**Kurukshetra University, Kurukshetra**

**(Established by the State Legislature Act XII of 1956)**

**(‘A+’ Grade, NAAC Accredited)**

|| योगस्थ: कुरु कर्माणि ||

समबुद्धि व योग युक्त 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)**

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| --- | --- | --- |
| 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)**

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| --- | --- |
| 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 environment in 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. 2020-21 in 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):
9. Internal Marks: 10
10. Experiment Performed: 15

II. Lab Record: 10

IV. Viva/Voce : 15

1. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:
2. Internal Marks: 10
3. Project Developed: 15

II. Project Report: 10

III. Viva Voce: 15

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| **Course Code: CC-EEM -1** | **Course Name: PRINCIPLES OF ELECTRONICS – I** |
| **Paper Code: EEM-101** |
| **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:

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| **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. |

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| **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 |

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| **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

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| **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:

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| **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. |

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| **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 |

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| **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

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| **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:

1. Multimeter (measurement of voltage, current, resistance).
2. Oscilloscope (voltage and frequency measurement).

2. Study of Electronic Components:

1. Resistor (study the types, colour coding, potential divider arrangement).
2. 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.

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| **Course Code: CC-EEM -2** | **Course Name: PRINCIPLES OF ELECTRONICS – II** |
| **Paper Code: EEM-201** |
| **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 networks and their analysis.

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

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| **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.
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| **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 |

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| **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

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| **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:

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| **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.
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| **CO3** | * Know the technicalities of IC Regulators and their applications as voltage regulators.
 |
| **CO4** | Understand the design concepts of oscillators, multivibrators and active filters. |

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| **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 |

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| **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

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| **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.
1. Study of Superposition Theorem (Verification and Application).
2. Study of Maximum Power Transfer Theorem for DC network (Verification).
3. Design power controller using SCR/Diac/Triac.
4. Study UJT characteristic and design UJT as relaxation Oscillator and calculate its frequency of oscillation.
5. Measurement of offset voltage, bias currents & CMRR of an operational amplifier.
6. Operational amplifier as (1) units gain buffer (I) inverting amplifier (3) Non-inverting amplifier.
7. Operational amplifier as (1) summing amplifier (2) difference amplifier.
8. Investigate the use of an op-amp as an Integrator and Differentiator.
9. 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.

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| **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:

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| **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. |

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| **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 |

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| **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.

**Composite Video Signal:** Video Signal dimensions, Horizontal & Vertical synchronous details, vestigial sideband transmission.

**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 George Kennedy
4. Basic Radio and Television by S.P. Sharma.

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| **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:

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| **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. |

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| **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 |

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| **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, Branch Operations.

**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.

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| **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.

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| **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:

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| **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.
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| **CO4** | * Learn the minimization techniques in simplifying the hardware requirements of digital circuits for their role in digital system design.
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| **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 |

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| **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 Seven Segment, 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- N Counters, 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

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| **Course Code: CC-EEM -4** | **Course Name: 8051: PROGRAMMING & APPLICATIONS** |
| **Paper Code: EEM- 402** |
| **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:

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

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| **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 |

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| **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, architecture of 8051 family (in brief), memory organization, Internal RAM/ROM memory, General purpose data memory, special purpose/function registers, external memory. Counters and timers – 8051 oscillator and clock, program counter, TCON, TMOD, timer counter interrupts, timer modes of operation. Input/output ports and circuits/configurations, serial data input/output – SCON, PCON, serial data transmission modes.

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

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| **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 given sequence.
5. Study the IC Tester application on 8085 µP kit.
6. Study the Traffic Light Controller application of 8085 µP kit.
7. Familiarization with 8051 based microcontroller trainer kit. Practice in entering and executing simple programs, like addition/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. Simulate binary counter (8 bit) on LED’s .
11. Design a square wave of varying duty cycles on 8051 based microcontroller trainer kit.
12. Interface stepper motor with 8051 microcontroller and write a program to move the motor through a given angle in clock wise or counter clockwise direction.