Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
('A+' Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योगयुक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)

Scheme of Examination and Syllabus of Bachelor of Science (B.Sc.) Programme (Course: Electronic Equipment Maintenance) (CBCS)
in Phased Manner

DEPARTMENT OF ELECTRONIC SCIENCE

CBCS CURRICULUM (2020-21)

Program Name: Bachelor of Science (B.Sc.) Programme
(**Course: Electronic Equipment Maintenance**)
(CBCS)

(For the Batches Admitted From 2020-2021)

Programme Outcomes (POs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environmentin cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

SCHEME OF EXAMINATION AND SYLLABI
for
B.Sc. Programme (Course: ELECTRONIC EQUIPMENT & MAINTENANCE)
under
Choice Based Credit System (CBCS) w.e.f. 2020-21in Phased Manner

Sem-ester	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Internal Marks	External Marks	Total Marks
							Max.	Max.	
1	CC-EEM -1	EEM-101	Principles of Electronics-I	3	3	3	15	60	75
		EEM-102	Electronic Devices, Components and Assemblies-I	3	3	3	15	60	75
		EEM -103	Practical-I	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
2	CC-EEM -2	EEM -201	Principles of Electronics-II	3	3	3	15	60	75
		EEM -202	Electronic Devices, Components and Assemblies-II	3	3	3	15	60	75
		EEM -203	Practical-II	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
3	CC-EEM -3	EEM -301	Operational Principles of Audio and Video Systems	3	3	3	15	60	75
		EEM -302	Microprocessor 8085 & Interfacing	3	3	3	15	60	75
		EEM - 303	Practical-I	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
4	CC-EEM -4	EEM -401	Advanced Digital Electronics	3	3	3	15	60	75
		EEM -402	8051 : Programming & Applications	3	3	3	15	60	75
		EEM -403	Practical-II	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
		EEM-503	Skill Development MOOC/SWAYAM Course	2	2	3	-	50	50
		EEM-504	Major Project	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**20**	**180**	**200**
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE-II)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM -602	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						

		EEM -604	Practical	2	4	3	-	50	50
	TOTAL			**06**	**08**	**-**	**20**	**130**	**150**
TOTAL CREDITS/MARKS				**46**	**58**	**-**	**160**	**990**	**1150**

**** DSE (Discipline Specific Elective).**

Important Instructions:-

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV& VI Semester):

I. Internal Marks: 10

II. Experiment Performed: 15

II. Lab Record: 10

IV. Viva/Voce : 15

9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:

I. Internal Marks: 10

II. Project Developed: 15

II. Project Report: 10

III. Viva Voce: 15

Course Code: CC-EEM -1 Paper Code: EEM-101	Course Name: PRINCIPLES OF ELECTRONICS – I
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with fundamental concepts of digital electronics and designing of logic circuits.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the different number systems, basic concepts and laws of Boolean algebra.
CO2	Understand the fundamental concepts of logic gates, logic families and the abilities of reducing the Boolean expressions.
CO3	Learn minimization techniques in simplifying the hardware requirements of digital circuits.
CO4	Understand the concepts of combinational and sequential circuits utilized in the different digital circuits and systems.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	3	3	2	3	3	2	2	2	2	3	2
CO4	3	2	3	3	3	2	2	2	2	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	2	3	3

Unit-I

Number Systems: Introduction to Decimal, Binary, Octal, Hexadecimal NumberSystems 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.

Unit-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.

Unit-III

Digital Logic Families: Characteristics (fan in, fan out, noise margin, propagation delay, power dissipation), Bipolar and unipolar logic families and their comparison, Characteristics of digital ICs, Resistor Transistor logic (RTL), Diode Transistor logic (DTL), High Threshold Logic (HTL), Transistor Transistor logic (TTL), Schottky TTL, MOS & CMOS, Emitter Coupled Logic (ECL).

Unit-IV

Combinational circuits: Half adder, Full adder, Half Subtractor, Full Subtractor, 8421 adders, Parallel Binary Adder, 1's & 2's complementAdder/Subtractor, Excess-3 adder, Digital Comparator, Multiplexer, Demultiplexer.

Basic Sequential circuit: Asynchronous and Synchronous circuits, Flip-Flops (RS, JK, MS-JK, D and T-type), Shift Register, Applications of shift register: Ring counter, Time delay,Sequence Generator.

References:

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

Course Code: CC-EEM-1	Course Name: ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - I
Paper Code: EEM-102	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with fundamental concepts of basic electronic devices and circuits.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the concepts of various passive & active components and their characteristics.
CO2	Understand the working principles of various electronics circuits.
CO3	Understand the mechanism and basic principle of working of popular measuring instruments.
CO4	Understand the mechanism of various electronic devices and measuring instruments and equip the design of analog circuits based on these electronic devices.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	1
CO4	3	2	2	2	3	3	3	3	3	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	3
CO4	2	2	2

Unit-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.

Junction Diodes: Rectifying diode, Forward and reverse bias characteristics, ZenerDiodes, Varactor Diode, Light Emitting Diode, Photodiode and Phototransistors (qualitative only).

Unit-II

Rectifiers: Half wave, Full wave, Bridge (calculation of ripple factor and rectificationefficiency), 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 Characteristicsof 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.

Unit-III

Amplifiers: Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading ofAmplifiers, 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.

Unit-IV

Field Effect Transistors: JFET, basic working principle, I/O Characteristics, pinch offVoltage, parameters, MOSFET, basic working principle, Characteristics.

Measuring Instruments: Regulated power supply, Analogue Multimeter, DigitalMultimeter, Cathode Ray Oscilloscope, Function Generator (functional block diagram, basic working principle, measuring quantities).

References:

1. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
2. Integrated Electronics by Millman and Halkias

Course Code: CC-EEM -1	Course Name: PRACTICAL - I	
Paper Code: EEM-103		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: (Minimum 6 experiments are to be performed in a semester)

Basic Analog & Digital Electronics - I

1. Practical use of:
   (a) Multimeter (measurement of voltage, current, resistance).
   (b) Oscilloscope (voltage and frequency measurement).
2. Study of Electronic Components:
   (a) Resistor (study the types, colour coding, potential divider arrangement).
   (b) Capacitors (study the types).
3. P-N Junction Diode (study V-I Characteristics).
4. Study of PN diode as wave clipping element.
5. Study of Zener Diode as a voltage regulator.
6. Study of Transistors (manual study, CB/CE/CC Characteristics, parameters).
7. Familiarization with Breadboard, IC types, pin number, testing, IC Manual.
8. Verification of truth tables for two input AND, OR, NOT gates.
9. Design DTL & TTL NAND Gate using discrete components & verify its truth table.
10. Study of Half Adder and Full Adder.
11. Study of 4:1 multiplexer.
12. Study of JK, D, T type flip-flops.

Course Code: CC-EEM -2 Paper Code: EEM-201	Course Name: PRINCIPLES OF ELECTRONICS – II
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR morequestions selecting ONE question from each UNIT. All questions will carryequal marks.

Course Objectives: The aim of this course is to familiarize with networks and their analysis.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts on RLC circuits and their steady states and transients behaviour.
CO2	Learn the concepts of circuit analysis on the basis of KCL and KVL.
CO3	Gain the knowledge in analyzing networks on the basis of various network theorems in real world applications.
CO4	Understand the concepts of various parameters of a two-port network and their interconversions.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	1	2
CO2	3	2	3	3	1	2	2	3	2	2	2
CO3	2	3	3	3	2	2	3	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2
CO2	2	2	2
CO3	2	3	3
CO4	2	3	3

Unit-I

DC Transient Analysis: RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with sources, DC Response of Series RLC Circuits.
Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor.
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.
Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.

Unit-II

Circuit Analysis: Source Transformation, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion.

Unit-III

Network Theorems: Principle of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem.

Unit-IV

Two Port Networks: Impedance Parameters, Admittance Parameters, HybridParameters, Inverse Hybrid Parameters, Transmission Parameters, Inverse Transmission Parameters, Transformation of parameters.

