KURUKSHETRA UNIVERSITY KURUKSHETRA

Scheme of Examination and Syllabus for

Under-Graduate Programme

Subject: Electronic Equipment & Maintenance

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020 w.e.f. 2023-24 (in phased manner)

Scheme of Examination for Under-Graduate Programme
Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020
w.e.f. 2023-24 (in phased manner), Subject: Electronic Equipment & Maintenance

FIRST YEAR: SEMESTER-1									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A & C	**CC-1 MCC-1 4 credit**	B23-EEM-101	Principles of Electronics-I	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme C only	**MCC-2 4 credit**	B23-EEM-102	Electronic Components, Measuring Instruments and Amplifiers	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A	**CC-M1 2 credit**	B23-EEM-103	Basic Digital Electronics	1	1	10	20	30	3 hrs.
			Practical	1	2	5	15	20	3 hrs.
Scheme A & C	**MDC-1 3 credits**	B23-EEM-104	Electronics in Daily Life	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	3 hrs.
Scheme C only	**CC-M1 4 credit**	From Available CC-M1 of 4 credits as per NEP							
Scheme A & C	**AEC-1 2 credit**	From Available AEC-1 of two credits as per NEP							
	SEC-1 3 credit	From Available SEC-1 of three credits as per NEP							
	VAC-1 2 credit	From Available VAC-1 of two credits as per NEP							
FIRST YEAR: SEMESTER-2									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A & C	**CC-2 MCC-3 4 credit**	B23-EEM-201	Principles of Electronics-II	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme C only	**DSEC-2 4 credit**	B23-EEM-202	Transistors & Linear Integrated Circuits	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A only	**CC-M2 2 credit**	B23-EEM-203	Basic Electronic components & Devices	1	1	10	20	30	3 hrs.
			Practical	1	2	5	15	20	3 hrs.
Scheme A & C	**MDC-2 3 credits**	B23-EEM-204	Understanding of Mobiles and Computer Systems	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	3 hrs.
Scheme C only	**CC-M2 4 credit**	From Available CC-M2 of 4 credits as per NEP							
Scheme A & C	**AEC-2 2 credit**	From Available AEC-2 of two credits as per NEP							
	SEC-2 3 credit	From Available SEC-2 of three credits as per NEP							
	VAC-2 2 credit	From Available VAC-2 of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 2nd Semester									

SECOND YEAR: SEMESTER-3									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A, B & C	**CC-3 MCC-4 4 credit**	B23-EEM-301	Microprocessor 8085 - Architecture & Programming	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**MCC-5 4 credit**	B23-EEM-302	Programming in C	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A, B & C	**MDC-3 3 credits**	B23-EEM-303	Electronics in Smart World	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	3 hrs.
Scheme A & C	**CC-M3 4 credits**	From Available CC-M3 of 4 credits as per NEP							
Scheme B only	**CC-M3 (V) 4 credits**	From Available CC-M3(V) of 4 credits as per NEP							
Scheme A, B & C	**AEC-3 2 credit**	From Available AEC-3 of two credits as per NEP							
	SEC-3 3 credit	From Available SEC-3 of three credits as per NEP							
Scheme C only	**VAC-3 2 credits**	From Available VAC-3 of two credits as per NEP							
Scheme B only	**MCC-3**	**MCC-2 FROM SCHEME C OF FIRST SEMESTER**							
SECOND YEAR: SEMESTER-4									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Scheme A, B & C	**CC-4 MCC-6 4 credit**	B23-EEM-401	Advanced Digital Electronics	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**MCC-7 4 credit**	B23-EEM-402	8051: Programming & Applications	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**MCC-8 4 credit**	B23-EEM-403	Biomedical Equipment Maintenance	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme B & C	**DSE-1 4 credit Select one option**	B23-EEM-404	Electronic Communication-1	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
		B23-EEM-405	Electronic Instrumentation-1	3	3	20	50	70	3 hrs.
			Practical	1	2	10	20	30	3 hrs.
Scheme A, B & C	**CC-M4 (V) 4 credits**	From Available CC-M4(V) of 4 credits as per NEP							
	AEC-4 2 credit	From Available AEC-3 of two credits as per NEP							
Scheme C only	**VAC-4 2 credits**	From Available VAC-4 of two credits as per NEP							
Scheme A & B	**VAC-3 2 credits**	From Available VAC-3 of two credits as per NEP							
Internship of 4 credits of 4-6 weeks duration after 4th Semester (if not done after second semester)									

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	Mechatronics	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	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							

FOURTH YEAR: SEMESTER-7 (FOR HONOURS/HONOURS WITH RESEARCH IN ELECTRONIC EQUIPMENT & MAINTENANCE)									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
for Honours in Electronics/Honours with Research in Electronic Equipment & Maintenance (For Scheme B & C)	**CC-H1 4 credit**	B23-EEM-701	Digital Circuits and System Design	4	4	30	70	100	3 hrs.
	CC-H2 4 credit	B23-EEM-702	MOS Analog Circuits	4	4	30	70	100	3 hrs.
	CC-H3 4 credit	B23-EEM-703	Instrumentation and Control Systems	4	4	30	70	100	3 hrs.
	DSE-H1 4 credit Select one Option	B23-EEM-704	Optical Fiber Communication	4	4	30	70	100	3 hrs.
		B23-EEM-705	CAD Tools for VLSI	4	4	30	70	100	3 hrs.
	PC-H1 4 credit	B23-EEM-706	Practical Based on B23-EEM-701 TO 704/705	4	8	30	70	100	6 hrs.
	CC-HM1 4 credit	From Available Minor of 4 credits as per NEP							
SEMESTER-8 (FOR HONOURS IN ELECTRONIC EQUIPMENT & MAINTENANCE)									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Honours in Electronic Equipment & Maintenance (For Scheme B & C)	**CC-H4 4 credit**	B23-EEM-801	Microwave devices and systems	4	4	30	70	100	3 hrs.
	CC-H5 4 credit	B23-EEM-802	MOS Digital Circuits	4	4	30	70	100	3 hrs.
	CC-H6 4 credit	B23-EEM-803	Device Models and Circuit Simulation	4	4	30	70	100	3 hrs.
	DSE-H2 4 credit Select one option	B23-EEM-804	Semiconductor Material & Device Characterization	4	4	30	70	100	3 hrs.
		B23-EEM-805	Digital Communication	4	4	30	70	100	3 hrs.
	PC-H2 4 credit	B23-EEM-806	Practical Based on B23-EEM-801 TO 804/805	4	8	30	70	100	6 hrs.
	CC-HM2 4 credit	From Available Minor of 4 credits as per NEP							
OR SEMESTER-8 (FOR HONOURS WITH RESEARCH IN ELECTRONIC EQUIPMENT & MAINTENANCE)									
Remarks	**Course**	**Paper(s)**	**Nomenclature of Paper**	**Credits**	**Hours/ Week**	**Internal marks**	**External Marks**	**Total Marks**	**Exam Duration**
Honours with Research in Electronic Equipment & Maintenance (For Scheme B & C)	**CC-H4 4 credit**	B23-EEM-801	Microwave devices and systems	4	4	30	70	100	3 hrs.
	CC-H5 4 credit	B23-EEM-802	MOS Digital Circuits	4	4	30	70	100	3 hrs.
	Project/Dissertation 12 credit	B23-EEM-807	Project/Dissertation	8+4	-	-	300	300	-
	CC-HM2 4 credit	From Available Minor of 4 credits as per NEP							

