microcontroller 5. Practical Hands on with Arduino/Raspberry Microcontrollers		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Introduction to Embedded Systems: Background and History of embedded systems, Definition and Classification, Von-Neuman and Harvard architectures, Processor design tradeoffs, CISC and RISC architectures, Programming languages for embedded systems, Embedded Systems on a Chip (SoC), memory devices for embedded systems	10
II	Characteristics and quality attributes of embedded systems : Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domain specific – automotive Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time CLO sck, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.	11

III	The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input/output Pin Ports and Circuits, External Memory, Serial data Input/output, Interrupts. Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.	12
IV	Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory Read Only Data Moves, Push and Pop Op-codes, Data Exchanges. Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment	12
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Assembly Language Programming experiments using 8051 Trainer kit. 2. Data transfer/exchange between specified memory locations. 3. Largest/smallest from a series. 4. Sorting (Ascending/Descending) of data. 5. Addition / subtraction / multiplication / division of 8/16 bit data. 6. Sum of a series of 8 bit data. 7. Multiplication by shift and add method. 8. Square / cube / square root of 8 bit data. 9. Matrix addition. 10. LCM and HCF of two 8 bit numbers. 11. Code conversion – Hex to Decimal/ASCII to Decimal and vice versa.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: (5 Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5 Marks) • Mid-Term Exam: (10 Marks) • **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 Marks 20 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Raj Kamal, Embedded System Architecture, Programming and Design, Tata McGraw Hill, (2004).
2. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
3. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
4. Introduction to embedded systems, Shibu K V Tata McGraw-Hill.
5. Embedded Systems – Lyla, Pearson, 2013.
6. The 8051 Microcontroller and Embedded Systems Using Assembly and C , Mohammad Ali Mazidi, Pearson Education India

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SIXTH		
Name of the Course	Computer Hardware & Maintenance-II		
Course Code	B23-EEM-601		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**CC-6 MCC-11**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Familiarize with the fundamentals concepts in the installation of a PC System. 2. Familiarize with diagnosis of common symptoms of faulty peripherals of a PC System. 3. Learn the troubleshooting techniques of various peripherals of a PC System. 4. Learn basic steps for the maintenance and upgradation of a PC System. 5. Learning the above through practicals		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	**PC Installation:** Room Preparation (Location, PC room pollution, air conditioning with principle of operation of an AC system, false flooring & false ceiling, fire protection system); PC Installation (basic steps).Boot Process (DOS & Windows), basic functions of POST and its test sequences. **Power Supply for PC:** Clean power supply, p.s. problems, power conditioning, servo stabilizer, CVT, offline and online UPS (basic idea).	11
II	**Troubleshooting PC Faults-I:** Mother board possible problems, diagnosis procedure and their troubleshooting; Keyboard (checks for proper functioning, possible problems, diagnosis procedure and their troubleshooting), Mouse (troubleshooting common symptoms), Monitor (troubleshooting common symptoms), Printers (possible problems, diagnosis procedure and their troubleshooting).	10

III	**Troubleshooting PC Faults-II:** CD-ROM (Installation upgradation, replacement, trouble shooting common symptoms), FDD (Installation, replacement and troubleshooting common symptoms), HDD (Preparation Concepts, installation, replacement and troubleshooting common symptoms),Memory (upgradation, installation, and troubleshooting common symptoms)	12
IV	**General PC Servicing:** PC maintenance using various diagnostic S/W, universal trouble shooting process, computer viruses and their types, virus protection techniques, quick start bench testing, tips for windows startup problems. **PC Upgrading:** Introduction, Upgrade Essentials, Performance Upgrade, Capacity Upgrades, Features Upgrades	12
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. To study and testing of offline and online UPS. 2. To study troubleshooting of Motherboard issues. 3. To study use of PC troubleshooting software. 4. To study upgradation of PC hardware. 5. To study troubleshooting of keyboard, mouse, Monitor etc. 6. To identify various cards, assembly and disassembly of a PC system. 7. Familiarization of Diagnostic tools and Antivirus Software for the repair/ maintenance of PC. 8. Study of power supply for PC.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(20 Marks)** • Class Participation(5Marks) • Seminar/presentation/assignment/quiz/class test etc.(5 Marks) • Mid-Term Exam(10 Marks) ➢ **Practicum(10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.(10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. IBM PC Clones by Govindarajalu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke
3. PC Hardware by Ron Gilster