References:

1. Networks and Systems by D. Roy Choudhary
2. Network Analysis , Publication Pearson India By M.E. Van Valkenburg
3. Circuits and Networks by A. Sudhakar and Shyam Mohan

Course Code: CC-EEM -2	Course Name:ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - II
Paper Code: EEM- 202	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to learn the operation of power devices & linear integrated circuits and their applications.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the working principle of various power devices and their applications.
CO2	Know the technicalities of operational amplifiers and their applications in designing various circuits.
CO3	Know the technicalities of IC Regulators and their applications as voltage regulators.
CO4	Understand the design concepts of oscillators, multivibrators and active filters.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	1	2
CO2	3	2	3	3	1	2	2	3	2	2	2
CO3	2	3	3	3	2	2	3	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	3
CO4	2	2	2

Unit-I

Power Control Devices: Four Layer Diode (PNPN), Silicon Controlled Rectifier (SCR), Triac, Diac (Principle, Characteristics and Applications).
Unijunction Transistor: Basic Working Principle, Characteristics, intrinsic standoff ratio, Applications as aswitch and as time base generator.

Unit-II

Operational Amplifiers: Basic idea of an OPAMP with black box concept, emittercoupled differential amplifier, transfer characteristics of a differential amplifier, IC 741 various parameters, offset error voltages and currents, temperature drift of input offset voltage and current, inverting and non-inverting amplifiers, virtual ground, summing, difference, integrator, differentiator.

Unit-III

Power Supplies: Regulated power supply, transistorizedseries and shunt regulated power supply, block diagram of IC 723, regulated supply using IC 723, three terminal regulator ICs, IC based power supply study.

Unit-IV

Oscillators: Positive Feedback, Barkhausen criteria, Phase-Shift Oscillators, WeinBridge Oscillators, Hartley's and Colpitt's Oscillators, Crystal Oscillators.
Timer IC 555: Block diagram and operation, applications as Monostable & Astable Multivibrators.
Active Filters: Ist order low pass, high pass and Band pass Butterworth filters

References:

1. Integrated Electronics by Millman and Halkias
2. Op-Amp and Linear Integrated Circuits by R. A. Gyakward

Course Code: CC-EEM -2	Course Name: PRACTICAL - II	
Paper Code: EEM-203		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: (Minimum 6 experiments are to be performed in a semester)

Basic Analog & Digital Electronics - II

1. To study RC low pass and high pass filter and measurement of cut-off frequency from graph.
2. To study RC components as integrating and differentiating circuits.
3. Study of Superposition Theorem (Verification and Application).
4. Study of Maximum Power Transfer Theorem for DC network (Verification).
5. Design power controller using SCR/Diac/Triac.
6. Study UJT characteristic and design UJT as relaxation Oscillator and calculate its frequency of oscillation.
7. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
8. Operational amplifier as (1) units gain buffer (I) inverting amplifier (3) Non-inverting amplifier.
9. Operational amplifier as (1) summing amplifier (2) difference amplifier.
10. Investigate the use of an op-amp as an Integrator and Differentiator.
11. Design and testing of oscillators (any two):
    (a) RC-phase shift (b) Wein Bridge (c) Hartley (d) Colpitt
11. Study of Monostable and Astable multivibrator using IC 555.
12. Study the frequency response of 1st and 2nd order active High pass/Low pass filter.

Course Code: CC-EEM -3	Course Name: OPERATIONAL PRINCIPLES & AUDIO AND VIDEO SYSTEMS
Paper Code: EEM- 301	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: To understand working mechanism of various types of Audio-Video Equipment.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the superheterodyne receiver and its different sections.
CO2	Understand the fundamental concepts of audio systems and their recording mechanisms.
CO3	Learn working mechanism of a TV Receiver and its various sections.
CO4	Learn the technicalities of common audio & video equipment.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3
CO2	2	3	3
CO3	2	3	3
CO4	2	2	3

Unit-I

Superheterodyne Receivers: Principles, advantages, block diagram, RF input and coupling AF coupling arrangements, RF amplifiers, mixer, local oscillator, IF amplifier, detector, audio amplifier, loud speaker, power requirements.

High Fidelity & Stereophony: High Fidelity, Stereophony and Monophony (difference), Ideal & Practical Stereo System, Quadraphonic sound system, stereophonic recording on Disc and Reproduction, block diagram of stereo recording on disc, Hi-Fi stereo reproducing system, Stereo Controls, Troubleshooting of Stereo Amplifier.

Unit-II

Television Receiver: schematic block diagram and functions of different sections, Analysis of TV Picture:Gross structure, Image continuity, number of scanning lines, flicker, fine structure.

CompositeVideoSignal: Video Signal dimensions, Horizontal& Vertical synchronous details, vestigial sidebandtransmission.

Video Detector: video signal detection (Basic idea), basic video detector, video detector requirements.

Unit-III

Video Section Fundamentals: Video amplifiers, Transistor video amplifier, contrast control methods, Direct coupled video amplifier, Advantages of AGC, various AGC systems, merits of keyed AGC system.

Unit-IV

Deflection Oscillators: Deflection current waveform, generation of driving voltage waveform, Requirements of vertical deflection stage (in brief).

Sound System: Sound signal separation, sound take off circuits, audio O/P state.

RF Tuner: Tuner operation and its functions, various sections of VHF tuner.

Video IF Amplifier: Video IF Section, IF amplifier, Adjacent channel interference.

References:

1. Radio Engineering by G.K.Mithal
2. Monochrome TV and Colour TV by R.R.Gulati.
3. Principles of communication by GeorgeKennedy
4. Basic Radio and Television by S.P.Sharma.

Course Code: CC-EEM -3	Course Name: MICROPROCESSOR 8085 & INTERFACING

Paper Code: EEM- 302	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to introduce with 8085 microprocessor and its programming concepts.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with 8085 microprocessor architecture, instruction sets, addressing modes.
CO2	To learn programming techniques in 8085 microprocessor.
CO3	Understand the stacks and stack operations in 8085.
CO4	Understand the fundamental concepts of interfacing of 8085 microprocessor with input/output and memory devices.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	2	2	3	2	2	2
CO2	3	2	3	2	2	3	2	3	2	1	3
CO3	3	2	3	2	2	2	2	3	2	2	2
CO4	3	2	3	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2
CO2	3	3	3
CO3	2	3	2
CO4	3	3	3

Unit-I

Microprocessor Architecture: Microprocessor Architecture and its Operations, Fetching, decoding and execution of an Instruction, concept of Peripheral I/O and Memory Mapped I/O.

Instruction Set of 8085: 8085 Programming Model, Instruction Classification, Instruction and Data Format, Addressing Modes. Data Transfer Operations, Arithmetic Operations, Logic Operations, BranchOperations.

Unit-II

Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-bit Arithmetic Instructions, Arithmetic Operation related to Memory, Logic Operations: Rotate, Compare, Counters and Time Delays with few examples.

Stacks and Subroutines: Stack, Subroutine, Restart, conditional call, and return instructions; BCD Addition, BCD Subtraction, Introduction to advanced instructions and applications, multiplication, subtraction with carry.

Unit-III

Interrupts & Interfacing Data Converters: 8085 Interrupt, 8085 Vectored Interrupts, Direct Memory Access, Digital-to-Analog Converter (basic concepts, D/A Converter Circuits, Interfacing 8-bit D/A Converter), Analog-to-Digital Converter (basic concepts, Successive Approximation A/D Converter, Interfacing 8-bit A/D Converter).

Unit-IV

Programmable Interface Devices: 8155 Multipurpose Programmable Device (I/O ports & Timer, Interfacing 7-segment-LED), 8255 programmable peripheral interface (block diagram, modes), 8253/8254 Programmable Interval Timer (block diagram, programming 8254), 8259 Programmable Interrupt Controller (block diagram, interrupt operation and features).

References:

1. Microprocessor Architecture, Programming & Applications with 8085 by R. S.Gaonkar.
2. Introduction to Microprocessors by A.P.Mathur.

Course Code: CC-EEM -3	Course Name: PRACTICAL - I	
Paper Code: EEM-303		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in a Semesters.

Audio/Video Systems &Advanced Digital Electronics

1. Study of Radio Receiver testing (noting waveforms and voltages at different check points, fault finding and troubleshooting).
2. To identify various sections of a TV Receiver; to understand basic working of TV receiver and the main functions of various sections.
3. Location, Orientation and Connection of TV antenna; main faults of antenna and their rectification; knowledge of Balun unit and its replacement.
4. Study of Power supply cold tests and hot tests, voltage measurement at various points and the common faults in power supply.
5. Study of IF section testing by voltage measurement.
6. Study of Horizontal and vertical section testing.
7. Study of Audio section testing by voltage measurement.
8. Study of common faults and their rectification in a TV receiver.
9. To design the circuit of Schmitt Trigger using Op-amp IC 741 and plot its voltage waveforms.
10. To design and study the Sample and Hold Circuit.
11. To design Digital to Analog (D/A) Converter by binary weighted resistors & R-2R ladder arrangement.
12. Design an 8-bit Analog to Digital (A/D) Converter that utilizes LEDs to indicate its binary output value.

