Kurukshetra University, Kurukshetra

Scheme of Examination and Syllabus for Undergraduate Programme
Under
(Multiple Entry-Exit, Internship and CBCS-LOCF) NEP w.e.f 2023-24

Course: Electronic Equipment & Maintenance

Semester	Course	Paper	Nomenclature of paper	Credits	Internal marks	End Term Marks	Total	Duration of Exam
3	CC-3	B-EEM-N301	Electronic Instrumentation, Transducers & Operational Amplifier	2	25	25	50	3 hours
		B-EEM-N302	Microprocessor & Interfacing	2	25	25	50	3 hours
		B-EEM-N303	Practical-III	2	25	25	50	3 hours
4	CC-4	B-EEM-N401	Digital Electronics-II	2	25	25	50	3 hours
		B-EEM-N402	Microcontroller 8051: Programming & Applications	2	25	25	50	3 hours
		B-EEM-N403	Practical-IV	2	25	25	50	3 hours

Programme Outcomes (POs) for UG 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 UG Programme

Course: Electronic Equipment & Maintenance

PSO1	Students will be able to acquire the basic understanding of the electronic components, principles, working and applications of the electronic devices.
PSO2	Explore technical knowledge in diverse areas of Electronics and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.
PSO3	Students will acquire experimental skills, research aptitude in the area of electronics that will make them capable of contributing to the academic as well as industrial growth of the country.

Instruction for the Examiners

1. Syllabus in each Theory Paper in each semester is divided in 4 units.
    i. A student is required to attempt 5 questions in all.
    ii. Question No 1 is compulsory, consisting of short answer type questions based on all the 4 units.
    iii. Two questions will be set from each unit. A student is required to attempt one question from each unit.
    iv. All questions carry equal marks.
2. Use of scientific calculator is permissible.
    i. Instructions should be imparted using SI system of units. Familiarity with CGS system of units should also be ensured.
3. Distribution of Marks: 25*+25*.
   Each theory question paper will be of 25 marks of 3 hours duration and 25 marks in each theory paper are to be awarded through internal assessment in each semester.
4. Work load – two hours per week per theory paper.
5. Practical classes to be conducted during odd as well as even semester.
6. The Practical examination will be held at the end of each semester in one sitting of 3 hours.
7. A candidate is required to perform minimum 6 experiments out of the list provided during course of study in each semester.
8. Distribution of Marks: 25*+25*
   Each practical examination in each semester will be of 25marks of 3 hours duration and 25 marks in each practical paper are to be awarded through internal assessment in each semester.
9. Maximum 10 students in one group of practical during course of study and also in examination.

Note: Each credit equals one hour/week for theory teaching load.

Each credit equals two hours/week for practical teaching load.

Semester – III
CC-3
Paper: B-EEM-N301
ELECTRONIC INSTRUMENTATION, TRANSDUCERS & OPERATIONAL AMPLIFIER

Credits: 2
Total Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 hr

Aims & Objectives

The aim of this course is to understand the basic concepts of Instrumentation, Transducers and working mechanism of operational amplifier having following objectives: -

- familiarize with the basic concepts of instrumentation.
- familiarize with the basic concepts of transducers and sensors.
- working of operational Amplifier
- Understand the basic applications of operational amplifier.

CO1: Familiarize and understand the basic concepts of Instrumentation and Measurement Systems
CO2: Understand the different types of Sensors and Transducers for different parameters
CO3:Understand the basic working principle of Operational Amplifier and its different configurations
CO4: Learn and understand the different applications of an Operational Amplifier in implementing circuits like Integrator, Differentiator, Filters etc.

CO-PO Mapping Matrix for Course Code: CC-B-EEM-N301											
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-B-EEM-N301			
COs	**PSO1**	**PSO2**	**PSO3**
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, Measurement system parameters: accuracy, sensitivity, linearity, precision, resolution, threshold, range, hysteresis, dead band, backlash, drift, fidelity, speed of response, dynamic error
Transducers and Sensors-I: Classification, Active and Passive, Primary and secondary. Mechanical and Electrical. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges–Types, Gauge Factor)

Unit-II

Transducers and Sensors-II: 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)

Sensors: Classification, Basic Concept of Different Types of Sensors: Temperature, Proximity, IR sensor, Pressure, Light, Touch, Humidity, Microphone, Ultrasonic, Smoke and Gas.

