# KURUKSHETRA UNIVERSITY
# KURUKSHETRA

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

## Scheme of Examination and Syllabus for

## Under-Graduate Programme

## (Subject: Electronics)

## 5$^{th}$ & 6$^{th}$ Semester

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

| THIRD YEAR: SEMESTER-5 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Remarks** | **Course** | **Paper(s)** | **Nomenclature of Paper** | **Credits** | **Hours/ Week** | **Internal marks** | **External Marks** | **Total Marks** | **Exam Duration** |
| **Scheme A, B & C** | **CC-5 MCC-9 4 credit** | B23-ELE-501 | Transducers and Sensors | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **MCC-10 4 credit** | B23-ELE-502 | Digital Signal Processing | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **DSE-2 4 credit Select one Option** | B23-ELE-503 | Microprocessor Architecture and Programming with 8085 | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| | | B23-ELE-504 | Optoelectronic Devices | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **DSE-3 4 credit Select one Option** | B23-ELE-505 | Mechatronics | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| | | B23-ELE-506 | Introduction to Embedded Systems | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme A & C** | **CC-M5 (V) 4 credits** | From Available CC-M5(V) of 4 credits as per NEP | | | | | | | |
| **Scheme A, B & C** | **Internship 4 credits** | Internship#4 credit after 4th semester | | | | | | | |
| **THIRD YEAR: SEMESTER-6** | | | | | | | | | |
| **Remarks** | **Course** | **Paper(s)** | **Nomenclature of Paper** | **Credits** | **Hours/ Week** | **Internal marks** | **External Marks** | **Total Marks** | **Exam Duration** |
| **Scheme A, B & C** | **CC-6 MCC-11 4 credit** | B23-ELE-601 | Microcontroller 8051 and its Interfacing | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **MCC-12 4 credit** | B23-ELE-602 | Basic Electrical Engineering & Skills | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **DSE-4 4 credit Select one Option** | B23-ELE-603 | Interfacing Peripheral Devices and Applications of 8085 | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| | | B23-ELE-604 | Verilog and FPGA based System Design | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme B & C** | **DSE-5 4 credit Select one Option** | B23-ELE-605 | Introduction to C and its programming | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| | | B23-ELE-606 | Modern communication systems | 3 | 3 | 20 | 50 | 70 | 3 hrs. |
| | | | Practical | 1 | 2 | 10 | 20 | 30 | 3 hrs. |
| **Scheme A only** | **CC-M6 4 credits** | From Available CC-M6 of 4 credits as per NEP | | | | | | | |
| **Scheme A only** | **CC-M7(V) 4 credits** | From Available CC-M7(V) of 4 credits as per NEP | | | | | | | |
| **Scheme B only** | **CC-M5(V) 4 credits** | **From Available CC-M5(V) of 4 credits as per NEP** | | | | | | | |
| **Scheme C only** | **CC-M6(V) 4 credits** | **From Available CC-M6(V) of 4 credits as per NEP** | | | | | | | |
| **Scheme C only** | **SEC-4 2 credit** | From Available SEC-4 of two credits as per NEP | | | | | | | |

| Session: 2024-25 | | | |
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| **Part A-Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | FIFTH | | |
| Name of the Course | TRANSDUCERS AND SENSORS | | |
| Course Code | B23-ELE-501 | | |
| CourseType:(CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC) | CC-5, MCC-9 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | Advance Knowledge of Electronics | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Understand the principles of various sensors and transducers for the measurement and instrumentation.<br>2. Evaluate various measurements techniques for industrial Applications.<br>3. Apply signal conditioning for measurements of various quantities<br>4. Present the experimental results and conclusions by having Hands-on experience in the Laboratory<br>5. Learning the above through practicals | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory +10 Practical<br>End Term Exam Marks: 50 Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **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 | 11 |
| II | **Introduction to Electronic Measurement and Instrumentation:** Transducers and sensors- Static and Dynamic Characteristics (Accuracy, repeatability, reproducibility, range/span, linearity, threshold, sensitivity, resolution, hysteresis, precision, drift , Speed of response, settling time, fidelity, lag etc. Errors (Types of errors, statistical analysis, probability of errors, limiting errors) | 12 |