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIRST		
Name of the Course	Principles of Electronics-I		
Course Code	B23-EEM-101		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-1 MCC-1		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as a Subject at 4.0 Level (Class XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. To understand the basics of various Number systems and their conversions 2. To understand the basics of Boolean algebra, different logic gates and minimization techniques using K-maps 3. To understand the passive components, construction, working & applications of various semiconductor diodes 4. To learn about the use of filters in rectifiers and about Bipolar Junction Transistor. 5. To present the experimental results and conclusions by having Hands-on experience in the Laboratory		
Credits	**Theory**	**Practical**	**Total**
	3	1	4
Contact Hours	45	30	75
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	**Number Systems:** Introduction to Decimal, Binary, Octal, Hexadecimal Number Systems and their inter-conversions; BCD codes, Excess-3 codes, Gray codes, Cyclic codes, code conversions; BCD Arithmetic, parity, binary arithmetic (addition, Subtraction, multiplication, division), 1's and 2's compliments and 9's and 10's compliments.	11
II	**Boolean Algebra:** Postulates & theorems of Boolean algebra, Duality Principal, De-Morgan's Theorem. **Logic Gates:** Positive and Negative Logic, Basic Logic Gates: AND, OR, NOT (symbol, truth-table, circuit diagram, working); NAND, NOR, EX-OR, EX-NOR (symbol, truth table). **Minimization Techniques:** Reduction of Boolean expressions using Boolean Identities, SOP and POS form of Boolean functions, Karnaugh Map simplifications, implementations of SOP and POS form using NAND and NOR gates.	12
III	**Passive Components:** Resistors, Capacitors, Inductors, Transformers, Relays, Fuses (their types & applications). **Junction Diodes:** Rectifying diode, Forward and reverse bias characteristics, Zener Diodes, Varactor Diode, Light Emitting Diode, Photo diode and Photo transistors (qualitative only).	11
IV	**Rectifiers:** Half wave, Full wave, Bridge, Filters (L, C, LC, π), Clipping and Clamping circuits. **Zener diode regulator**: circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator. **Bipolar Junction Transistor:** Basic working principle, Input and Output Characteristics of CB & CE configurations, Biasing, Operating point, Load line, Stabilization of Operating Point.	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Practical use of Multimeter (measurement of voltage, current, resistance). 2. Practical use of Oscilloscope (voltage and frequency measurement). 3. Study of Electronic Components Resistors, Capacitors (study the types, colour coding). 4. Familiarization with Breadboard, IC types, pin number, testing, IC Manual. 5. Verification of truth tables for AND, OR, NOT gates. 6. P-N Junction Diode (study V-I Characteristics). 7. Study of PN diode as wave clipping element. 8. Study of Zener Diode as a voltage regulator. 9. Study of Input and output Characteristics of a transistor in Common base configuration. 10. Study of Input and output Characteristics of a transistor in Common emitter configuration.	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. Digital Electronics by R.P. Jain
2. Digital Computer Electronics by A. P. Malvino
3. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
4. Integrated Electronics by Millman and Halkias

Session: 2023-24

Part A - Introduction

Subject	ELECTRONICS
Semester	FIRST
Name of the Course	Electronic Components, Measuring Instruments and Amplifiers
Course Code	B23-EEM-102
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MCC-2
Level of the course	100-199
Pre-requisite for the course (if any)	Physics as a Subject at 4.0 Level (Class XII)

Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Student will be able to understand the various electronic components and basic semiconductors. 2. Student will be able to learn about the use of measuring instruments. 3. Student will be able to understand the biasing of Bipolar Junction Transistors. 4. Student will be able to understand the various amplifiers. 5. Student will be able to present the experimental results and conclusions by having Hands-on experience in the Laboratory