Unit-III

Operational Amplifier-I: Double ended differential Amplifier, differential gain, Common-mode gain, CMRR, ideal operational amplifier, Inverting & non-inverting configuration, unity-gain configuration, Summing amplifier, Scaling amplifier, Difference amplifier

Unit-IV

Operational Amplifier-II: Error sources in OP-Amp: Offset Voltages, input bias Current, input offset current, Division and Multiplication, integrating circuit, differentiating circuit, 1st order active filter using op-amp: LPF, HPF, Band Pass Filter.

References:

1. Modern Electronic Instrumentation and Measurement Techniques by Albert D Helfrick and William D Cooper, PHI Pvt. Ltd.
2. A course in Electrical and Electronic measurements and Instrumentation by A k Sawhney, Dhanpat Rai and Co.
3. Op-Amps and Linear Integrated Circuits by Ramakant A Gayakwad, Pearson Education

Semester – III
CC-3
Paper: B-EEM-N302
MICROPROCESSOR & INTERFACING

Credits: 2
Total Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 hr

Aims & Objectives

The aim of this course is to introduce with 8085 microprocessor and its programming with following objectives: -

- 8085 microprocessorarchitecture, instruction sets, addressing modes& programming exercises
- stacks and stack operations
- interfacing 8085 microprocessor with input/output devices ,memory devices
- interfacing programmable peripheral devices

CO1: Understand the basic architecture and Instruction set of 8085
CO2: Learn and familiarize with the different programming techniques of 8085 and working principle of stacks and subroutines
CO3: Understand the basic concept of Interrupts and Direct Memory Access in microprocessor
CO4: Understand the different programmable peripheral devices and their interfacing with 8085

Outcome

To be able to learn programming techniques of 8085 microprocessor alongwith its interfacing with various peripherals through interfacing devices.

CO-PO Mapping Matrix for Course Code: CC-B-EEM-N302											
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-B-EEM-N302			
COs	**PSO1**	**PSO2**	**PSO3**

CO1	3	3	2
CO2	2	3	3
CO3	3	3	2
CO4	2	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.

Unit-III

Interrupts & Interrupt Controller: 8085 Interrupt, 8085 Vectored Interrupts, Direct Memory Access, 8259 Programmable Interrupt Controller (block diagram, interrupt operation and features).

Unit-IV

Programmable Interface Devices: 8255 programmable peripheral interface (block diagram, modes), 8253/8254 Programmable Interval Timer (block diagram, programming 8253),

References:

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

Semester – III
CC-3
Paper: B-EEM-N303
Practical - III

Credits: 2
Max. Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 h (one session)

Course Objectives

The objective of teaching this practical paper is

1. To learn the use of various electronic equipment used for analysis of basic analog circuits.
2. To learn the operation of multimeter, CRO and function generator.
3. To designvarious circuits on bread boardusing desecrate components.
4. To learn the functioning of wave shaping circuits.
5. To analyze and interpret experimental data.

Course Outcome

After the end of this paper, the students will be able

1. To operate various equipment used in the design and analysis of basic electronic circuits.
2. To design electronics circuits based on semiconductor devices and passive components.
3. To design combinational circuits using IC.
4. To present the experimental results and conclusions in the form of written report in clear and concise manner.

Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	3
CO3	3	3	2	3	3	3	2	--	--	3	3	2	3	3
CO4	3	3	2	3	3	3	3	--	--	3	3	3	3	2

Note:A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

List of Experiments:

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 multi byte 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. To design the circuit of Schmitt Trigger using Op-amp IC 741 and plot its voltage waveforms.
8. To Study op-amp as an Inverting, Non-inverting and Unity gain amplifier using IC 741
9. To study op-amp as a summing and difference amplifier using IC 741
10. Calculate offset voltage, bias current and CMRR of an op-amp using IC 741
11. To study op-amp as an Integrator
12. To study op-amp as a Differentiator

Semester – IV
CC-4
Paper: B-EEM-N401
DIGITAL ELECTRONICS-II

Credits: 2
Total Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 hr

Aims & Objectives

The aim of this course is to familiarize with some advanced concepts of digital electronics having following objectives:-

- familiarize with advanced sequential circuits, viz., counters and shift registers
- Application of timing circuits and circuits to generate various types of timing pulses/waveforms implemented in digital circuits.
- concepts and structure of various types of memories.
- Importance of PLA and familiarize with its basic design concepts.
- Various types of A/D and D/A converters and their accuracy and resolution.

CO1: Understand the basic concepts of Flip-Flops and their application in sequential circuits like counters
CO2: Understand the different types of Shift registers and their applications in advanced digital circuits
CO3: Understand the operation and classification of different types of memories
CO4: Understand the implementation and working principle of various types of A/D converters and D/A Converters

Outcome

To be able to learn minimization techniques in simplifying the hardware requirements of digital circuits and understand the working mechanism and design guidelines of different combinational and sequential circuits for their role in digital system design.