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| | Performance measures of sensors, Classification of sensors, Sensor calibration techniques | |
| III | **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) | 10 |
| IV | **Magnetic Sensor, Optical Sensors and Special Sensors:** Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor, Optical Sensors - Photo conductive cell, photo voltaic, Photo resistive, IR sensor, LDR, Fibre optic sensors, Special Sensors: GPS, Bluetooth, Smart Sensors - Film sensor. Touch screen sensor | 12 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge.)<br>2. To determine the Characteristics of LVDT.<br>3. Measurement of distance using LVDT plot ac and dc characteristics.<br>4. To determine the Characteristics of Thermistors and RTD.<br>5. Measurement of temperature by Thermocouples.<br>6. Study of transducers like AD590 (two terminal temperature Sensor), PT-100, J- type, K- type.<br>7. To study the Characteristics of LDR, Photodiode.<br>8. To study the Characteristics of Phototransistor: (i) Variable Illumination. (ii) Linear Displacement.<br>9. Characteristics of one Solid State sensor/ Fibre optic sensor | 30 |

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. H. S. Kalsi, Electronic Instrumentaion, TMH(2006)
2. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
3. Instrumentation Measurement and analysis: Nakra B C, Chaudry K, TMH
4. A. K Sawhney, Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai and Sons (2007).
5. C. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata McGraw Hill (1998).
6. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 201

**Session: 2024-25**

**Part A- Introduction**

| | |
|---|---|
| Subject | ELECTRONICS |
| Semester | FIFTH |
| Name of the Course | Digital Signal Processing |
| Course Code | B23-ELE-502 |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | MCC-10 |
| Level of the course | 300-399 |
| Pre-requisite for the course (if any) | Knowledge of Electronics |

| | |
|---|---|
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. To understand the concept of signals and Z-transforms.<br>2. To understand various design of IIR and FIR filters.<br>3. To understand and compute DFT and IDFT.<br>4. Present the experimental results and conclusions by having Hands-on experience in the Laboratory.<br>5. Learning the above through practicals |

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

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

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | Elementary Discrete –time Signals, Basic operations on Sequences, Classification of Discrete-time signals, Introduction to Discrete-time Systems | 11 |
| II | Introduction to Z-transforms, advantages of Z-transform, relation between DTFT and Z-transform, Z-transform and ROC of finite duration sequences, properties of ROC, properties of Z-transform and Inverse Z-transform | 12 |
| III | Introduction to Discrete-Time Fourier Transform and its inverse, relation between DFT and Z-transform, comparison between DTFT and DFT, computation of DFT & IDFT, circular convolution, properties of DFT, Radix-2 DIT FFT | 10 |
| IV | Types of digital filters, design of IIR filters (approximation of derivatives, Impulse Invariant Transformation, Bilinear transformation | 12 |

| | | |
|---|---|---|
| | method) design of FIR filters (using rectangular window, Hanning Window, frequency sampling technique), Structures for realization of IIR systems, Structures of realizations of FIR systems. | |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Generation & plot of unit sample sequence, unit step over given intervals (MATLAB).<br>2. Generation & plot of ramp function, discrete time sinusoidal sequence over given intervals (MATLAB).<br>3. Given x[n], write program to find X[z] (MATLAB).<br>4. Discrete Fourier Transform and its properties (MATLAB).<br>5. Fast Fourier Transform and its properties (MATLAB).<br>6. Design of a digital IIR Butterworth filter for low pass (MATLAB).<br>7. Design of a digital IIR Butterworth filter for high pass (MATLAB).<br>8. Design of digital FIR filters using windows (MATLAB). | 30 |