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

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	**Passive Components:** Resistors, Capacitors, Inductors, Transformers, Relays, Fuses (their types & applications). **Introduction to Semiconductors:** Energy Band Diagram, Conductors, Semiconductors, Insulators, Intrinsic and Extrinsic Semiconductors (P&N), currents in semiconductors, Diffusion Junction, Depletion Layer, Barrier Potential.	11
II	**Measuring Instruments:** Regulated power supply, Analogue Multimeter, Digital Multimeter, Cathode Ray Oscilloscope, Function Generator (functional block diagram, basic working principle, measuring quantities). **Zener diode regulator**: circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator.	11
III	**Bipolar Junction Transistor:** Basic working principle, Input and Output Characteristics of CB & CE configurations, Biasing, Operating point, Load line, thermal runaway, stability and stability factor, Stabilization of Operating Point, Collector to Base bias, Voltage Divider bias and Emitter bias (+VCC &–VEE bias), circuit diagrams and their working.	12
IV	**Amplifiers:** Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading of Amplifiers, RC Coupled amplifiers. Properties of amplifiers (distortion, noise, thermal noise, shot noise, noise figure). Feedback in Amplifiers: Feedback concept, transfer gain with feedback, Effect of Negative Feedback on amplifiers performance. Transistor as a switch (circuit and working), Darlington pair and its applications.	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Identification and study of Electronics Components. 2. Understanding the use of Function generator and draw the different wave shapes by connecting it with CRO 3. Understand the use of Multimeter by measuring resistance, capacitance, voltage, frequency, transistor type etc. 4. Measurement of voltage. Time period and phase-shift using CRO. 5. Study of fixed bias arrangement for transistor. 6. Study of Voltage divider bias arrangement for transistor. 7. Study of Collector to base bias arrangement for transistor. 8. Study multi stage R-C coupled amplifier & to determine frequency response & gain 9. Find the gain (i) Class A. Amplifier (ii) Class B. Amplifier (iii) Class C Amplifier 10. Verify the operation of transistor as a switch and draw the waveform.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **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:	**50 marks** **20 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
2. Integrated Electronics by Millman and Halkias
3. A course in Electrical and Electronic Measurements and Instrumentation by A K Sawhney.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FIRST		
Name of the Course	Basic Digital Electronics		
Course Code	B23-EEM-103		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M1		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as a Subject at 4.0 Level (Class XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. To understand the basics of various Number systems and their conversions 2. To understand the basics of Boolean algebra and its theorems 3. To understand the concept and basics of different logic gates 4. To understand the concept and minimization techniques using K-maps 5. To learn and understand the use of various electronic components and equipment's used for analysis of basic digital electronic circuits		
Credits	Theory	Practical	Total
	1	1	4
Contact Hours	15	30	45
Max. Marks: 50 (30 Theory + 20 Practical) **Internal Assessment Marks: 10 Theory + 5 Practical** **End Term Exam Marks: 20 Theory + 15 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	**Number Systems:** Introduction to Decimal, Binary, Octal, Hexadecimal Number Systems and their inter-conversions; BCD codes, Excess-3 codes, Gray codes, code conversions, binary arithmetic (addition, Subtraction, multiplication, division), 1's and 2's compliments and 9's and 10's compliments.	4
II	**Boolean Algebra:** Postulates & theorems of Boolean algebra, Duality Principle, De-Morgan's Theorem.	4
III	**Logic Gates:** Positive and Negative Logic, Basic Logic Gates: AND, OR, NOT (symbol, truth-table, circuit diagram, working); NAND, NOR, EX-OR, EX-NOR (symbol, truth table).	4
IV	**Minimization Techniques:** Reduction of Boolean expressions using Boolean Identities, SOP and POS form of Boolean functions, Karnaugh Map simplifications, implementations of SOP and POS form using NAND and NOR gates.	3
V*	**Note:** A candidate is required to perform minimum 4 experiments out of the list provided during course of study in this semester. 1. Design of basis logic gates using discrete components. 2. Study of different type of digital IC's :(functions, pin diagram, block diagram of various Digital ICs etc.). 3. Data Sheet Analysis of Digital ICs (Quote the data sheet of any two digital ICs in Laboratory File) 4. Realization of Boolean Identities on Digital Trainer Kit 5. Digital trainer using AOI. 6. Digital trainer using NAND gates. 7. Realization of K-map expression on Digital Trainer Kit	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory(10 Marks)** • Class Participation **(4 Marks)** • Seminar/presentation/assignment/quiz/class test etc.: • Mid-Term Exam: **(6 Marks)** ➢ **Practicum (5 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc**.(5 Marks)** • Mid-Term Exam:		**End Term Examination:** **20 marks** **15 marks**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Digital Electronics by R.P. Jain
2. Digital Computer Electronics by A. P. Malvino

Session: 2023-24

Part A - Introduction

Subject	ELECTRONIC EQUIPMENT & MAINTENANCE
Semester	FIRST
Name of the Course	Electronics in Daily Life
Course Code	B23-EEM-104
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**MDC-1**
Level of the course	100-199
Pre-requisite for the course (if any)	Any Arts, Commerce Subject at 4.0 Level (Class XII)

Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand about various electronic components 2. Learn about the use of AC and DC voltages and transformers etc 3. Understand the concept of assembling and disassembling of various home appliances. 4. Learn the concept and importance of earthing 5. To get practical exposure of various electronics components and appliances

Credits	Theory	Practical	Total
	2	1	3
Contact Hours	30	30	60

Max. Marks: 75 (50 Theory + 25 Practical) **Internal Assessment Marks: 15 Theory + 5 Practical** **End Term Exam Marks: 35 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.
3. Medium of examination may be Hindi/English.

Unit	Topics	Contact Hours
I	**Introduction to basic Electronics components and Devices:** Resistor, Color code, Inductor, Capacitor, basic Potentiometer circuit, Multiple range Potentiometer Classification of Instruments, Analog and Digital Mode of operations, Basics of CRO, Multimeter	7
II	AC - DC Voltage, Domestic Electric supply, Transformer, Power consumption, wire, electric tester, clamp meter, Fuse, circuit breaker, Inverter, Electric consumption meter reading, BEE rating, Soldering techniques, LED, Display HD, Full HD and UHD.	8
III	Assembly and disassembly of internal parts: of geyser, tube light, Emergency light, internal parts of ceiling fan, mixer grinder, Types of water purifiers and geyser, Different parts of water purifiers and geyser. Installation and Repairing of water purifiers and geyser.	8
IV	Measurement of Earth Resistance: Necessity of Earth Electrode, Necessity of measurement of Earth Electrode, Factors effecting Earth Electrodes, Methods of measuring Earth Resistance	7
V*	**Note:** A candidate is required to perform minimum 4 experiments out of the list provided during course of study in this semester. 1. Measurement of alternating voltage using multimeter. 2. Measurement of voltage and Time period and using CRO. 3. Measurement of resistance value using colour codes and multimeter. 4. Design and verify the potential divider arrangement using resistances. 5. Testing of wire, measuring voltage, current and frequency using multimeter 6. Demonstrate soldering of basic electronics components using soldering iron. 7. Understanding the role of transformer.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory(15 Marks)** • Class Participation: **(4 Marks)** • Seminar/presentation/assignment/quiz/class test etc.: **(4 Marks)** • Mid-Term Exam**: (7 Marks)** ➢ **Practicum (5 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: **(5 Marks)** • Mid-Term Exam:		**End Term Examination:** **35 marks** **20 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. A course in Electrical and Electronic Measurements and Instrumentation by A K Sawhney.