Course Code: CC-EEM -4	Course Name: ADVANCED DIGITAL ELECTRONICS
Paper Code: EEM- 401	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with some advanced concepts of digital electronics.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with advanced combinational & sequential circuits, viz., code converters, and counters.
CO2	Understand the application aspect of timing circuits to generate various types of timing pulses/waveforms implemented in digital circuits.
CO3	Learn the structure of various types of memories, importance of PLA and familiarization with various types of A/D and D/A converters and their features.
CO4	Learn the minimization techniques in simplifying the hardware requirements of digital circuits for their role in digital system design.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	-	2
CO2	3	2	3	3	3	2	2	2	2	-	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	3	2	2	3	3	2	3	2	-	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2
CO2	2	3	3
CO3	2	3	3
CO4	2	2	2

Unit-I

Code Converters: Encoders and Decoders, Design of Code Converters: BCD to SevenSegment, BCD to Cyclic Code, Binary to Decimal, Binary to Gray, Binary to Excess-3.

Counters: Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- NCounters, UP-Down counters, Decade Counter, BCD Counter.

Unit-II

Timing Circuits: Applications of Logic Gates in Timing Circuits, OPAMP and its applications in Timing Circuits (OPAMP Comparator, Regenerator Comparator, Schmitt Trigger, Free Running Multivibrator, Monostable Multivibrator), Schmitt Trigger Square Wave Generator.

Unit-III

Memories: Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Sequential Memory (Static Shift Register, Dynamic Shift Register, Dynamic MOS Inverter), Read Only Memory (ROM Organization, Programming Mechanisms, , Read and Write Memory (Bipolar RAM Cell, MOS RAMs, Charge Couple Device Memory (Basic concept of CCD, Operation of CCD)

Unit-IV

Programmable Logic Array: Input Buffer, AND Matrix, OR Matrix, Invert/Non-Invert Matrix, Output Buffer, Output Through FFs and Buffers, Programming PLA, Expanding Capacity, Applications of PLA

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)

References:

1. Modern Digital Electronics by R. P. Jain
2. Integrated Electronics by Millman & Halkias
3. Digital Computer Electronics by A. P. Malvino

Course Code: CC-EEM -4 Paper Code: EEM- 402	Course Name: 8051: PROGRAMMING & APPLICATIONS
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamentals of microcontroller 8051 and its programming.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic concepts of microcontroller 8051.
CO2	Understand the Interrupts, Addressing modes and Instruction set of 8051 microcontroller.
CO3	Learn programming techniques with 8051 microcontroller.
CO4	Learn the fundamental concepts of interfacing and to design basic applications being interfaced with 8051 microcontroller.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	1	3	2	3	2	1	2
CO2	3	3	3	3	1	3	2	2	2	1	2
CO3	3	3	3	3	2	3	2	2	2	1	2
CO4	3	3	3	3	2	3	2	3	2	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3
CO2	2	3	3
CO3	2	3	3
CO4	2	3	3

Unit-I

Microcontroller 8051: Introduction and block diagram of 8051 microcontroller,architectureof 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.

Unit-II

8051- Interrupts, Addressing modes and Instruction set: Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts. Addressing modes, Data transfer instructions, Push and Pop and data exchange instructions, Logical Instructions,Arithmetic Instructions, simple programs in assembly language.

Unit-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.

Unit-III

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.

References:

1. 8051Microcontroller&EmbeddedSystemsbyM.A.Mazidi,J.G.Mazidi&R.D.McKinlay.
2. The 8051 Microcontroller, architecture, programming and applications by K.J.Ayala.

Course Code: CC-EEM -4	Course Name: PRACTICAL - II	
Paper Code: EEM-403		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in each of the Semesters.

8085 Microprocessor & 8051 Microcontroller:Programming &Applications

1. Familiarization with 8085 based microprocessor trainer kit by identifying different IC chips and their utilities. Understanding various functions of the kit, like, insertion, deletion, block-move, block-fill, examining registers/memory, single step, etc. by writing and executing simple programs for addition/subtraction of single and multibyte numbers.
2. Writing 8085 program for multiplication and division of two numbers.
3. Write 8085 program for arranging an array of data in ascending/descending order.
4. Write 8085 program for the generation of time delays of the order of 1-5 seconds and its testing by interfacing LED's to make them glow in a givensequence.
5. Study the IC Tester application on 8085 µPkit.
6. Study the Traffic Light Controller application of 8085 µPkit.
7. Familiarization with 8051 based microcontroller trainer kit. Practice in entering and executing simpleprograms, likeaddition/subtraction/smallest/largest of N 8-bit numbers.
8. Write a program on 8051 microcontroller kit to find that the given numbers is prime or not.
9. Write a program on 8051 microcontroller kit to glow the first four LEDs then next four using Timer application.
10. Use one of the four ports of 8051 for output interfaced to eight LED's. Simulatebinary counter (8 bit) on LED's .
11. Design a square wave of varying duty cycles on 8051 based microcontroller trainerkit.
12. Interface stepper motor with 8051 microcontroller and write a program to move the motorthrough a given angle in clock wise or counter clockwise direction.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
('A+' Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योगयुक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)

Scheme of Examination and Syllabus of Bachelor of Science (B.Sc.) Programme (Course: Electronic Equipment Maintenance) (CBCS)
in Phased Manner

DEPARTMENT OF ELECTRONIC SCIENCE

CBCS CURRICULUM (2020-21)

Program Name: Bachelor of Science (B.Sc.) Programme
(**Course: Electronic Equipment Maintenance**)
(CBCS)

(For the Batches Admitted From 2020-2021)

Programme Outcomes (POs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environmentin cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

SCHEME OF EXAMINATION AND SYLLABI
for
B.Sc. Programme (Course: ELECTRONIC EQUIPMENT & MAINTENANCE)
under
Choice Based Credit System (CBCS) w.e.f. 2020-21in Phased Manner

Sem-ester	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Internal Marks	External Marks	Total Marks
							Max.	Max.	
1	CC-EEM -1	EEM-101	Principles of Electronics-I	3	3	3	15	60	75
		EEM-102	Electronic Devices, Components and Assemblies-I	3	3	3	15	60	75
		EEM -103	Practical-I	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
2	CC-EEM -2	EEM -201	Principles of Electronics-II	3	3	3	15	60	75
		EEM -202	Electronic Devices, Components and Assemblies-II	3	3	3	15	60	75
		EEM -203	Practical-II	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
3	CC-EEM -3	EEM -301	Operational Principles of Audio and Video Systems	3	3	3	15	60	75
		EEM -302	Microprocessor 8085 & Interfacing	3	3	3	15	60	75
		EEM - 303	Practical-I	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
4	CC-EEM -4	EEM -401	Advanced Digital Electronics	3	3	3	15	60	75
		EEM -402	8051 : Programming & Applications	3	3	3	15	60	75
		EEM -403	Practical-II	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**30**	**170**	**200**
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
		EEM-503	Skill Development MOOC/SWAYAM Course	2	2	3	-	50	50
		EEM-504	Major Project	2	4	3	-	50	50
	TOTAL			**08**	**10**	**-**	**20**	**180**	**200**
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE-II)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM -602	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						

		EEM -604	Practical	2	4	3	-	50	50
	TOTAL			**06**	**08**	**-**	**20**	**130**	**150**
TOTAL CREDITS/MARKS				**46**	**58**	**-**	**160**	**990**	**1150**

**** DSE (Discipline Specific Elective).**

Important Instructions:-

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV& VI Semester):

I. Internal Marks: 10

II. Experiment Performed: 15

II. Lab Record: 10

IV. Viva/Voce : 15

9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:

I. Internal Marks: 10

II. Project Developed: 15

II. Project Report: 10

III. Viva Voce: 15

Course Code: CC-EEM -1 Paper Code: EEM-101	Course Name: PRINCIPLES OF ELECTRONICS – I
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with fundamental concepts of digital electronics and designing of logic circuits.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the different number systems, basic concepts and laws of Boolean algebra.
CO2	Understand the fundamental concepts of logic gates, logic families and the abilities of reducing the Boolean expressions.
CO3	Learn minimization techniques in simplifying the hardware requirements of digital circuits.
CO4	Understand the concepts of combinational and sequential circuits utilized in the different digital circuits and systems.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	3	3	2	3	3	2	2	2	2	3	2
CO4	3	2	3	3	3	2	2	2	2	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	2	3	3

Unit-I

Number Systems: Introduction to Decimal, Binary, Octal, Hexadecimal NumberSystems 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.