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. A. Anand Kumar, "Digital Signal Processing", Second Edition, PHI Learning Private Limited.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. S. Salivahanan, "Digital Signal Processing", McGraw Hill, Fourth Edition.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A- Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | FIFTH | | |
| Name of the Course | Microprocessor Architecture and Programming with 8085 | | |
| Course Code | B23-ELE-503 | | |
| CourseType:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-2 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course( if any) | Basic knowledge of digital electronics and computer organization. | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Perform in depth study of microprocessor architecture and programming using the Intel 8085 microprocessor.<br>2. To understand various instructions used for low level programming.<br>3. To analyze given problem and write programs using 8085 assembly language.<br>4. Present the experimental results and conclusion by having Hands-on experience in the Laboratory<br>5. Learning the above through practicals | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical)<br>Internal Assessment Marks: 20 Theory +10 Practical<br>End Term Exam Marks: 50Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Introduction:** Introduction to Microprocessors, microcomputer and single chip microcomputer, Components of Microprocessor: Registers, ALU and control & timing, CPU, I/O devices, clock, memory, bussed architecture, tri-state logic, address bus, data bus and control bus. | 11 |
| II | **Architecture and Programming of 8085:** Architecture of 8085 Microprocessor, Pin Description of 8085, Instruction set of 8085, Fetching and Executing Instructions, Idea of fetch execute overlap | 11 |
| III | **Instruction Set:** : Assembly Language Programming Basics, Data Transfer operations, Arithmetic Operations, Logic Operations, Branch Operations, Writing Assembly language Programs | 11 |
| IV | **Programming Technique**: Looping, Counting, and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, | 12 |

| | | |
|---|---|---|
| | Arithmetic Operations Related to Memory, Logic Operations: Rotate, Logic Operations: Compare<br>**8085 Programming**: Programs of Addition, Subtraction, Multiplication, Division , Ascending/Descending, Largest/Smallest | |
| V* | **Note:** A candidate is required to perform minimum 5experiments, out of the list provided during course of study in this semester.<br>1. Addition and Subtraction of Two 8-Bit Numbers or microprocessor-Kit.<br>2. Addition and Subtraction of Two 16-Bit Numbers or microprocessor-Kit.<br>3. Multibyte Addition/Subtraction of two numbers by Repetitive addition/subtraction on Microprocessor-kit.<br>4. Division of two 8-Bit numbers by repetitive subtraction on microprocessor-Kit.<br>5. Multiplication of Two 8-Bit Numbers on Microprocessor –Kit.<br>6. Find the smallest/largest number from a give series of numbers on Microprocessor-Kit.<br>7.To sort a given series of unsigned numbers in Ascending order on Microprocessor-kit.<br>8.To sort a given series of unsigned numbers in Descending order on Microprocessor-kit.<br>9. Check even parity/add parity of binary number on microprocessor-Kit. | 30 |

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. Digital Computer Electronics- A P Malvino (2nd Edition)
2. Microprocessor Architecture, programming and application with the 8085 by R S Gaonkar
3. Fundamentals of Microprocessors and Microcontrollers by B.RAM
4. Introduction to microprocessor 8085, D K Kaushik, Dhanpat Rai Publications

| Session:2024-25 | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | FIFTH | | |
| Name of the Course | OPTOELECTRONIC DEVICES | | |
| Course Code | B23-ELE-504 | | |
| CourseType:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-2 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | Advance Knowledge of Electronics | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. To understand the basic physics behind optoelectronic devices.<br>2. Develop detailed knowledge of laser operating principles and Structures.<br>3. Acquire detailed knowledge of solar cells and optoelectronic Modulation and switching devices.<br>4. To understand the optical detection devices.<br>5. Hands on with experiments on the above topics. | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical)Internal Assessment Marks: 20 Theory +10 Practical End Term Exam Marks: 50Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory &Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **ELEMENTS OF LIGHT AND SOLID STATE PHYSICS:** Basics of semiconductor optics: Dual nature of light, band structure of various semiconductors, light absorption and emission, photo luminescence. Electro luminescence, radioactive and non-radiative recombination, wave trains. Properties of semiconductors: Electron and photon distribution: density of states, effective mass and band structure, effect of temperature and pressure on band gap, recombination processes. | 11 |
| II | **Optical Sources (LEDs and LASERs):** Semiconductor light-emitting diodes: Structure and types of LEDs and their characteristics, guided waves and optical modes, optical gain, confinement factor, internal and external efficiency, semiconductor hetero junctions, double-hetero structure LEDs. Semiconductor lasers: Spontaneous and stimulated emission, principles of a laser diode, threshold current, effect of temperature, design of an edge-emitting diode, emission spectrum of a laser diode, quantum wells, | 12 |