2. Electronics Instrumentation and Measurement Techniques by W D Cooper

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SECOND		
Name of the Course	Principles of Electronics-II		
Course Code	B23-EEM-201		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-2 MCC-1		
Level of the course	100-199		
Pre-requisite for the course (if any)	Knowledge of Electronics in 1st Sem		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Students will be able to understand field effect transistors. 2. Students will be able to understand different power devices. 3. Students will be able to understand the basic design principle of combinational circuits 4. Students will be able to implement advanced combinational circuits 5. Students will get a hands-on experience while implementing different analog and digital circuits		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**Field Effect Transistor: -** Junctions Field Effect Transistor, Qualitative Description of JFET, Drain and transfer characteristics of JFET, FET small signal low frequency model, CS & CD low frequency model, MOSFET -Depletion and enhancement and their drain & transfer characteristics, CMOS (Basic idea).	11
II	**Power Control Devices:** Four Layer Diode (PNPN), Silicon Controlled Rectifier (SCR), Triac, Diac (Principle, Characteristics and Applications). **Unijunction Transistor:** Basic Working Principle, Characteristics, intrinsic stand-off ratio, Applications as a switch and as time base generator.	12
III	**Combinational Circuit-I:** Half adder, full adder, half subtractor, full subtractor, Parity Generator. Multiplexers, Demultiplexer	11
IV	**Combinational Circuit-II:** Decoder, Encoder, Parity bit generator and checker, Code Converter: BCD to Seven Segment, BCD to Excess-3, Gray to Binary , Binary to Gray, Binary to Excess-3	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Study Drain and transfer characteristics of JFET. 2. Study of I-V Characteristics of Silicon Controlled Rectifier (SCR). 3. Study of I-V Characteristics of Unijunction Transistor. 4. Design a time base generator using UJT. 5. Study of Half Adder. 6. Study of Half subtractor. 7. Study of Full Adder. 8. Study of 4:1 multiplexer. 9. Study of 1:4 demultiplexer. 10. Study and design Parity bit generator and checker.	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. Digital Electronics by R.P. Jain 2. Digital Computer Electronics by A. P. Malvino 3. Integrated Electronics by Millman & Halkias 4. Basic Electronics SOLID STATE by B L Theraja	

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SECOND		
Name of the Course	Transistors & Linear Integrated Circuits		
Course Code	B23-EEM-202		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	DSEC-2		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as a Subject at 4.0 Level (Class XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Describe the transistor working at low frequencies and its other applications. 2. Learn about various fabrication techniques and processes 3. Understand the concept of fabricating monolithic devices 4. Develop the concept of operational amplifiers 5. Present the experimental results and conclusions by having Hands-on experience in the Laboratory		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**Transistor at Low Frequencies**: Transistor hybrid model, h parameters, Analysis of transistor amplifier circuit using h-parameters, Emitter follower, Comparison of transistor configurations, Simplified common Emitter hybrid model.	11
II	**Integrated Circuit-I**: Basics of Integrated Circuit Technology, Monolithic fabrication technique, Different Fabrication Processes: Crystal growth, Epitaxial growth, Oxidation, Masking and Etching, Diffusion of Impurities, Metallization, Classification of ICs (SSI, MSI, LSI and VLSI).	12
III	**Integrated Circuit-II:** Transistors for Monolithic Circuits (NPN & PNP), Monolithic Diodes, Integrated Resistors, Integrated Capacitors and Inductors, JFET, MOSFET fabrication (Qualitatively), Monolithic Circuit Layout.	12
IV	**Operational Amplifier:** DC Coupled Amplifier, Double ended differential Amplifier, differential gain. Common-mode gain, CMRR, ideal operational amplifier, Basic Concept of Feedback in Opamp, Inverting & non-inverting configuration, Buffer, Summing and Difference amplifier.	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. **1.** Operational amplifier as Unity gain buffer amplifier. **2.** Operational amplifier as an Inverting amplifier and Non-inverting amplifier. 3. Operational amplifier as summing amplifier. 4. Operational amplifier as Difference amplifier. 5. Measurement of offset voltage, bias currents & CMRR of an operational amplifier. 6. Learn about basic IC Fabrication Processes 7. Understand the concept of Thermal Oxidation, Diffusion and other thin film processes. 8. Learn about various photolithography methods and their applications 9. Learn about various etching methods of different semiconductor substrates. 10. Get the exposure of the field visit to IC Fabrication Laboratory and other hands-on experiences.	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. Electronics for Scientist & Engineers by Vishvanathan.
2. Op. amp. and Linear Integrated Circuit by Ramakant A. Gayakward
3. Integrated Electronics by Millman & Halkias
4. Linear Integrated Circuits by Roy Choudhury & Shail Jain