CO-PO Mapping Matrix for Course Code: CC-B-EEM-N401											
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-B-EEM-N401			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2

CO2	2	3	3
CO3	3	3	2
CO4	2	3	3

Unit-I

Basic Sequential circuit: Asynchronous and Synchronous circuits, RS Flip-Flop, JK Flip Flop, Race Around Condition, Master Slave JK flip flop, T and D Flip Flop, Excitation Table, Conversion of Flip Flop.

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

Unit-II

Shift Registers: SISO, SIPO, PISO,PIPO, Bidirectional Shift register, Universal Shift register Applications of shift register: Ring counter, Johnson Counter, Time delay generation.

Unit-III

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

Unit-IV

A/D and D/A Converters: D/A Converters (Specifications, Weighted Resister, R-2R Ladder), Sample and Hold Circuit, A/D Converters (Quantization and Encoding, Specifications, Parallel Comparator, Successive Approximation, Dual Slope)

References:

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

Semester – IV
CC-4
Paper: B-EEM-N402
MICROCONTROLLER 8051: PROGRAMMING & APPLICATIONS

Credits: 2
Total Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 hr

Aims & Objectives

The aim of this course is to teach the concepts of microcontroller 8051 and its programming with following objectives:-

- basic concepts of microcontroller 8051 based system.
- study of instruction set and programming techniques of 8051 microcontroller.
- design of interfacing circuits with 8051 microcontroller.

CO1: Understand and familiarize the basic architecture of 8051
CO2: Learn the different types of Interrupts, addressing modes and Instruction set of 8051
CO3: Understand and Implement the programming of 8051 in C Language
CO4: Understand and Implement the basic interfacing of 8051 microcontroller with Keyboard, seven segment displays, stepper motor, DAC, ADC etc.

Outcome

To be able to learn about microcontroller 8051 circuits and its programming techniques and the design of basic applications being interfaced with the microcontroller.

CO-PO Mapping Matrix for Course Code: CC-B-EEM-402											
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-B-EEM-402			
COs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2
CO2	2	3	3
CO3	3	3	2

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-IV

Interfacing with 8051: Basic interfacing concepts and interrupts, Programming 8051 interrupts, programming Timer interrupts, programming the external hardware interrupts. Schematic diagrams and basic concepts of Interfacing of 8051 to keyboard, seven segment display, stepper motor, DAC, ADC and traffic light controller circuits.

References:

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

Semester – IV

Paper: B-EEM-N403

Practical - IV

Credits: 2
Max. Marks: 50
Internal Assessment: 25
End Term Exam: 25
End term examination time: 3 hr (one session)

Course Objectives

The objective of teaching this practical paper is

- To learn the use of various electronic equipment used for analysis of basic analog circuits.
- To learn the operation of multimeter, CRO and function generator.
- To design various circuits on bread board using desecrate components.
- To learn the functioning of wave shaping circuits.
- To analyze and interpret experimental data.

Course Outcome

After the end of this paper, the students will be able

1. To operate various equipment used in the design and analysis of basic electronic circuits.
2. To design electronics circuits based on semiconductor devices and passive components.
3. To design combinational circuits using IC.
4. To present the experimental results and conclusions in the form of written report in clear and concise manner.

Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	3	--	--	2	3	3	3	2
CO2	3	3	2	3	3	3	3	--	--	--	3	3	3	3
CO3	3	3	2	3	3	3	2	--	--	3	3	2	3	3
CO4	3	3	2	3	3	3	3	--	--	3	3	3	3	2

Note:A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.

List of Experiments:

1. Familiarization with 8051 based microcontroller trainer kit. Practice in entering and executing simple programs, like addition/subtraction/smallest/largest of N 8-bit numbers.
2. Write a program on 8051 microcontroller kit to find that the given numbers is prime or not.
3. Write a program on 8051 microcontroller kit to glow the first four LEDs then next four using Timer application.
4. Use one of the four ports of 8051 for output interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.
5. Design a square wave of varying duty cycles on 8051 based microcontroller trainer kit.

6. 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.
7. Study JK, D and T type flip flops
8. Design a 4-bit Ripple counter
9. Design an asynchronous decade counter
10. Design a Ring counter
11. Design a SISO shift register
12. To design Digital to Analog (D/A) Converter by binary weighted resistors & R-2R ladder arrangement.