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|---|---|---|
| | quantum-well laser diodes. | |
| III | **Optical Detectors:** Semiconductor light detectors: I-V characteristics of a p-n diode under illumination, photovoltaic and photoconductive modes, load line, photocells and photodiodes, p-i-n photodiodes, responsively, noise and sensitivity, photodiode materials, electric circuits with photodiodes, solar cells. | 10 |
| IV | **Optoelectronic Modulators and Optoelectronic Integrated Circuits**: Semiconductor light modulators: Modulating light (direct modulation of laser diodes, electro-optic modulation, acousto-optic modulation), isolating light (magneto-optic isolators), inducing optical nonlinearity, Introduction, hybrid and Monolithic Integration, Application of Optoelectronic Integrated Circuits, Integrated transmitters and Receivers. | 12 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. To study the light-current characteristics of Light Emitting Diodes (LEDs)<br>2. To study the light-current characteristics of Light Depended Resistors (LDRs)<br>3. To study the light-current characteristics of Infrared LEDs and Sensors.<br>4. To study the working of Opto-couplers.<br>5. To study the light-current characteristics of Photodiodes and p-i-n diodes.<br>6. To study the light-current characteristics of Phototransistors.<br>7. To study the light-current characteristics of Laser Diode.<br>8. To be familiar with optical fibre training set for optical communication.<br>9. Measurements of optical fibre power and attenuation.<br>10. Measurement of Bending Losses and Numerical Aperture in optical fibre.<br>11. Optoelectronic Based Mini Project | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>**1. Theory 20 Marks**<br>1. Class Participation: **5 Marks**<br>2. Seminar/presentation/assignment/quiz/class test etc.:**5 Marks**<br>3. Mid-Term Exam: **10 Marks**<br>**2. Practicum 10Marks**<br>1. Class Participation:<br>2. Seminar/Demonstration/Viva-voce/Lab records etc.:**10Marks**<br>3. Mid-Term Exam: | **End Term Examination:**<br>50Marks<br><br><br><br>20Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. Semiconductor Optoelectronics: Physics and Technology, Jasprit Singh, McGraw Hill Companies, ISBN 0070576378
2. Optoelectronics, E. Rosencher and B. Vinter, Cambridge Univ. Press, ISBN 052177813.
3. Photonic Devices, J. Liu, Cambridge Univ. Press, ISBN 0521551951.
4. Semiconductor Optoelectronic Devices 2nd Edition", P. Bhattacharya, Prentice Hall, ISBN 0134956567.
5. Physics of Semiconductor Devices, by S. M. Size (2nd Edition, Wiley, New York, 1981)
6. S. O. Kasap, "Optoelectronics and Photonics: Principles and Practices," Prentice-Hall, 2001.
7. B. Streetman and S. Banerjee, "Solid **State Electronic** Devices," 6th edition, Pearson/Prentice Hall, 2006

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A - Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | FIFTH | | |
| Name of the Course | Mechatronics | | |
| Course Code | B23-ELE-505 | | |
| Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC) | **DSE-3** | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | Basic Knowledge of Electronics | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Understanding about the basic elements of a mechatronics system<br>2. Hardware required for a Mechatronic system<br>3. Smart materials and their use in mechatronic systems<br>4. Micro mechatronic systems and their fabrication<br>5. Learning the above through experiments | | |
| Credits | Theory | Practical | Total |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100(70 Theory + 30 Practical)<br>Internal Assessment Marks: 20 Theory + 10 Practical<br>End Term Exam Marks: 50 Theory + 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B- Contents of the Course**

**Instructions for Paper- Setter**

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

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

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

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.).

2. Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education

3. A Textbook of Mechatronics, R.K. Rajput, S. Chand & Company Private Limited

4. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall.

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | FIFTH | | |
| Name of the Course | INTRODUCTION TO EMBEDDED SYSTEMS | | |
| Course Code | B23-ELE-506 | | |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-3 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | Basic knowledge of digital electronics and computer architecture. | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Explain the concepts related to embedded systems and architecture of microcontrollers.<br>2. Familiarize with serial bus standards.<br>3. Design systems for common applications like general I/O, counters, PWM motor control, data acquisition etc<br>4. Learn the development tools for a microcontroller, and write assembly language code according to specifications<br>5. Learning the above through practicals | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical )<br>InternalAssessmentMarks: 20Theory+10 Practical<br>End Term Exam Marks: 50Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Introduction to Embedded Systems:** Overview of Embedded Systems, Features, Requirements and Applications, Common architectures for the Embedded System Design, Embedded Software design issues. Introduction to microcontrollers, Overview of Harvard architecture and Von Neumann architecture, RISC and CISC microcontrollers | 11 |
| II | **AVR RISC Microcontrollers**: Introduction to AVR RISC Microcontrollers, Architecture overview, status register, general purpose register file, memories, Instruction set, Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions, Bit and Bit-test Instructions, MCU Control Instructions. | 12 |