Unit-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.

Unit-III

Digital Logic Families: Characteristics (fan in, fan out, noise margin, propagation delay, power dissipation), Bipolar and unipolar logic families and their comparison, Characteristics of digital ICs, Resistor Transistor logic (RTL), Diode Transistor logic (DTL), High Threshold Logic (HTL), Transistor Transistor logic (TTL), Schottky TTL, MOS & CMOS, Emitter Coupled Logic (ECL).

Unit-IV

Combinational circuits: Half adder, Full adder, Half Subtractor, Full Subtractor, 8421 adders, Parallel Binary Adder, 1's & 2's complementAdder/Subtractor, Excess-3 adder, Digital Comparator, Multiplexer, Demultiplexer.

Basic Sequential circuit: Asynchronous and Synchronous circuits, Flip-Flops (RS, JK, MS-JK, D and T-type), Shift Register, Applications of shift register: Ring counter, Time delay,Sequence Generator.

References:

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

Course Code: CC-EEM-1	Course Name: ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - I
Paper Code: EEM-102	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with fundamental concepts of basic electronic devices and circuits.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the concepts of various passive & active components and their characteristics.
CO2	Understand the working principles of various electronics circuits.
CO3	Understand the mechanism and basic principle of working of popular measuring instruments.
CO4	Understand the mechanism of various electronic devices and measuring instruments and equip the design of analog circuits based on these electronic devices.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	1
CO4	3	2	2	2	3	3	3	3	3	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	3
CO4	2	2	2

Unit-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.

Junction Diodes: Rectifying diode, Forward and reverse bias characteristics, ZenerDiodes, Varactor Diode, Light Emitting Diode, Photodiode and Phototransistors (qualitative only).

Unit-II

Rectifiers: Half wave, Full wave, Bridge (calculation of ripple factor and rectificationefficiency), 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 Characteristicsof 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.

Unit-III

Amplifiers: Classification of amplifiers, Class-A, B, AB and C Amplifiers, Cascading ofAmplifiers, 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.

Unit-IV

Field Effect Transistors: JFET, basic working principle, I/O Characteristics, pinch offVoltage, parameters, MOSFET, basic working principle, Characteristics.

Measuring Instruments: Regulated power supply, Analogue Multimeter, DigitalMultimeter, Cathode Ray Oscilloscope, Function Generator (functional block diagram, basic working principle, measuring quantities).

References:

1. Basic Electronics and Linear Circuits by Bhargava & Kulshreshtha (TTTI)
2. Integrated Electronics by Millman and Halkias

Course Code: CC-EEM -1	Course Name: PRACTICAL - I	
Paper Code: EEM-103		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: (Minimum 6 experiments are to be performed in a semester)

Basic Analog & Digital Electronics - I

1. Practical use of:
   (a) Multimeter (measurement of voltage, current, resistance).
   (b) Oscilloscope (voltage and frequency measurement).
2. Study of Electronic Components:
   (a) Resistor (study the types, colour coding, potential divider arrangement).
   (b) Capacitors (study the types).
3. P-N Junction Diode (study V-I Characteristics).
4. Study of PN diode as wave clipping element.
5. Study of Zener Diode as a voltage regulator.
6. Study of Transistors (manual study, CB/CE/CC Characteristics, parameters).
7. Familiarization with Breadboard, IC types, pin number, testing, IC Manual.
8. Verification of truth tables for two input AND, OR, NOT gates.
9. Design DTL & TTL NAND Gate using discrete components & verify its truth table.
10. Study of Half Adder and Full Adder.
11. Study of 4:1 multiplexer.
12. Study of JK, D, T type flip-flops.

Course Code: CC-EEM -2 Paper Code: EEM-201	Course Name: PRINCIPLES OF ELECTRONICS – II
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR morequestions selecting ONE question from each UNIT. All questions will carryequal marks.

Course Objectives: The aim of this course is to familiarize with networks and their analysis.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts on RLC circuits and their steady states and transients behaviour.
CO2	Learn the concepts of circuit analysis on the basis of KCL and KVL.
CO3	Gain the knowledge in analyzing networks on the basis of various network theorems in real world applications.
CO4	Understand the concepts of various parameters of a two-port network and their interconversions.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	1	2
CO2	3	2	3	3	1	2	2	3	2	2	2
CO3	2	3	3	3	2	2	3	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2
CO2	2	2	2
CO3	2	3	3
CO4	2	3	3

Unit-I

DC Transient Analysis: RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with sources, DC Response of Series RLC Circuits.
Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor.
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.
Passive Filters: Low Pass, High Pass, Band Pass and Band Stop.

Unit-II

Circuit Analysis: Source Transformation, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Node Analysis, Mesh Analysis, Star-Delta Conversion.

Unit-III

Network Theorems: Principle of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Millman's Theorem, Maximum Power Transfer Theorem.

Unit-IV

Two Port Networks: Impedance Parameters, Admittance Parameters, HybridParameters, Inverse Hybrid Parameters, Transmission Parameters, Inverse Transmission Parameters, Transformation of parameters.

References:

1. Networks and Systems by D. Roy Choudhary
2. Network Analysis , Publication Pearson India By M.E. Van Valkenburg
3. Circuits and Networks by A. Sudhakar and Shyam Mohan

Course Code: CC-EEM -2	Course Name:ELECTRONIC DEVICES, COMPONENTS AND ASSEMBLIES - II
Paper Code: EEM- 202	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to learn the operation of power devices & linear integrated circuits and their applications.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the working principle of various power devices and their applications.
CO2	Know the technicalities of operational amplifiers and their applications in designing various circuits.
CO3	Know the technicalities of IC Regulators and their applications as voltage regulators.
CO4	Understand the design concepts of oscillators, multivibrators and active filters.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	1	2
CO2	3	2	3	3	1	2	2	3	2	2	2
CO3	2	3	3	3	2	2	3	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	3
CO4	2	2	2

Unit-I

Power Control Devices: Four Layer Diode (PNPN), Silicon Controlled Rectifier (SCR), Triac, Diac (Principle, Characteristics and Applications).
Unijunction Transistor: Basic Working Principle, Characteristics, intrinsic standoff ratio, Applications as aswitch and as time base generator.

Unit-II

Operational Amplifiers: Basic idea of an OPAMP with black box concept, emittercoupled differential amplifier, transfer characteristics of a differential amplifier, IC 741 various parameters, offset error voltages and currents, temperature drift of input offset voltage and current, inverting and non-inverting amplifiers, virtual ground, summing, difference, integrator, differentiator.

Unit-III

Power Supplies: Regulated power supply, transistorizedseries and shunt regulated power supply, block diagram of IC 723, regulated supply using IC 723, three terminal regulator ICs, IC based power supply study.

Unit-IV

Oscillators: Positive Feedback, Barkhausen criteria, Phase-Shift Oscillators, WeinBridge Oscillators, Hartley's and Colpitt's Oscillators, Crystal Oscillators.
Timer IC 555: Block diagram and operation, applications as Monostable & Astable Multivibrators.
Active Filters: Ist order low pass, high pass and Band pass Butterworth filters

References:

1. Integrated Electronics by Millman and Halkias
2. Op-Amp and Linear Integrated Circuits by R. A. Gyakward

Course Code: CC-EEM -2	Course Name: PRACTICAL - II	
Paper Code: EEM-203		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: (Minimum 6 experiments are to be performed in a semester)

Basic Analog & Digital Electronics - II

1. To study RC low pass and high pass filter and measurement of cut-off frequency from graph.
2. To study RC components as integrating and differentiating circuits.
3. Study of Superposition Theorem (Verification and Application).
4. Study of Maximum Power Transfer Theorem for DC network (Verification).
5. Design power controller using SCR/Diac/Triac.
6. Study UJT characteristic and design UJT as relaxation Oscillator and calculate its frequency of oscillation.
7. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
8. Operational amplifier as (1) units gain buffer (I) inverting amplifier (3) Non-inverting amplifier.
9. Operational amplifier as (1) summing amplifier (2) difference amplifier.
10. Investigate the use of an op-amp as an Integrator and Differentiator.
11. Design and testing of oscillators (any two):
    (a) RC-phase shift (b) Wein Bridge (c) Hartley (d) Colpitt
11. Study of Monostable and Astable multivibrator using IC 555.
12. Study the frequency response of 1st and 2nd order active High pass/Low pass filter.