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SECOND		
Name of the Course	Basic Electronic components & Devices		
Course Code	B23-EEM-203		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M2		
Level of the course	100-199		
Pre-requisite for the course (if any)	Physics as a Subject at 4.0 Level (Class XII)		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn about active, Passive components and junction diode's 2. Understand the applications of junction diode and Zener diode 3. Understand the Concept of Bipolar Junction Transistor 4. Understand various R, L and C circuits 5. Practical exposure of the different active and passive components in their uses		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	15	30	45
Max. Marks: 50 (30 Theory + 20 Practical) **Internal Assessment Marks: 10 Theory + 5 Practical** **End Term Exam Marks: 20Theory + 15 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	**Passive Components:** Resistors, Capacitors, Inductors, Transformers, Relays, Fuses (their types & applications). **Junction Diodes:** Rectifying diode, Forward and reverse bias characteristics, Varactor Diode, Light Emitting Diode, Photo diode and Photo transistors (qualitative only).	4
II	**Rectifiers:** Half wave, Full wave, Bridge, Clipping and Clamping circuits. **Zener diode:** Zener diode as voltage regulator**.**	3
III	**Bipolar Junction Transistor:** Basic working principle, Input and Output Characteristics of CB & CE configurations. Transistor as an amplifier, Transistor as a switch.	4
IV	**Sinusoidal Circuit Analysis**: for RL, RC and RLC Circuits, Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth.	4
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Measurement of resistance value using colour codes and multimeter. 2. To study the V-I characteristics of PN junction diode. 3. To study the zener diode as voltage regulator. 4. To study HWR and measurement of ripple factor without filter. 5. To study FWR and measurement of ripple factor without filter. 6. To study diode as shunt clipping circuit. 7. To study diode as clamping element. 8. Study of CB characteristics. 9. Study of CE characteristics. 10. Measurement of voltage and Time period using CRO.	30
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory(10 Marks)** • Class Participation **(4 Marks)** • Seminar/presentation/assignment/quiz/class test etc.: • Mid-Term Exam: **(6 Marks)** ➢ **Practicum (5 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc**.(5 Marks)** • Mid-Term Exam:		**End Term Examination:** **20 marks** **15 marks**
Part C-Learning Resources		

Recommended Books/e-resources/LMS:

1. Integrated Electronics by Millman and Halkias.
2. Basic Electronics and Linear Circuits by NN Bhargava, DC Kulshreshtha (TTTI)
3. Electronics Devices and Circuit by Allen Mottershead
4. Basic Electronics SOLID STATE by B L Theraja

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	SECOND		
Name of the Course	Understanding of Mobiles and Computer Systems		
Course Code	B23-EEM-204		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-2		
Level of the course	100-199		
Pre-requisite for the course (if any)	B.A. & B.Com. Ist Sem.		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Identify the different parts of Computer or Laptop systems. 2. Know about various backup systems and cable connections 3. Learn about different printers available 4. Understand the Setting of Internet Connection with computer/Laptop systems 5. Hands-on with the different parts and peripherals of computer		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	30	30	60
Max. Marks: 75 (50 Theory + 25 Practical) **Internal Assessment Marks: 15 Theory + 5 Practical** **End Term Exam Marks: 35 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	Identification of various parts of Computer/ Laptop, Understanding the computer configuration/Laptop configuration and Mobile Configuration	8
II	Power Backup: Inverter, UPS, Dry Battery Various Interfacing Cables, connectors and converters for computer, Laptop and Mobile	8
III	Printer Scanner Configuration Projector: Types of Projectors and their Installation	7
IV	Setting Up of Internet Connection: Wired & Wi-fi Setting Up of a complete ICT solution using Computer/laptop and Mobile and interactive Panel	7
V*	**Note:** A candidate is required to perform minimum 4 experiments out of the list provided during course of study in this semester. 1. Introduction of Computer Peripherals (input devices, output devices etc) 2. Disassembling computer system. 3. Reassembling computer system 4. Familiarization with Motherboard and its Components. 5. Troubleshooting and Repairing of Keyboard and Scanner. 6. Troubleshooting and Repairing of Printer 7. Troubleshooting and Repairing of Speaker and Web camera.	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(15 Marks)** • Class Participation: **(4 Marks)** • Seminar/presentation/assignment/quiz/class test etc.: **(4 Marks)** • Mid-Term Exam**: (7 Marks)** ➢ **Practicum (5 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: **(5 Marks)** • Mid-Term Exam:	**End Term Examination:** **35 marks** **15 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Computer Fundamentals by Pradeep K. Sinha BPB Publications
2. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
3. PC Upgrade & Repair Bible , Wiley India.
4. PC Systems, Installation and Maintenance, Second Edition by R. P. Beales,
5. PC Upgrade & Repair Black Book by Ron Gilster.
6. Computer Installation and Servicing by D Balasubramanian

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	THIRD		
Name of the Course	**Microprocessor 8085- Architecture & Programming**		
Course Code	B23-EEM-301		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**CC-3** **MCC-4**		
Level of the course	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of Digital Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. learn the basic concepts and working of 8085 2. understand the use of instruction in 8085 3. make the assembly language in 8085 and learn about its interrupts 4. understand the concept of peripheral 8255 5. Hands-on experience by doing experiments on 8085 kit		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**8085 Microprocessor:** Evolution of Microprocessor, Microprocessor Architecture and its operations, Pin diagram, Fetching and Executing, Instruction Cycle, Timing Diagram. Fetch execute overlap. Instruction word size, Addressing modes, Counter & Time Delay	11
II	**Assembly Language Programming of 8085:** Instruction set of 8085, Addition, Subtraction, Multiplication, Division, Ascending, Descending, Largest Number, smallest Number	12
III	**Interrupt**: Methods of Input/output operations, Data transfer Schemes, software Interrupts, Hardware interrupts, Interrupt control circuits, Interrupt instructions.	11
IV	**Programmable Peripheral Interface 8255:** operational modes of 8255, control word format for 8255, programming in Mode 0, programming in Mode 1, BSR Mode	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Addition of Two 16 Bit Numbers or microprocessor-Kit. 2. Subtraction of two 16 Bit numbers on microprocessor-Kit. 3. Multibyte Addition/Subtraction of two numbers by repetitive addition/subtraction on 4. Microprocessor-kit. 5. Division of two 8-Bit numbers by repetitive subtraction on microprocessor-Kit. 6. Multiplication of Two 8-Bit Numbers on Microprocessor –Kit. 7. Find the smallest/largest number from a give series of numbers on Microprocessor- 8. Kit. 9. To sort a given series of unsigned numbers in Ascending/ descending order on 10. Microprocessor-kit. 11. Generate a time delay through software on Microprocessor-Kit. 12. Check even parity/add parity of binary number on microprocessor-Kit. 13. Program to generate Square, Sine and triangular waves using Microprocessor-Kit.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **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:	**50 marks** **20 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Microprocessor Architecture, Programming and Applications with 8085/8080A – Ramesh S. Gaonkar, Wiley Eastern Limited.
2. Fundamentals of Microprocessor and Microcomputers--B.RAM, Dhanpat Rai Pub.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	THIRD		
Name of the Course	**Programming in C**		
Course Code	B23-EEM-302		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**MCC-5**		
Level of the course	100-199		
Pre-requisite for the course (if any)	Basic Knowledge of Digital Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the basics of C language 2. Learn about the data inputs and outputs in C 3. Understand the concept of Functions in C 4. Understand the concept of Array in C 5. Present the experimental results and conclusions by having Hands-on experience in the Laboratory		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
Max. Marks: 100(70 Theory + 30 Practical) **Internal Assessment Marks: 20 Theory + 10 Practical** **End Term Exam Marks: 50 Theory + 20 Practical**		Time: 3 Hours	