| | | |
|---|---|---|
| III | **Interrupts and Timer**: Introduction to System Clock, Reset sources, Introduction to interrupts, External interrupts, IO Ports, 8-bit and 16-bit Timers, introduction to different modes. | 11 |
| IV | **Peripherals:** Analog Comparator, Analog-to-Digital Converter, Serial Peripheral Interface (SPI), The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART), Two Wire Interface (TWI) / I2C bus | 11 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Flash LED at an observable rate.<br>2. Hello LED – Flash LED at a rate such that the LED appears always on.<br>3. Estimate the onset of the rate when the LED appears to stay on.<br>4. Controlling ON/OFF of an LED using switch.<br>5. Use LFSR based random number generator to generate a random number and display it.<br>6. Toggle the LED every second using Timer interrupt.<br>7. Use the potentiometer to change the red LED intensity from 0 to maximum in 256 steps.<br>8. Use the switch to select the LED (from RGB led) and then the potentiometer to set the intensity of that LED.<br>9. Read the ADC value of the voltage divider involving the LDR. Print the value on the serial monitor.<br>10. Use the LDR and estimate a threshold for the LDR value and use that to turn the RGB LED on, to simulate an 'automatic porch light'.<br>11. Use the thermistor to estimate the temperature and print the raw value on the serial monitor.<br>12. Connect the LCD I/O Board and print 'Hello World' on the LCD. Scroll display from left to right.<br>13. Use the on-board EEPROM to store the temperature min and max values together with a time stamp.<br>14. Speed control of d.c. motor/ stepper motor. | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>**Theory: 20 Marks**<br>• Class Participation: **5 Marks**<br>• Seminar/presentation/assignment/quiz/class test etc.: **5 Marks**<br>• Mid-Term Exam: **10 Marks**<br>**Practicum10 Marks**<br>• Class Participation:<br>• Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks**<br>• Mid-Term Exam: | **End Term Examination:**<br>50 Marks<br><br>20 Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. AVR Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, PHI
2. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002
3. Programming and Customizing the AVR Microcontroller by D V Gadre, McGraw Hill
4. Atmel AVR Microcontroller Primer: Programming and Interfacing by Steven F. Barrett, Daniel J. Pack, Morgan & Claypool Publishers
5. An Embedded Software Primer by David E Simon, Addison Wesley

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A- Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | SIXTH | | |
| Name of the Course | MICROCONTROLLER 8051 AND ITS INTERFACING | | |
| Course Code | B23-ELE-601 | | |
| Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC) | CC- 6 MCC-11 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | - | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Understand the basic architectural blocks of a microcontroller.<br>2. Understand the difference between a microprocessor and microcontroller.<br>3. Understand the instruction set of 8051 microcontroller and will be able to write simple programs.<br>4. Interface various I/O devices with microprocessor and microcontroller.<br>5. Learning the above through practicals | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| **Max. Marks:** 100 (70 Theory + 30 Practical)<br>Internal Assessment Marks: 20 Theory +10 Practical<br>End Term Exam Marks: 50 Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B- Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Architecture of 8051 Microcontroller-** Basic block diagram of microcontroller, Comparison of microcontroller with microprocessors, Architecture -internal block diagram and key features of 8051, pin diagram, memory organization, Internal RAM memory, Internal ROM. General purpose data memory, special purpose/function registers, external memory. | 11 |
| II | **Counters /timers and Programming**: 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. Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 | 12 |
| III | **Interrupts, Addressing modes, Instruction set and Interfacing**: | 11 |