Course Code: CC-EEM -3	Course Name: OPERATIONAL PRINCIPLES & AUDIO AND VIDEO SYSTEMS
Paper Code: EEM- 301	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: To understand working mechanism of various types of Audio-Video Equipment.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the superheterodyne receiver and its different sections.
CO2	Understand the fundamental concepts of audio systems and their recording mechanisms.
CO3	Learn working mechanism of a TV Receiver and its various sections.
CO4	Learn the technicalities of common audio & video equipment.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	2
CO4	3	2	2	2	3	3	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3
CO2	2	3	3
CO3	2	3	3
CO4	2	2	3

Unit-I

Superheterodyne Receivers: Principles, advantages, block diagram, RF input and coupling AF coupling arrangements, RF amplifiers, mixer, local oscillator, IF amplifier, detector, audio amplifier, loud speaker, power requirements.

High Fidelity & Stereophony: High Fidelity, Stereophony and Monophony (difference), Ideal & Practical Stereo System, Quadraphonic sound system, stereophonic recording on Disc and Reproduction, block diagram of stereo recording on disc, Hi-Fi stereo reproducing system, Stereo Controls, Troubleshooting of Stereo Amplifier.

Unit-II

Television Receiver: schematic block diagram and functions of different sections, Analysis of TV Picture:Gross structure, Image continuity, number of scanning lines, flicker, fine structure.

CompositeVideoSignal: Video Signal dimensions, Horizontal& Vertical synchronous details, vestigial sidebandtransmission.

Video Detector: video signal detection (Basic idea), basic video detector, video detector requirements.

Unit-III

Video Section Fundamentals: Video amplifiers, Transistor video amplifier, contrast control methods, Direct coupled video amplifier, Advantages of AGC, various AGC systems, merits of keyed AGC system.

Unit-IV

Deflection Oscillators: Deflection current waveform, generation of driving voltage waveform, Requirements of vertical deflection stage (in brief).

Sound System: Sound signal separation, sound take off circuits, audio O/P state.

RF Tuner: Tuner operation and its functions, various sections of VHF tuner.

Video IF Amplifier: Video IF Section, IF amplifier, Adjacent channel interference.

References:

1. Radio Engineering by G.K.Mithal
2. Monochrome TV and Colour TV by R.R.Gulati.
3. Principles of communication by GeorgeKennedy
4. Basic Radio and Television by S.P.Sharma.

Course Code: CC-EEM -3	Course Name: MICROPROCESSOR 8085 & INTERFACING

Paper Code: EEM- 302	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to introduce with 8085 microprocessor and its programming concepts.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with 8085 microprocessor architecture, instruction sets, addressing modes.
CO2	To learn programming techniques in 8085 microprocessor.
CO3	Understand the stacks and stack operations in 8085.
CO4	Understand the fundamental concepts of interfacing of 8085 microprocessor with input/output and memory devices.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	2	2	3	2	2	2
CO2	3	2	3	2	2	3	2	3	2	1	3
CO3	3	2	3	2	2	2	2	3	2	2	2
CO4	3	2	3	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2
CO2	3	3	3
CO3	2	3	2
CO4	3	3	3

Unit-I

Microprocessor Architecture: Microprocessor Architecture and its Operations, Fetching, decoding and execution of an Instruction, concept of Peripheral I/O and Memory Mapped I/O.

Instruction Set of 8085: 8085 Programming Model, Instruction Classification, Instruction and Data Format, Addressing Modes. Data Transfer Operations, Arithmetic Operations, Logic Operations, BranchOperations.

Unit-II

Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-bit Arithmetic Instructions, Arithmetic Operation related to Memory, Logic Operations: Rotate, Compare, Counters and Time Delays with few examples.

Stacks and Subroutines: Stack, Subroutine, Restart, conditional call, and return instructions; BCD Addition, BCD Subtraction, Introduction to advanced instructions and applications, multiplication, subtraction with carry.

Unit-III

Interrupts & Interfacing Data Converters: 8085 Interrupt, 8085 Vectored Interrupts, Direct Memory Access, Digital-to-Analog Converter (basic concepts, D/A Converter Circuits, Interfacing 8-bit D/A Converter), Analog-to-Digital Converter (basic concepts, Successive Approximation A/D Converter, Interfacing 8-bit A/D Converter).

Unit-IV

Programmable Interface Devices: 8155 Multipurpose Programmable Device (I/O ports & Timer, Interfacing 7-segment-LED), 8255 programmable peripheral interface (block diagram, modes), 8253/8254 Programmable Interval Timer (block diagram, programming 8254), 8259 Programmable Interrupt Controller (block diagram, interrupt operation and features).

References:

1. Microprocessor Architecture, Programming & Applications with 8085 by R. S.Gaonkar.
2. Introduction to Microprocessors by A.P.Mathur.

Course Code: CC-EEM -3	Course Name: PRACTICAL - I	
Paper Code: EEM-303		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in a Semesters.

Audio/Video Systems &Advanced Digital Electronics

1. Study of Radio Receiver testing (noting waveforms and voltages at different check points, fault finding and troubleshooting).
2. To identify various sections of a TV Receiver; to understand basic working of TV receiver and the main functions of various sections.
3. Location, Orientation and Connection of TV antenna; main faults of antenna and their rectification; knowledge of Balun unit and its replacement.
4. Study of Power supply cold tests and hot tests, voltage measurement at various points and the common faults in power supply.
5. Study of IF section testing by voltage measurement.
6. Study of Horizontal and vertical section testing.
7. Study of Audio section testing by voltage measurement.
8. Study of common faults and their rectification in a TV receiver.
9. To design the circuit of Schmitt Trigger using Op-amp IC 741 and plot its voltage waveforms.
10. To design and study the Sample and Hold Circuit.
11. To design Digital to Analog (D/A) Converter by binary weighted resistors & R-2R ladder arrangement.
12. Design an 8-bit Analog to Digital (A/D) Converter that utilizes LEDs to indicate its binary output value.

Course Code: CC-EEM -4	Course Name: ADVANCED DIGITAL ELECTRONICS
Paper Code: EEM- 401	
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with some advanced concepts of digital electronics.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with advanced combinational & sequential circuits, viz., code converters, and counters.
CO2	Understand the application aspect of timing circuits to generate various types of timing pulses/waveforms implemented in digital circuits.
CO3	Learn the structure of various types of memories, importance of PLA and familiarization with various types of A/D and D/A converters and their features.
CO4	Learn the minimization techniques in simplifying the hardware requirements of digital circuits for their role in digital system design.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	-	2
CO2	3	2	3	3	3	2	2	2	2	-	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	3	2	2	3	3	2	3	2	-	2

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	2
CO2	2	3	3
CO3	2	3	3
CO4	2	2	2

Unit-I

Code Converters: Encoders and Decoders, Design of Code Converters: BCD to SevenSegment, BCD to Cyclic Code, Binary to Decimal, Binary to Gray, Binary to Excess-3.

Counters: Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- NCounters, UP-Down counters, Decade Counter, BCD Counter.

Unit-II

Timing Circuits: Applications of Logic Gates in Timing Circuits, OPAMP and its applications in Timing Circuits (OPAMP Comparator, Regenerator Comparator, Schmitt Trigger, Free Running Multivibrator, Monostable Multivibrator), Schmitt Trigger Square Wave Generator.