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	**C. Fundamentals:** The character set, identifiers & keywords, data types, constants, variables& arrays declaration, expressions statements, symbolic constants. Operators and expressions: Arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators.	12
II	**Data input and output**: Entering input data- The scanned function, Writing output data- The print function. Control statements: While statement, Do-while statement, for statement, If-else statement, switch statement, break statement, continue statement	11
III	**Function:** Defining a Function, accessing a Function, passing arguments to a Function, specify arguments, data types.	11
IV	**Arrays:** Defining an Array, processing an Array, Passing arrays to a function, Multidimensional arrays, arrays and strings. Pointers: Fundamentals, pointer declaration, passing pointers to a function, pointers and one-dimensional array, operations on pointers.	11
V*	**Note:** A candidate is required to perform minimum 6experiments out of the list provided during course of study in this semester. 1. Program to study the behavior of data types i.e. their min & max values & their sizes. 2. Program to convert given distance in km to meters, feet, inches and centimeters. 3. Program to convert given temperature in Fahrenheit to Celsius. 4. Program to calculate the smallest & Largest out of given numbers using conditional operator. 5. Program to print roots of quadratic equation. 6. Program to print sum of digits of a given number. 7. Program to reverse the given number. 8. Program to check whether a given number is palindrome or not. 9. Program to add first seven terms of following series using for loop 1/1! + 2/2! + 3/3! ---------- 10. Program to print factorial of a number. 11. Program to print Fibonacci series till n given number using function. 12. Program to print binary equivalent of given decimal number. 13. Program to sort elements of array in ascending and descending order. 14. Program to search an element in 1-D arrays. 15. Program to implement multi-dimensional arrays- Multiplication of two matrices.	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. Schaum's Outline series: Theory and problems of programming with C by Byron S. Gottfried
2. Programming with C, Tata McGraw Hill, by Byron Gottfried.
3. Let Us C, BPB publications, by Yashwant Kanetkar.
4. C The Complete Reference, Tata McGraw Hill, by Herbert Schildt.
5. Programming in ANSI C, Tata McGraw Hill, by E. Balagurusamy.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	THIRD		
Name of the Course	**Electronics in Smart world**		
Course Code	B23-EEM-303		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**MDC-3**		
Level of the course	100-199		
Pre-requisite for the course (if any)	1. No Programming language or Experience needed 2. Interest and passion about latest technologies		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Student will be able to understand applications of electronics in smart homes. 2. Student will be able to understand applications of electronics in education sector and agriculture sector. 3. Student will be able to understand applications of electronics in smart homes. 4. Student will be able to understand applications of electronics in smart healthcare. 5. Study and report writing on latest technologies with emphasis on applications of electronics.		
	Theory	Practical	Total
Credits	2	1	3
Contact Hours	30	30	60
Max. Marks: 75 (50 Theory + 25 Practical) **Internal Assessment Marks: 15 Theory + 5 Practical** **End Term Exam Marks: 35 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	Evolution of smart homes; Video monitoring, Security and alarms, CCTV	8
II	Role of Electronics in Education and Agriculture (Drones for survey, Smart-irrigation)	7
III	Electronics in Smart watch, Auto-mobiles, ATM, RF-ID cards: Working and applications	7
IV	Electronics in Healthcare: Digital Thermometers, BP measurement, Digital X-Ray, MRI, USG, ECG (Basic principle only).	8
V*	Perform at least two activities and make the report on it: 1. Prepare a project report on proposed features of smart Homes 2. Prepare a PowerPoint presentation on any one electronic instrument used in Health care. 3. Prepare a project report on proposed features of smart City 4. Prepare a report on ATM systems	30