| | | |
|---|---|---|
| | Interrupts, reset, interrupt control, interrupt priority, and interrupt destinations & software generated interrupts. Addressing modes, Data transfer instructions, Arithmetic and Logic operations, , flags, internal data move, external data move, code memory read-only data move, Push and Pop and data exchange instructions | |
| IV | **Interface and Applications:** Develop the following applications with 8051 microcontroller using assembly language:<br>i) Stepper-motor interface,<br>ii) ADC interface,<br>iii) DAC interface,<br>iv) Keyboard interface | 11 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Program to find the sum of N 8-bit numbers.<br>2. Program to find largest of N numbers.<br>3. Program to find smallest of N numbers<br>4. Program to find whether the given data is palindrome.<br>5. Program to arrange the numbers in ascending order.<br>6. Interfacing of stepper motor and Rotating stepper motor by N Steps clockwise/ anticlockwise with speed control.<br>7. ADC interfacing.<br>8. DAC interface<br>9. Keyboard interface | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory 20 Marks**<br>● Class Participation: **5 Marks**<br>● Seminar/presentation/assignment/quiz/class test etc.:**5 Marks**<br>● Mid-Term Exam: **10Marks**<br>➢ **Practicum10Marks**<br>● Class Participation:<br>● Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks**<br>● Mid-Term Exam: | **End Term Examination :** 50 Marks<br><br>20 Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. Muhammad Ali Mazidi, “Microprocessors and Microcontrollers”, Pearson, 2006
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay “The 8051 Microcontroller and Embedded Systems”, 2nd Edition, Pearson Education 2008.
3. "Programming and Customizing the 8051 Microcontroller" by Myke Predko
4. The 8051 Microcontroller Based Embedded Systems”, Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
5. “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Raj Kamal, Pearson Education, 2005.

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A- Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | SIXTH | | |
| Name of the Course | BASIC ELECTRICAL ENGINEERING & SKILLS | | |
| Course Code | B23-ELE-602 | | |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | MCC-12 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course(if any) | Basic idea of Electronic components and their configurations | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Understand the working of RLC circuits and transformer.<br>2. Explain the basic models of different types of power Electronic converters including dc-dc converters, PWM rectifiers and inverters.<br>3. Describe the operation of electric machines, such as motors, their electronic controls and safety measures like earthing, MCB etc.<br>4. Analyze the performance of electric machine<br>5. Learning the above through practicals | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical)<br>Internal Assessment Marks: 20 Theory +10 Practical<br>End Term Exam Marks: 50 Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **AC Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. | 10 |
| II | **Transformers:** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. | 10 |
| III | **Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. | 13 |

| | | |
|---|---|---|
| | Construction and working of synchronous generators. | |
| IV | DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation. Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. | 12 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Basic safety precautions while working in electrical machine laboratory.<br>2. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.<br>3. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage.<br>4. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage.<br>5. Resonance in R-L-C circuits.<br>6. Transformers: measurement of primary and secondary voltages and currents, and power.<br>7. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).<br>8. Phase-shifts between the primary and secondary side.<br>9. Cumulative three-phase power in balanced three-phase circuits.<br>10. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.<br>11. Torque Speed Characteristic of separately excited dc motor. | 30 |

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press,2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A- Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | SIXTH | | |
| Name of the Course | **I**NTERFACING PERIPHERAL DEVICES AND APPLICATIONS OF 8085 | | |
| Course Code | B23-ELE-603 | | |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-4 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course( if any) | Basic idea of 8085 architecture and its programming | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Learn various interrupts of 8085 microprocessor.<br>2. understand about 8255 PPT<br>3. Learn about the Timer IC 8253.<br>4. Study about the DMA controller and programming applications of 8085.<br>5. Hands-on experience in the Laboratory on the above topics | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical)Internal Assessment Marks: 20 Theory +10 Practical<br>End Term Exam Marks:50 Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Interrupts:** Methods of Input/output operations, Data transfer Schemes, software Interrupts, Hardware interrupts, Interrupt control circuits, Interrupt instructions. | 11 |
| II | **Programmable Peripheral Interface 8255:** operational modes of 8255, control word format for 8255, programming in Mode 0, programming in Mode 1, programming in Mode 2, BSR mode. | 11 |
| III | **Programmable Interval Timer 8253:** Block diagram of 8253, control word format for 8253, Interfacing & programming of 8253, Programming of 8253 in various modes | 10 |
| IV | **DMA Controller 8257 and 8085 Applications:** Block diagram, Programming of 8257, Applications to illustrate the use of Microprocessor in: | 13 |