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SIXTH		
Name of the Course	Mobile Communication		
Course Code	B23-EEM-602		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**MCC-12**		
Level of the course	300-399		
Pre-requisite for the course (if any)	Basic Knowledge of Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand basics of mobile telecommunication system 2. Understand generations of telecommunication systems in wireless network 3. Understand the architecture of Wireless LAN technologies 4. Understand the functionality of network layer and Identify a routing protocol for a given Ad hoc networks 5. Learning the above through practicals		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies-MAC Protocols – SDMA- TDMA- FDMA- CDMA	11
II	**MOBILE TELECOMMUNICATION SYSTEM** : GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS- UMTS- Architecture	10
III	**WIRELESS NETWORKS** : LANs and PANs – IEEE 802.11 Standard – Architecture – Services – Blue Tooth- Wi-Fi – WiMAX **MOBILE NETWORK LAYER** : Mobile IP – DHCP – Adhoc– Proactive and Reactive Routing Protocols – Multicast Routing Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security	12

IV	**MOBILE TRANSPORT AND APPLICATION LAYER** : Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML	12
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Study of SDMA Trainer kit. 2. Study of TDMA Trainer kit. 3. Study of FDMA Trainer kit 4. Introduction to CDMA Trainer and PC interfacing using Serial Port 5. Study of GSM Trainer and PC interfacing using Serial Port 6. To understand the GSM Software Setting. 7. Prepare a wireless ad hoc network and show its working	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation (5Marks) • Seminar/presentation/assignment/quiz/class test etc. (5 Marks) • Mid-Term Exam (10 Marks) ➢ **Practicum (10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc. (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Jochen Schiller, ―Mobile Communications‖, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, ―Fundamentals of Mobile Computing‖, PHI Learning Pvt.Ltd, New Delhi – 2012
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, ―Principles of Mobile Computing‖, Springer, 2003.
5. William.C.Y.Lee,―Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition,Tata Mc Graw Hill Edition ,2006.
6. C.K.Toh, ―AdHoc Mobile Wireless Networks, First Edition, Pearson Education, 2002.

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SIXTH		
Name of the Course	Artificial Intelligence & Machine Learning		
Course Code	B23-EEM-603		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	DSE-4		
Level of the course	300-399		
Pre-requisite for the course (if any)	Familiarity with basic concepts of programming and the ability to write program algorithms in a language of your choice (e.g. C++) in a windows environment.		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: Student will be able to: 1. Learn the basics and applications of artificial intelligence 2. Analyze basic and advanced search techniques 3. Learn and design intelligent agents for concrete computational problems. 4. Understand the basics of Machine Learning. 5. Hands on practicals related to AI & ML		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical		Exam Time: 3 Hours each for Theory & Practical	

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.	11
II	Search Strategies: Solving problems by searching, Search- Issues in The Design of Search Programs, Un-Informed Search- BFS, DFS; Heuristic Search Techniques: Generate-And Test, Hill Climbing, Best-First Search, A* Algorithm, Alpha beta search algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis	11
III	Introduction to ML: Machine Learning basics, Applications of ML, Data Mining	12

	Vs Machine Learning vs Big Data Analytics. Supervised Learning- Naïve Base Classifier, Classifying with k-Nearest Neighbour classifier, Decision Tree classifier, Naive Bayes classifier. Unsupervised Learning - Grouping unlabeled items using k-means clustering, Association analysis with the Apriori algorithm Introduction to reinforcement learning	
IV	Forecasting and Learning Theory : Non-linear regression, Logistic regression, Random forest, Baysian Belief networks, Bias/variance tradeoff, Tuning Model Complexity, Model Selection Dilemma Clustering : Expectation-Maximization Algorithm, Hierarchical Clustering, Supervised Learning after Clustering, Choosing the number of clusters, Learning using ANN	11
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1. Write a Program to Implement Breadth First Search. 2. Write a Program to Implement Depth First Search 3. Write a program to implement Hill Climbing Algorithm 4. Write a program to implement A* Algorithm 5. Write a program to implement AO* Algorithm 6. Write a program to implement Tic-Tac-Toe game 7. Implementation of Find S Algorithm 8. Implementation of Candidate elimination Algorithm 9. Write a program to implement simple Linear Regression and Plot the graph	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(20 Marks)** • Class Participation: (5 Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5 Marks) • Mid-Term Exam: (10 Marks) • **Practicum** (10 Marks) • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 Marks 20 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press.
3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
4. B Joshi, Machine Learning and Artificial Intelligence, Springer, 2020.