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory(15 Marks)** • Class Participation: **(4 Marks)** • Seminar/presentation/assignment/quiz/class test etc.: **(4 Marks)** • Mid-Term Exam**: (7 Marks)** ➢ **Practicum (5 Marks)** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: **(5 Marks)** • Mid-Term Exam:	**End Term Examination:** **35 marks** **20 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Boylested, R. L. and Nashelsky, L., Electronic Devices and Circuit Theory, Pearson Education.
2. Stan Gibilisco, Teach Yourself Electricity and Electronics, McGraw-Hill
3. Edward L. Wolf, Quantum Nanoelectronics, Second Edition, Wiley
4. Getting Started in Electronics by Forrest M. Mims
5. Electronics For Dummies by Shamieh Cathleen, Wiley, 2019
6. Consumer Electronics by S P Bali, Pearson, 2008
7. . Handbook of Biomedical Instrumentation, R S Khandpur, Tata Mc Graw Hill, 2014
8. . Emerging Trends in Electronics Vijay G. Yangalwar Nirali Prakahshan Publishers, 2020
9. Paul Horowitz The Art of Electronics Cambridge University Press; 1st edition, 2020.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FOURTH		
Name of the Course	**Advanced Digital Electronics**		
Course Code	B23-EEM-401		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**CC-4** **MCC-6**		
Level of the course	200-299		
Pre-requisite for the course (if any)	Basic Knowledge of Digital Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Learn the basic concepts of flip flops and working of sequential circuits 2. Learn the design of asynchronous and synchronous counters 3. Understand the concept of shift registers and its applications 4. Understand the logics and theory of the semiconductor memories 5. Implementation of various sequential circuits using digital trainer kits		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**Basic Sequential circuit**: Asynchronous and Synchronous circuits, RS Flip-Flop, JK Flip Flop, Race Around Condition, Master Slave JK flip flop, T and D Flip Flop, Excitation Table, Conversion of Flip Flop.	12
II	**Counters:** Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo-N Counters, UP-Down counters, Decade Counter, skipping state counter.	11
III	**Shift Registers**: SISO, SIPO, PISO, PIPO, Bidirectional Shift register, Universal Shift register Applications of shift register: Ring counter, Johnson Counter, Time delay generation.	11
IV	**A/D and D/A Converters:** D/A Converters (Specifications, Weighted Resister, R-2R Ladder), Sample and Hold Circuit, A/D Converters (Quantization and Encoding, Specifications, Parallel Comparator, Successive Approximation, Dual Slope)	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Study J-K type flip flop. 2. Study D and T type flip flops. 3. Design a 4-bit Ripple counter 4. Design an asynchronous decade counter 5. Design a Ring counter 6. Design a SISO shift register 7. To design Digital to Analog (D/A) Converter by weighted resistors arrangement. 8. To design Digital to Analog (D/A) Converter by binary R-2R ladder arrangement.	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. Digital E1ectronics & Micro computers - R. K. Gaur (4th edition)
2. Modern Digital Electronics - R.P. Jain (4th edition)
3. Digital Principles and Applications by Leach Donald, Malvino AP (6th Edition)
4. Digital fundamentals by R.P. Jain & Floyd.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FOURTH		
Name of the Course	**8051: Programming & Applications**		
Course Code	B23-EEM-402		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**MCC-7**		
Level of the course	200-299		
Pre-requisite for the course (if any)	Basic Knowledge of Digital Electronics		
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Familiarize with the basic concepts of microcontroller 8051. 2. Understand Addressing modes and Instruction set of 8051 microcontroller. 3. Learn programming techniques with 8051 microcontroller. 4. Learn the fundamental concepts of interfacing and to design basic applications being interfaced with 8051 microcontroller. 5. Present the experimental results and conclusions by having Hands-on experience in the Laboratory		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**Microcontroller 8051:** Introduction and block diagram of 8051 microcontroller, architecture of 8051 family (in brief), memory organization, Internal RAM/ROM memory, General purpose data memory, special purpose/function registers, external memory. Counters and timers – 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input/output ports and circuits/configurations, serial data input/output – SCON, PCON, serial data transmission modes.	11
II	**8051- Addressing modes and Instruction set** Addressing modes, Data transfer instructions, Push and Pop and data exchange instructions, Logical Instructions, Arithmetic Instructions, simple programs in assembly language.	11
III	**8051 programming in C:** Jump and call instructions – jump and call program range, jumps, calls and subroutines, interrupts and returns, simple example programs in assembly language. 8051 programming using C– Data types and time delays in 8051 C, I/O programming, logic operations, data conversion programs, accessing code ROM space and data serialization. Timer/Counter Programming in 8051–Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 C.	12
IV	**Interfacing with 8051:** Basic interfacing concepts and interrupts, Programming 8051 interrupts, programming Timer interrupts, programming the external hardware interrupts. Schematic diagrams and basic concepts of Interfacing of 8051 to keyboard, seven segment display, stepper motor, DAC, ADC and traffic light controller circuits.	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Familiarization with 8051 based microcontroller trainer kit. 2. Practice in entering and executing simple programs, like addition/subtraction. 3. Practice in entering and executing simple programs smallest/largest of N 8-bit numbers. 4. Write a program on 8051 microcontroller kit to find that the given numbers is prime or not. 5. Write a program on 8051 microcontroller kit to glow the first four LEDs then next four using Timer application. 6. Use one of the four ports of 8051 for output interfaced to eight LED's. 7. Simulate binary counter (8 bit) on LED's .	30

	8. Design a square wave of varying duty cycles on 8051 based microcontroller trainer kit. 9. Interface stepper motor with 8051 microcontroller and write a program to move the motor through a given angle in clock wise or counter clockwise direction. 10. Study and design traffic light controller circuit using 8051 microcontroller.	

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. 8051 Microcontroller & Embedded Systems by M.A.Mazidi, J.G.Mazidi & R.D.McKinlay.
2. The 8051 Microcontroller, architecture, programming and applications by K.J.Ayala.

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FOURTH		
Name of the Course	**Biomedical Equipment Maintenance**		
Course Code	B23-EEM-403		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**MCC-8**		
Level of the course	200-299		
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 working principle and applications of various types of biomedical instruments. 2. Understand signal analysis and various types of electrodes used in various biomedical instruments. 3. Familiarize with role of various types of sensors in biomedical instruments. 4. Understand the utility of monitoring, imaging and therapeutic instruments in biomedical sciences. 5. Present the experimental results and conclusions by having Hands-on experience in the Laboratory		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**Basic medical Instrumentation System**, Desirable Characteristics and Performance Requirements, General Constrains in design of Medical Instrumentation. **Origin of Bioelectric signals**, Resting and action potential, Various Bioelectric Potentials and their waveforms (ECG, EEG, EMG); Bio-Potential Electrodes: Equivalent circuit model of Electrode, Various types Recording Electrodes (Surface, Micro, Needle, Array electrodes).	11
II	**Physiological Sensors**: Optical Fibre Sensors, Photometric Sensors, Pulse Sensors, Chemical Sensors, Biosensors, Smart Sensors. **Biomedical Equipment:** (Principle of operation and Application) Electrocardiograph (ECG), Electroencephalograph (EEG), Electromyography (EMG). **Patient Monitoring Systems:** Basic Principle and Mechanism of Cardiac Monitor, Heart Rate, Pulse Rate.	12
III	**Analytical Instruments** (Principle of operation and Application): Blood Gas Analyzers (pH & PCO_2 Measurement, Blood Cell Counter, Colorimeter, Spectrophotometer, Oximeter. **Imaging systems** (Basic principle, Block diagram, Biological Effects, Advantages): X-ray machine, Computed Tomography (CT), Magnetic Resonance Imaging System. **Therapeutic Equipment:** (Principle of operation and Application) Cardiac pacemakers, Hemodialysis machine, Ventilators, Humidifiers, Nebulizers.	11
IV	**Basic principle and operation:** Bedside patient monitor, Blood pressure Measurements, Audiometers and hearing aids, Single Channel Telemetry Systems and telemedicine. **Patient Safety medical equipment:** Electrical Shock Hazards, Leakage current, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment.	11
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Recording of ECG and identification of various peaks in ECG waveform. 2. Measurement of Heart Rate using conventional and modern electronic stethoscope. (an activity can be given for the design of electronic stethoscope using condenser	30