| | | |
|---|---|---|
| | 1. Traffic light<br>2. Temperature control<br>3. Stepper Motor control<br>4. Washing machine control. | |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Program to generate Square wave using Microprocessor-Kit.<br>2. Program to generate Sine wave using Microprocessor-Kit.<br>3. Program to generate triangular wave using Microprocessor-Kit.<br>4. Generate a time delay through software on Microprocessor-Kit and switch ON/OFF LED using IC 8255.<br>5. Write program to operate Stepper Motor using Microprocessor-Kit.<br>6. Write program to illustrate the use of Microprocessor in Traffic light system.<br>7. ADC interfacing using Microprocessor-Kit.<br>8. DAC interface using Microprocessor-Kit.<br>9. Interfacing of stepper motor and Rotating stepper motor by N Steps clockwise/ anticlockwise with speed control. | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory: 20Marks**<br>● Class Participation: **5 Marks**<br>● Seminar/presentation/assignment/quiz/class test etc.:**5 Marks**<br>● Mid-Term Exam: **10Marks**<br>➢ **Practicum10Marks**<br>● Class Participation:<br>● Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks**<br>● Mid-Term Exam: | **End Term Examination:**<br>50 Marks<br><br>20 Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. Digital Computer Electronics- A P Malvino (2nd Edition)
2. Microprocessor Architecture, programming and application with the 8085 by R S Gaonkar
3. Fundamentals of Microprocessors and Microcontrollers by B.RAM
4. Introduction to microprocessor 8085, D K Kaushik, Dhanpat Rai Publications

**Session: 2024-25**

**Part A- Introduction**

| | |
|---|---|
| Subject | ELECTRONICS |
| Semester | SIXTH |
| Name of the Course | VERILOG AND FPGA BASED SYSTEM DESIGN |
| Course Code | B23-ELE-604 |
| CourseType:(CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-4 |
| Level of the course | 300-399 |
| Pre-requisite for the course (if any) | Basic Knowledge of Digital Circuits and their design |

| | |
|---|---|
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Understand syntax, various data types, modules and ports in VERILOG.<br>2. Understand the various VERILOG models to write RTL codes.<br>3. Understand the HDL design flow and write programs in VERILOG<br>4. Understand about the FPGA technology and how to synthesize a RTL code on FPGA.<br>5. Learning the above through practicals |

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

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

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Verilog HDL :** Overview of digital design with Verilog – Hierarchical modeling concepts – Basic Verilog concepts – Data types – Modules and ports – Gate level modeling – Data flow modeling – Behavioral modeling – Test benches – Logic synthesis with Verilog | 11 |
| II | **Logic Design with Behavioural Models** : Behavioural models of combinational logic – Cyclic behavioural models of Flip-flops and Latches – Multiplexers, encoders, decoders, Algorithmic state machines – design of counters, shift registers, register files – Data path controllers | 11 |
| III | **Synthesis of Combinational and Sequential Logic:** Introduction to synthesis – Synthesis of combinational logic – Synthesis of sequential logic with latches, explicit state machines and register logic – Synthesis of implicit state machines, registers. | 11 |
| IV | **FPGA-Based Systems :** Digital design and FPGA based system design – Techniques – Hierarchical design – Design abstraction – | 12 |

| | | |
|---|---|---|
| | Methodologies, FPGA architectures – SRAM-Based FPGAs – Permanently programmed FPGAs – Chip IO – Circuit design of FPGA fabrics – Architecture of FPGA fabrics, Combinational Logic : The logic design process – Modeling with HDLs – Combinational delay, fanout, path delay – Power and energy optimization – Arithmetic logic – Logic implementation of FPGAs, Sequential Logic : Sequential machine design process – Sequential design styles – Rules for clocking | |
| V* | **Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.<br>**Programming using VERILOG:**<br>1. Half Adder/ Full Adder<br>2. MUX(8:1)/ DeMUX<br>3. Code Converters<br>4. Decoder (m to n)<br>5. Encoder (n to m)<br>6. Shift Registers<br>7. 4 bit synchronous counter<br>8. 4 bit asynchronous counter<br>9. Memory (16X8)<br>10. FIFO Design | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory 20 Marks**<br>● Class Participation: **5 Marks**<br>● Seminar/presentation/assignment/quiz/class test etc.: **5 Marks**<br>● Mid-Term Exam: **10 Marks**<br>➢ **Practicum10Marks**<br>● Class Participation:<br>● Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks**<br>● Mid-Term Exam: | **End Term Examination :**<br>50 Marks<br><br>20 Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", PHI Learning Pvt Ltd (2013)
2. Samir Palnitkar, "Verilog HDL – A Guide to Digital Design and Synthesis" 2nd Ed, Dorling Kindersley (India) Pvt Ltd / Pearson Education (2013)
3. Wayne Wolf, "FPGA-Based System Design", Dorling Kindersley (India) Pvt. Ltd / Pearson Education Inc (2009)
4. A Verilog HDL Primer – J. Bhasker, BSP, 2003 II Edition.