Unit-III

Memories: Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Sequential Memory (Static Shift Register, Dynamic Shift Register, Dynamic MOS Inverter), Read Only Memory (ROM Organization, Programming Mechanisms, , Read and Write Memory (Bipolar RAM Cell, MOS RAMs, Charge Couple Device Memory (Basic concept of CCD, Operation of CCD)

Unit-IV

Programmable Logic Array: Input Buffer, AND Matrix, OR Matrix, Invert/Non-Invert Matrix, Output Buffer, Output Through FFs and Buffers, Programming PLA, Expanding Capacity, Applications of PLA

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)

References:

1. Modern Digital Electronics by R. P. Jain
2. Integrated Electronics by Millman & Halkias
3. Digital Computer Electronics by A. P. Malvino

Course Code: CC-EEM -4 Paper Code: EEM- 402	Course Name: 8051: PROGRAMMING & APPLICATIONS
Type: Core Course (CC) **Course Credits:** 03 **Contact Hours:** 03 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 60 **Internal Maximum Marks:** 15	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamentals of microcontroller 8051 and its programming.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic concepts of microcontroller 8051.
CO2	Understand the Interrupts, Addressing modes and Instruction set of 8051 microcontroller.
CO3	Learn programming techniques with 8051 microcontroller.
CO4	Learn the fundamental concepts of interfacing and to design basic applications being interfaced with 8051 microcontroller.

CO-PO Mapping Matrix for Course Code: CC-EEM -1											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	1	3	2	3	2	1	2
CO2	3	3	3	3	1	3	2	2	2	1	2
CO3	3	3	3	3	2	3	2	2	2	1	2
CO4	3	3	3	3	2	3	2	3	2	2	3

CO-PSO Mapping Matrix for Course Code: CC-EEM -1			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3
CO2	2	3	3
CO3	2	3	3
CO4	2	3	3

Unit-I

Microcontroller 8051: Introduction and block diagram of 8051 microcontroller,architectureof 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.

Unit-II

8051- Interrupts, Addressing modes and Instruction set: Interrupts – IE, IP, time flag interrupts, serial port interrupt, external interrupts, reset, interrupt control, interrupt priority, interrupt destinations & software generated interrupts. Addressing modes, Data transfer instructions, Push and Pop and data exchange instructions, Logical Instructions,Arithmetic Instructions, simple programs in assembly language.

Unit-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.

Unit-III

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.

References:

1. 8051Microcontroller&EmbeddedSystemsbyM.A.Mazidi,J.G.Mazidi&R.D.McKinlay.
2. The 8051 Microcontroller, architecture, programming and applications by K.J.Ayala.

Course Code: CC-EEM -4	Course Name: PRACTICAL - II	
Paper Code: EEM-403		
Type: Core Course (CC);	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in each of the Semesters.

8085 Microprocessor & 8051 Microcontroller:Programming &Applications

1. Familiarization with 8085 based microprocessor trainer kit by identifying different IC chips and their utilities. Understanding various functions of the kit, like, insertion, deletion, block-move, block-fill, examining registers/memory, single step, etc. by writing and executing simple programs for addition/subtraction of single and multibyte numbers.
2. Writing 8085 program for multiplication and division of two numbers.
3. Write 8085 program for arranging an array of data in ascending/descending order.
4. Write 8085 program for the generation of time delays of the order of 1-5 seconds and its testing by interfacing LED's to make them glow in a givensequence.
5. Study the IC Tester application on 8085 µPkit.
6. Study the Traffic Light Controller application of 8085 µPkit.
7. Familiarization with 8051 based microcontroller trainer kit. Practice in entering and executing simpleprograms, likeaddition/subtraction/smallest/largest of N 8-bit numbers.
8. Write a program on 8051 microcontroller kit to find that the given numbers is prime or not.
9. Write a program on 8051 microcontroller kit to glow the first four LEDs then next four using Timer application.
10. Use one of the four ports of 8051 for output interfaced to eight LED's. Simulatebinary counter (8 bit) on LED's .
11. Design a square wave of varying duty cycles on 8051 based microcontroller trainerkit.
12. Interface stepper motor with 8051 microcontroller and write a program to move the motorthrough a given angle in clock wise or counter clockwise direction.

Kurukshetra University, Kurukshetra
(Established by the State Legislature Act XII of 1956)
('A+' Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥
समबुद्धि व योगयुक्त होकर कर्म करो
(Perform Actions while Stead fasting in the State of Yoga)

Revised Scheme of Examinations and Syllabus of Bachelor of Science (B.Sc.) Programme (Course: Electronic Equipment Maintenance) (CBCS-LOCF)

5th& 6th Semesters
w.e.f. 2022-23 (For IIHS only)

DEPARTMENT OF ELECTRONIC SCIENCE

CBCS-LOCF CURRICULUM (2022-23)

Programme Name: Bachelor of Science (B.Sc.) Programme
(**Course: Electronic Equipment Maintenance**)
(CBCS-LOCF)

(For the Batches Admitted From 2020-2021)

Programme Outcomes (POs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme (Course: Electronic Equipment Maintenance)

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environmentin cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

KURUKSHETRA UNIVERSITY KURUKSHETRA

Revised Scheme of Examinations & Syllabus for B.Sc. Non-Medical Programme for the subject of Electronic Equipment Maintenance under Choice Based Credit System (CBCS-LOCF)

V & VI Semesters w.e.f. 2022-23

Sem	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Internal Marks	External Marks	Total Marks
							Max.	Max.	
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502 (ELECTIVE-II)	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
		EEM-503	Major Project	2	4	3	10	40	50
	TOTAL			**06**	**08**	**-**	**30**	**120**	**150**
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE-III)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM-602 (ELECTIVE-IV)	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						
		EEM -603	Practical	2	4	3	10	40	50
	TOTAL			**06**	**08**	**-**	**30**	**120**	**150**

**** DSE (Discipline Specific Elective).**

Important Instructions:-

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV& VI Semester):
   I. Internal Marks: 10
   II. Experiment Performed: 15
   II. Lab Record: 10
   IV. Viva/Voce : 15
9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:
   I. Internal Marks: 10
   II. Project Developed: 15
   II. Project Report: 10
   III. Viva Voce: 15

Course Code: DSE-EEM-5	Course Name: ELECTRONIC INSTRUMENTATION
Paper Code: EEM- 501 Elective-I; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the basic fundamental concepts of various types of Electronic Instruments.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts and characteristics of electronic instruments.
CO2	Demonstrate the working principle and utilities of various types of bridges.
CO3	Familiarize with the fundamentals of various types of transducers and their applications.
CO4	Learn the concepts of acquiring the data from any of the transducers.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	3	3	2	2	3	2	3	2
CO2	3	3	2	2	2	3	2	3	1	2	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	2	2	3	3	3	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit-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.

Unit-2

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.

Unit- 3

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)

Unit- 4

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.

References:

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

Course Code: DSE-EEM-5	Course Name: COMPUTER HARDWARE & MAINTENANCE-I
Paper Code: EEM- 501 Elective-I; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the basic concepts of various types of computer hardware and its maintenance.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Understand the basic concepts of the working of a PC system and functions of its main parts.
CO2	Familiarize with the importance of BIOS, Bus System, and primary and secondary memories in a PC.
CO3	Learn the functionsand mechanism of different types of computer peripheral devices.
CO4	Understand the concepts of computer communication and software in a PC System.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	2	2	3	3	3	2	3	2	2	1	2
CO3	3	3	3	3	2	2	2	2	1	3	1
CO4	3	2	2	2	3	3	3	3	3	2	3

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	2	3
CO4	3	3	3

Unit-I

Personal Computer: Evolution PC through Pentium; specifications of differentstyles of PCs,Functional Block diagram, System Unit and its various parts, Introduction to peripheral parts, Input/Outputports (serial port, parallelport, game port, USBport).Motherboard (MB), motherboard Layouts with specifications, motherboard items, SMPSand linear power supply (Brief Idea and comparison).

Unit-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, MemoryPackages, Magnetic Storage (Fundamentals, Diskette basics, FDDTypes and capacity, HDD, FDD &HDD sub-assemblies, HDD controller & interface types) Disk organization inDOS.

Unit-III

Input Devices:Keyboard (basics, operation, types, functions, signals, interfacelogic); 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).

Unit-IV

CD-ROM Drive: Principle of operation, merits and demerits, CD/DVD Diskette construction and R/W mechanism, Comparison of CD andDVD, Caring for CD and DVD discs, front and rearview details of CD/DVD drives.
Computer Communication: Modem basics and principle of operation, Internet and itsfeatures.
Software Concepts: System software, application software, operating systems, MSDOS and Windows (Introduction and differences).