	Microphone) 3. Measurement of blood pressure (systolic and diastolic) using sphygmomanometer 4. Measurement of oxygen (SpO_2) level using oximeter. 5. Understand and make a presentation on CT Scan and MRI setups. 6. Understand and make a presentation on complete ventilator setups. 7. Measurement of respiratory rate and various tidal volumes using spirometer. (an activity can be given for the design of respiratory rate monitor using Strain gauge/thermistor) 8. Measurement of body temperature using conventional mercury `thermometer and modern electronic thermometer. (an activity can be given for the design of electronic thermometer using thermistor/thermocouple).	

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. Khandpur R. S. - Handbook of Biomedical Instrumentation, TMH

2. L.Cromwell et al- Biomedical Instrumentation and Measurements PHI

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FOURTH		
Name of the Course	**Electronic Communication-1**		
Course Code	B23-EEM-404		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-1**		
Level of the course	200-299		
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. 1. Develop the concept of basics of communication systems 2. Familiar with modulation & demodulation methods 3. Familiar with AM, FM and pulse modulation. 4. Learn the different Digital Modulation Techniques. 5. Get the hands-on practice of different communication techniques and methods		
	Theory	Practical	Total
Credits	3	1	4
Contact Hours	45	30	75
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	**Communication Systems:** Elements of Communication Systems, Basic Terminology in communication system, Bandwidth of Signal, Bandwidth of Transmission medium, Propagation of Electromagnetic waves: Ground Wave, Sky wave, Space Wave	11
II	**Modulation & Demodulation**: Principle of modulation, Amplitude Modulation, Percent Modulation, upper & lower side frequencies, upper & lower side bands, mathematical analysis of a modulated carrier wave, power relations in an AM wave, simple idea about different forms of amplitude modulation. A) DSB-SC B) SSB-TC C) SSBSC	12
III	**Frequency Modulation:** Frequency modulation, FM Sidebands, modulation index and number of side bands, mathematical expression for FM wave, Demodulation, diode detector for AM signals.FM detector, Limited and phase shift detectors, comparison between AM & FM.	12
IV	**Pulse Analog Modulation:** Channel capacity, Sampling theorem, PAM, PWM, PPM modulation and detection techniques, Multiplexing: TDM and FDM.	10
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester: 1. Study of Amplitude Modulation, plot the waveform and calculation of modulation index (using Kit) 2. Study of Amplitude demodulation and plot the waveform (using Kit) 3. Study of Frequency Modulation and wave form tracing (using Kit). 4. Study of Pulse Amplitude Modulation using IC 555 (using Kit). 5. Study Pulse width Modulation using IC 555 (using Kit). 6. Study of Pulse Position Modulation using IC 555 (using Kit). 7. Multiplexing Techniques: FDM 8. Multiplexing Techniques: TDM	30

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

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Kennedy, George & Davis, Bernard "Electronic Communication Systems" Tata McGraw-Hill 4thEd.
2. Modem Analog & Digital Communication Systems: B.P. Lathi; Oxford Univ. Press.
3. Communication Systems S. Haykin, John Willy & Sons.
4. Taub, Herbert & Schilling, Donald L. "Communication Systems" Tata McGraw-Hill
5. Electronic Communication Systems: Fundamentals through Advanced (4^{th}ed.) Wayne Tomasi, Prentice Hall
6. Radio Engineering by G K Mithal

Session: 2023-24			
Part A - Introduction			
Subject	ELECTRONIC EQUIPMENT & MAINTENANCE		
Semester	FOURTH		
Name of the Course	**Electronic Instrumentation-1**		
Course Code	B23-EEM-405		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	**DSE-1**		
Level of the course	200-299		
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 basic concepts and characteristics of electronic instruments 2. Demonstrate the working principle and utilities of various types of bridges. 3. Familiarize with the fundamentals of various types of transducers and their applications. 4. Learn the concepts of acquiring the data from any of the transducers. 5. Get the hands-on practice of different instrumentation measurement techniques and methods		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75
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	**DC and AC indicating Instruments:** Accuracy and precision, Types of errors, PMMC galvanometer, Sensitivity, Loading effect, Series Type and Shunt type Ohmmeter, Multimeter. Watthour Meter, Power Factor Meter.	11
II	**DC and AC Bridges & their Applications:** General Conditions for Bridge Balance of Wheatstone Bridge, Kelvin Bridge, Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge, Wagner Ground Connection.	10
III	**Transducers:** Classification, Active, Passive, Mechanical, Electrical, their comparison. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Temperature (electrical and non-electrical), Piezoelectric (Element and their properties, Piezoelectric coefficients. Equivalent circuit and frequency response of P.E. Transducers)	12
IV	**Photosensitive Transducers:** photo-conductive, photo emissive, photo voltaic, semiconductor, LDR. **Data acquisition systems:** Block diagram, brief description of preamplifier, signal conditioner, instrumentation amplifier, waveform generator, A/D and D/A converter blocks, D/A and A/D Multiplexing, computer-controlled test and measurement system.	12
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester: 1. Measurement of displacement using LVDT. 2. Measurement of load using strain gauge-based load cell. 3. Measurement of temperature by RTD. 4. Measurement of temperature by thermocouple 5. Measurement of resistance with Wheatstone bridge 6. Study the characteristics of an LDR 7. Determination of characteristics of a solid-state sensor/ fibre-optic sensor 8. Study any complete data acquisition system and make a presentation on it.	30
Suggested Evaluation Methods		

Internal Assessment:	End Term Examination:
➢ **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:	**50 marks** **20 marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Instrumentation Measurements and Analysis by Nakra & Choudhary; TMH
2. Electrical & Electronic Measurements & Instrumentation by A.K. Sawhney
3. Electronic Instrumentation and Measurements Techniques by W.D. Cooper; PHI