Session: 2024-25

Part A - Introduction

Subject	ELECTRONIC EQUIPMENT & MAINTENANCE
Semester	SIXTH
Name of the Course	IOT basics and applications
Course Code	B23-EEM-604
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-4**
Level of the course	300-399
Pre-requisite for the course (if any)	Knowledge of Electronics

Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn basic concepts, principles and challenges in IoT. 2. Understand functioning of hardware devices and sensors used for IoT. 3. Analyze network communication aspects and protocols used in IoT and application implementation of Arudino. 4. To develop IoT infrastructure for popular applications 5. Solving Societal problems with the help of IOT

Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5

Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical	Exam Time: 3 Hours each for Theory & Practical

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability	11
II	Hardware for IoT: Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. **Network & Communication aspects in IoT**: Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	10

III	**Embedded Platforms for IoT**: Embedded computing basics, Overview and comparison of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex. **Programming the Ardunio:** Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT	12
IV	Challenges in IoT Design challenges: Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	12
V*	Students should implement two case studies from the IOT Projects List (Individually or in small group): 1. Wearable Computer With Temperature Distance Sensors 2. Weather Imaging CubeSat with Telemetry Transmission 3. IOT Water Pollution Monitor RC Boat 4. Mountain Climber Health & GPS Tracker 5. IOT Smart Parking Using RFID 6. IOT Contactless Covid Testing Booth Automation 7. IOT Social Distancing & Monitoring Robot For Queue 8. IOT Covid Patient Health Monitor in Quarantine 9. IOT based Manhole Detection and Monitoring System 10. IOT based Smart Energy Meter Monitoring with Theft Detection 11. IOT Weather Station Airship 13. IOT based Three Phase 12. Note: Any other relevant applications of IOT	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(20 Marks)** • Class Participation(5Marks) • Seminar/presentation/assignment/quiz/class test etc.(5 Marks) • Mid-Term Exam(10 Marks) ➢ **Practicum(10 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.(10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 marks 20 marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SIXTH		
Name of the Course	Advanced Embedded Systems		
Course Code	B23-EEM-605		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	DSE-5		
Level of the course	300-399		
Pre-requisite for the course (if any)	Familiarity with basic concepts of programming and the ability to write program algorithms in a language of your choice (e.g. C++) in a windows environment.		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: Student will be able to: 1. Understand the Embedded system, Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits. 2. Recognize the need of Embedded system 3. Learn the hardware aspects of embedded systems 4. Understand RTOS based Embedded Systems 5. Hands on with Arduino/Raspberry Microcontrollers		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical	Exam Time: 3 Hours each for Theory & Practical		

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Advanced Embedded Systems Architectures: Features of Arduino Microcontroller, Architecture of Arduino, Different boards of Arduino. Fundamental of Arduino Programming, in built functions and libraries. Serial Communication between Arduino hardware and PC and Arduino Interrupt Programming. Experimental embedded platform like Raspberry Pi. Standards IEEE 1275.1-1994 and IEEE 1754.	11
II	Real Time Operating Systems (RTOS) Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. . Defining Semaphores, Operations and Use, Exceptions, Interrupts and Timers Exceptions, Interrupts,	11

	Applications, Processing of Exceptions and Spurious Interrupts, Real Time CLO scks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers	
III	Sensors, ADCs and Actuators Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Optocouplers/Opto isolators, relays.	12
IV	Examples of embedded systems Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks(WISENET), robotics, biomedical applications, brain machine interface	11
V*	Note: A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester. 1.Introduction to Arduino UNO/ Raspberry Pi 2.Programming based on Arduino UNO/ Raspberry Pi 3.Digital Input & Digital Output: Experiments on digital input and digital output on Arduino Mega board and using LED and Buzzer. 4.LCD Display: Experiment on LCD display:-Print numbers, Name, Time etc. 5. Interface an IR sensor with a microcontroller and decode signals from a remote control. Use it to control devices or systems 6. Temperature Sensor: Use a temperature sensor (like DS18B20) to measure and display the temperature on an LCD or through a serial monitor. 7. Explore real-time operating systems (RTOS) by implementing a simple task scheduler on a microcontroller. 8. Control a DC motor or a stepper motor using a microcontroller. Experiment with different speed control techniques. 9. Connect an ultrasonic sensor to measure distances and display them on an LCD or serial monitor. 10. Use a sound sensor to detect claps or loud sounds and trigger an action (e.g., turning on an LED). 11. Use a Piezo buzzer to play simple melodies or tunes. 12. Any Project based on Arduino UNO/Raspberry Pi	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: (5 Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5 Marks) • Mid-Term Exam: (10 Marks) • **Practicum** (10 Marks) • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 Marks 20 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Raj Kamal, Embedded System Architecture, Programming and Design, Tata McGraw Hill, (2004).
2. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
3. Programming Embedded Systems in C and C++, First Edition January, Michael Barr
4. Kanta Rao B, Embedded Systems, 1st Ed., PHI
5. Frank Vahid & Tony Givargis, Embedded System Design, 2nd Edition, John Wiley, Simon, D.E., An Embedded Software Primer, Dorling Kindersley (2005)
6. Embedded Systems – Lyla, Pearson, 2013.