References:

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

Course Code: DSE-EEM-5	Course Name: CONSUMER ELECTRONICS
Paper Code: EEM- 502 Elective-II; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamental concepts of popular consumer gadgets and appliances.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic mechanism and application of various audio and video systems.
CO2	Understand the working mechanismof commonly used domestic appliances.
CO3	Learn day to day maintenance of commonly used domestic appliances.
CO4	Familiarize with utilities of various popular office gadgets and digital access devices.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	3	2	2	2	2	2
CO2	3	3	3	3	2	2	3	2	3	1	3
CO3	3	3	3	3	2	2	3	1	1	3	2
CO4	3	3	2	3	3	3	2	3	3	2	1

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	2	3	3
CO2	3	2	3
CO3	2	3	3
CO4	3	3	2

Unit-I

Audio and Video systems: Block diagram and basic working mechanism of PA system, Microphone, HDTV, DVD players, MP4 players, Set Top box, Digital cable TV, LCD, Plasma & LED TV. Projectors: DLP, Home Theatres, Remote Controls. Digital Camera, Handicam.

Unit-2

Microwave Ovens: Microwaves (Range, block diagram, Single-Chip Controllers, types of Microwave oven, Wiring and Safety instructions, care and Cleaning).
Washing Machines: Electronic controller, hardware and software, Types of washing machines, Fuzzy logic washing machines, Features of washing machines, maintenance.
Air Conditioners: Air Conditioning, Components of air conditioning systems, types of air conditioning systems (unitary, central and split air conditioning systems), maintenance.
Refrigerators, Dish Washer, Vacuum Cleaners: Block diagram, basic working mechanism, maintenance.

Unit-3

Electronic Gadgets and Domestic Appliances: Facsimile machine, Xerographic copier, calculators (Structure of a calculator, Internal organization of a calculator, servicing electronic calculators), Digital clocks (Block diagram and its working mechanism), Home security system, CCTV.

Unit-4

Digital Access Devices: Types, Block diagram and basic working mechanism of Printers, Barcode scanner and decoder, Electronic Fund Transfer, Automated Teller Machines (ATMs).
Landline and Mobile telephony: Block diagram and basic working mechanism of Basic landline equipment, Cordless, Mobile phones: GPRS & Bluetooth, GPS Navigation system.

References:

1. Consumer Electronics by S. P. Bali; Pearson Education
2. Consumer Electronics for Engineers by Philip Herbert Hoff

Course Code: DSE-EEM-5 **Paper Code: EEM- 502** Elective-II; Option (ii)	**Course Name: TRANSDUCERS AND SENSORS**
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the fundamental concepts of transducers and sensors and their applications.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the basic concepts of electronic instrumentation..
CO2	Learn different types of errors existing in various measuring instruments.
CO3	Understand the mechanism of various types of transducers in measuring various physical quantities.
CO4	Familiarize with popular sensors and their applications in electronic instruments.

CO-PO Mapping Matrix for Course Code: DSE-EEM-5											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	1	1	1
CO4	3	2	2	2	3	3	3	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-5			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	2	3	3

Unit-I

Basic concepts of Instrumentation: generalized instrumentation systems block diagram representation, scope of instrumentation in Industrial organization. Measurement systems: static (accuracy, sensitivity, linearity, precision, resolution, threshold, range, hysteresis, dead band, backlash, drift), impedance matching and loading, dynamic characteristics (types, fidelity, speed of response, dynamic error).

Unit-2

Definition of errors: systematic errors, instrumental errors, environmental errors, random errors, loading errors, random errors, source of errors in measuring instruments, Uncertainties types, propagation of uncertainties)

Unit- 3

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, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Hall effect sensors).

Unit- 4

Sensors: Piezoelectric (Element and their properties, Piezo Electric coefficients. Equivalent circuit and frequency response of P.E. Transducers), light (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature (electrical and non-electrical). Pressure (force summing devices, load cell)

Suggested Books:

1. Measurement Systems by Doeblin& Manek; McGraw Hill,New York
2. Electronic Instrumentation by H.S Kalsi; McGraw Hill, 4th edition
3. Measurement & Instrumentation by DVS Murthy; PHI
4. Sensors and Transducers by D. Patranabis; PHI, 2nd edition

Course Code: DSE-EEM-5	Course Name: MAJOR ROJECT	
Paper Code: EEM-503		
Type: DSE Course;	**Course Credits:** 02;	**Contact Hours:** 04 hours/week;
Examination Duration: 3 Hours;	**Mode:** Lab. Work	
External Maximum Marks: 40;	**Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to train the students to learn hand-on practice by developing a Lab. Project on the basis of already studied theoretical and practical concepts.

Course Outcomes (CO): At the end of this course, with an advisory support from a faculty member as Supervisor, the students will be able to:

- Acquire advanced practical skill/knowledge.
- Develop any productive idea based on Electronics fundamentals in solving a problem encountered in daily life.
- Hand-on practice in developing the project with an experimental investigation in the Lab.
- Applythe knowledge in solving/analyzing/exploring a real life problem.

Course Details: The Student should design, fabricate and assemble one Electronic project in their respective Institute/Department. After successful completion of Lab. Project, each student would prepare a report and submit it at the time of the final examination duly certified by the concerned faculty guide (as an Internal Examiner) and an External Examiner, deputed by the University. Institute/Department faculty shall ensure that the entire project work is carried out in their respective Institute/Department by utilizing the Lab. Classes assigned and, therefore, will be able to:-

- demonstrate creativity and critical thinking ability
- gain confidence in application of theoretical knowledge to practical aspects
- design circuits, PCB and solder components on the PCB
- final testing of the project and fault finding and rectification (if any)

Process of doing Project/Dissertation:

- Familiarity with research ethics & plagiarism
- Literature review
- Problem formulation and definition of the project work
- Modular design and its implementation
- PCB design and soldering of the tested circuit
- Report writing
- Correction by Supervisor
- Printing & Hard binding

Evaluation of Project:

- Internal Assessment (Lab. Work: 5 + Attendance: 5 Marks)
- Distribution of External Marks (40): Project Demonstration (10), Project Report Evaluation (10) and Viva-Voce (20): Evaluation of Project would be carried out by two examiners (the Supervisor, as an Internal Examiner and an External Examiner)

Course Code: DSE-EEM-6	Course Name: ELECTRONIC EQUIPMENT MAINTENANCE
Paper Code: EEM- 601 Elective-III; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to train the students with the troubleshooting concepts of electronic equipment.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the fundamentals of troubleshooting procedure and their evolution in general.
CO2	Learn the steps for the installation, maintenance and repair of generalequipment.
CO3	Familiarize with the servicing practices of surface mount devices.
CO4	Understand safety measures& maintenance management concepts for electronicequipment.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	3	2	2	3	2	2	2
CO2	3	2	3	2	2	3	2	3	2	1	3
CO3	3	2	3	2	2	2	2	3	2	2	2
CO4	3	2	3	2	3	3	2	3	3	2	3

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	2	2	2
CO2	2	2	2
CO3	2	3	3
CO4	2	3	3

Unit-I

Fundamental Troubleshooting Procedures: Equipment Failures, Causes of Equipment Failure, Nature of faults, Failure Rate, Mean Time Between Failures, Mean Time to Fail, Maintainability, Mean Time to Repair, Availability, Redundancy.
Maintenance Aids and Records: Test Instruments, Tools, Service Manual & its Importance, Logbook & its significance, Policy of a Service Engineer, Maintenance Terminology & Policy, Stages of Maintenance.

Unit-II

Troubleshooting and Repair Procedure: Steps in Troubleshooting,Troubleshooting Process, Fault-Finding Aids, Identification of Faulty Stage, Identification of Faulty Component, Intermittent Faults, Fault Detection and Repair, Troubleshooting Techniques (preliminary observations, troubleshooting methods, systematic troubleshooting checks, thumb rules in troubleshooting).

Unit-III

Rework & Repair of Surface Mount Assemblies: Surface Mount Technology, SMDs, Surface Mounting Semiconductor Packages, Packaging of Passive Components as SMD, Repairing SM PCBs.
Installation and Safety Measures: General Installation Guidelines, Preparation of Site, Provision of Suitable Physical Environment, Calculation of Power requirement, Layout of Electric and Signal Leads, Artificial Earth, General Safety Measures for Electronic Systems.

Unit-IV

Preventive Maintenance: Indications for Preventive Maintenance Action, Preventive Maintenance of Electronic Circuits, Preventive Maintenance of Mechanical Systems.
Maintenance Management: Objectives, Maintenance Policy, Equipment Service Options, Essentials of a good Equipment Management Programme, Installation Procedures, Service and Maintenance Laboratory, Documentation, Professional Qualities and Work Habits.

References:

1. Troubleshooting and repairing consumer electronics by Homer Davidson (McGraw Hill)
2. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance by R.S. Khandpur

Course Code: DSE-EEM-6	Course Name: COMPUTER HARDWARE & MAINTENANCE - II
Paper Code: EEM- 601 Elective-III; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to train the students with the troubleshooting concepts of computer system maintenance.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with the fundamentals concepts in the installation of a PC System.
CO2	Familiarize with diagnosis of common symptoms of faulty peripherals of a PC System.
CO3	Learn the troubleshooting techniques of various peripherals of a PC System.
CO4	Learn basic steps for the maintenance and upgradation of a PC System.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	2	2	3	2
CO2	3	2	3	3	3	2	2	2	2	2	2
CO3	2	3	3	3	2	2	2	2	2	1	2
CO4	3	3	2	2	3	3	2	3	2	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit-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).

Unit-II

Troubleshooting PC Faults-I: Motherboard: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 commonsymptoms), Printers (possible problems, diagnosis procedure and theirtroubleshooting).

Unit-III

Troubleshooting PC Faults-II: CDROM (Installation upgradation, replacement, troubleshootingcommon symptoms), FDD (Installation, replacement and troubleshooting common symptoms), HDD (Preparation Concepts, installation, replacement and troubleshooting common symptoms),Memory (upgradation, installation, and troubleshooting common symptoms)

Unit-IV

General PC Servicing:PC maintenance using various diagnostic S/W, universal troubleshootingprocess,computer viruses and their types, virus protection techniques, quick startbench testing, tips for windows startup problems.
PC Upgrading: Introduction, Upgrade Essentials, Performance Upgrade, Capacity Upgrades, Features Upgrades.

References:

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

Course Code: DSE-EEM-6	Course Name: BIOMEDICAL EQUIPMENT MAINTENANCE
Paper Code: EEM- 602 Elective-IV; Option (i)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to familiarize with the foundations of biomedical engineering.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Familiarize with working principle and applications of various types of biomedical instruments.
CO2	Understandsignal analysis and various types of electrodes used in various biomedical instruments.
CO3	Familiarize with role of various types of sensors in biomedical instruments.
CO4	Understand the utility of monitoring, imaging and therapeutic instruments in biomedical sciences.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	3	3	2	2	3	2	2	2
CO2	3	3	2	3	3	2	1	2	3	2	-
CO3	3	3	3	2	2	3	2	3	2	2	2
CO4	3	3	3	3	2	3	2	2	2	1	1

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	3	3
CO2	3	3	2
CO3	2	2	3
CO4	3	3	2

Unit 1

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 heir waveforms (ECG, EEG, EMG); Bio-Potential Electrodes: Equivalent circuit model of Electrode, Various types Recording Electrodes (Surface, Micro, Needle, Array electrodes).

Unit -2

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 Principal and Mechanism of Cardiac Monitor, Heart Rate, Pulse Rate.

Unit- 3

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.

Unit -4

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.

References:

1. Khandpur R. S. - Handbook of Biomedical Instrumentation, TMH
2. L.Cromwell et al- Biomedical Instrumentation and Measurements PHI

Course Code: DSE-EEM-6	Course Name: EMBEDDED SYSTEMS & ROBOTICS
Paper Code: EEM- 602 Elective-IV; Option (ii)	
Type: DSE Course **Course Credits:** 02 **Contact Hours:** 02 hours/week. **Examination Duration:** 3 Hours **Mode:** Lecture **External Maximum Marks:** 40 **Internal Maximum Marks:** 10	**Instructions For Paper Setter:** Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

Course Objectives: The aim of this course is to learn the foundations of embedded systems and robotics engineering.

Course Outcomes (CO): At the end of this course, the students will be able to:

CO1	Learn the basics of popular microcontroller 8051, including memory map, interrupts, programming, etc.
CO2	Understandfundamentals of an embedded system and its basic design concepts.
CO3	Familiarize with interfacing techniques of a microcontroller in developing embedded systems.
CO4	Acquire the fundamental knowledge of Robotics and utility of embedded system in robotics technology.

CO-PO Mapping Matrix for Course Code: DSE-EEM-6											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	3	3	2	2	3	2	3	2
CO2	3	2	3	3	2	3	2	2	2	2	2
CO3	3	3	3	3	2	3	2	2	1	1	2
CO4	3	3	3	2	3	2	2	3	3	2	2

CO-PSO Mapping Matrix for Course Code: DSE-EEM-6			
COs	**PO1**	**PO2**	**PO3**
CO1	3	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	3	3

Unit 1

Introduction to RISC microcontrollers: Von- Neumann and Harvard architectures, Introduction to 8051 family microcontrollers, 8051 architecture, Register banks and Special Function Registers, Block Diagram, Addressing Modes, Instruction Set, Timers, Counters, Stack Operation, Programming using PIC microcontroller.

Unit 2

Introduction to Embedded Systems: Overview of Embedded Systems, Features, Requirements and Applications of Embedded Systems, Recent Trends in the Embedded System Design, Common architectures for the ES design, Embedded Software design issues, Communication Software, Introduction to Development and Testing Tools

Unit 3

8051 Interfacing: 8051 interfacing with Keyboard, display Units (LED, 7-segment display, LCD), ADC, DAC, Stepper motor, Introduction to AVR family and its architecture. Interfacing and Communication Links Serial Interfacing: SPI / Micro wire Bus, I2C Bus, CAN Bus

Unit 4

Robotics: Overview of Robotics, Pattern recognition and robots, Use of Embedded Systems in Robotics, Robots and Computer Vision.

References:

1. Design with PIC Microcontrollers by John B. Peatman (Pearson Education).
2. Embedded C Programming and the Microchip PIC by Richard Barnett, Larry O'Cull and Sarah Cox.
3. Robotic Engineering – An Integrated Approach by Richard D Klafter, Thomas A. Chmielewski and Michael Negin (PHI).

Course Code: DSE-EEM-6	Course Name: PRACTICAL
Paper Code: EEM-603	
Type: DSE Course ;**Course Credits:** 02; **Contact Hours:** 04 hours/week;	
Examination Duration: 3 Hours; **Mode:** Lab. Work	
External Maximum Marks: 40; **Internal Maximum Marks:** 10	

Course Objectives: The aim of this course is to learn the practical aspects of Theory Papers.

List of Experiments: Minimum 6 experiments are to be performed in the Semester.

Electronic Instrumentation and Computer Maintenance

1. Study the mechanism of CD-ROM/DVD Drive by noting voltages at various check points and its installation.
2. Installation and set-up of CCTV Camera(s) with DVR for the purpose of Home/Office Security.
3. Maintenance and servicing of Xerox Machine.
4. Measurement using R/L/C transducer.
5. Measurement of R/L/C utilizing following Bridges (any two)
   (i) Kelvin's Bridge (ii) Maxwell Bridge (iii) Schering Bridge
6. To study the Characteristics of LDR and Photodiode with:
   (i) Variable Illumination Intensity.
   (ii) Linear Displacement of source.
7. Recording of ECG and identification of various peaks in ECG waveform.
8. Measurement of Heart Rate using conventional and modern electronic stethoscope. (an activity can be given for the design of electronic stethoscope using condenser Microphone)
9. 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)
10. 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).
11. Write a program to convert a digital signal to analog signal using 8051 and PIC microcontrollers.
12. Write a program for temperature sensor interfacing through serial port on 8051 and PIC microcontroller kits.
13. Write a program for P W M control of DC Motor/Stepper Motor using 8051 and PIC microcontrollers.
14. Installation of Windows operating system and other software.
15. Installation of peripheral devices (Scanner, Printers) in a PC system.
16. Maintenance and cleaning of diskette drives, keyboard, mouse, etc.
17. To identify various cards, assembly and disassembly of a PC system.
18. Familiarization of Diagnostic tools and Antivirus Software for the repair/maintenance of PC.