Session: 2024-25			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SIXTH		
Name of the Course	Advanced Microprocessors		
Course Code	B23-EEM-606		
Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)	DSE-5		
Level of the course	300-399		
Pre-requisite for the course (if any)	Knowledge of basic processors and their programming		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: Student will be able to: 1. Understand the concept of advanced microprocessors and their uses 2. Learn the difference between architectures of various microprocessors 3. understand the programming and concept of 8051 Microcontrollers and its interfacing 4. understand the programming and concept of PIC microcontroller 5. Hands on practicals based on advanced microprocessors		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours per week	3	2	5
Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical	Exam Time: 3 Hours each for Theory & Practical		

Part B- Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	Intel 80386 Microprocessor: Architecture - Registers – Descriptors - Real Mode - Protected mode - Virtual 8086 mode - Paging and Segmentation - Comparison with 80486 Microprocessor. Pentium class of processors: RISC and CISC architectures - Superscalar Architecture - MMX technology – SSE – Pipelining - Branch Prediction techniques – FPU - Comparative study of features of Pentium-II, Pentium-III and Pentium-IV processors.	11
II	Intel 64 bit processors-: Overview of 64 bit processor execution environment – Memory organization – IA-32 memory models – Memory organization in 64 bit mode – Extended physical addressing in protected mode - Basic program execution registers – Operand addressing. Multicore Architectures: Concepts – Power reduction techniques in processors – Comparison of Intel Skylake, Goldmont and Ice Lake micro architectures	11
III	8051 microcontroller: Architecture - pin configuration - addressing modes - instruction	12

	set – programming - timers – counters - Programming - interrupts- communication interfaces - interfacing with DAC, ADC, stepper motor	
IV	PIC micro controllers: PIC family - PIC16F84A: Features - architecture – data memory organization – RAM - Program memory - ROM – instruction types and addressing modes- instruction cycle -ports - Introduction to programming PIC microcontrollers using MPLAB.	11
V*	**Note: Perform atleast six Practicals :** Interfacing experiments with 8051/PIC using Kit: 1. Display (LED/Seven segments/LCD) and keyboard interface. 2. ADC interface. 3. DAC interface with wave form generation. 4. Stepper motor and DC motor interface. 5. Realization of Boolean expression through port. 6. Study and Analyzing interfacing of graphical LCD using 8051/8951 7. Study and Analyzing interfacing of graphical LCD using PIC 8. ALP for pressure and Temperature measurement 9. ALP to generate 10KHZ Square wave	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(20 Marks)** • Class Participation: (5 Marks) • Seminar/presentation/assignment/quiz/class test etc.: (5 Marks) • Mid-Term Exam: (10 Marks) • **Practicum** (10 Marks) • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: (10 Marks) • Mid-Term Exam:	**End Term Examination:** 50 Marks 20 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Douglas V Hall, "Microprocessor & Interfacing: Programming and Hardware", Tata McGraw Hill, 2nd Edition,2006.
2. Lyla B. Das, The x86 Microprocessors: 8086 to Pentium, Multi cores, Atom and the 8051 Microcontroller, 2/e, Pearson Education. ISBN-13: 978-9332536821.
3. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing, Pearson Education India, ISBN:9788131726228.
4. 8051 Microcontrollers and Embedded Systems, Mohammad Ali Mazidi, Pearson
5. Tim Wilmshurst, Designing Embedded Systems with PIC Microcontrollers, Newnes Publisher, ISBN:9780080961842.
6. PIC: 18F2420, 16F84A data sheet ,by Microchip.
7. Intel® 64 and IA-32 Architectures Software Developer's Manual: Vol.
8. PIC Microcontrollers and Embedded Systems, Mohammad Ali Mazidi, Pearson