| Session: 2024-25 | | | |
|---|---|---|---|
| **Part A-Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | SIXTH | | |
| Name of the Course | INTRODUCTION TO C AND ITS PROGRAMMING | | |
| Course Code | B23-ELE-605 | | |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-5 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | Basic idea of programming and logic design | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Learn Programming basics and the fundamentals of C<br>2. Use Data types in C and Mathematical and logical operations<br>3. Using if statement and loops, Arranging data in arrays, arrays and functions<br>4. Implement the pointers<br>5. Present the experimental results and conclusions by having Hands-on experience in the Laboratory | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical)<br>Internal Assessment Marks: 20 Theory +10 Practical<br>End TermExamMarks:50Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **C. Fundamentals**: The character set, identifiers & keywords, data types, constants, variables& arrays declaration, expressions statements, symbolic constants. Operators and expressions: Arithmetic operators, uniary operators, relational and logical operators, assignment operators, conditional operators. | 11 |
| II | **Data input and output:** Entering input data- The scanned function, Writing output data- The print function. Control statements: While statement, Do-while statement, for statement, If-else statement, switch statement, break statement, continue statement. | 12 |
| III | **Function:** Defining a Function, Accessing a Function, Calling a function (call by value/reference) passing arguments to a Function, specify arguments, data types. | 10 |
| IV | **Arrays:** Defining an Array, processing an Array, Passing arrays to a function, Multidimensional arrays, arrays and strings. Pointers: Fundamentals, pointer declaration, passing pointers to a function, | 12 |

| | | |
|---|---|---|
| | pointers and one dimensional array, operations on pointers. | |
| V* | **Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester.<br>1. Enter a 5 digit number from keyboard and reverse the number and to calculate the sum of all digits of original number.<br>2. Enter a character from keyboard and identifying that whether the entered character is lower-case alphabet, upper-case alphabet, a digit or a special symbol.<br>3. To print all the prime numbers between 1 to 1000.<br>4. To determine whether the entered number is ARMSTRONG number or not.<br>5. To print 20 terms (or so ) of FIBONAAKI series.<br>6. To print a triangle of stars or numbers.<br>7. To calculate factorial of a number without calling a function and with calling a function with and without RECURSION.<br>8. A program based on calling a function by value and by reference.<br>9. Sorting the entered numbers in ascending and descending order using arrays.<br>10. Write a program to calculate sum and difference of two matrices of 3*3 order. | 30 |

**Suggested Evaluation Methods**

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

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**

1. Let Us “C” by Yashwant Kanitkar.
2. Schaum’s Outline series: Theory and problems of programming with C by Byron

| Session:2024-25 | | | |
|---|---|---|---|
| **Part A- Introduction** | | | |
| Subject | ELECTRONICS | | |
| Semester | SIXTH | | |
| Name of the Course | MODERN COMMUNICATION SYSTEMS | | |
| Course Code | B23-ELE-606 | | |
| Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC) | DSE-5 | | |
| Level of the course | 300-399 | | |
| Pre-requisite for the course (if any) | | | |
| Course Learning Outcomes (CLO): | After completing this course, the learner will be able to:<br>1. Summarize different types of modern communication systems.<br>2. Understand the basics of a digital communication system.<br>3. Explain the basics of an optical communication system.<br>4. Understand the working of a cellular communication system.<br>5. Understand the working of satellite communication | | |
| Credits | **Theory** | **Practical** | **Total** |
| | 3 | 1 | 4 |
| Contact Hours per week | 3 | 2 | 5 |
| Max. Marks: 100 (70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory +10 Practical End Term Exam Marks:50 Theory+ 20 Practical | | Exam Time: 3 Hours each for Theory & Practical | |

**Part B-Contents of the Course**

**Instructions for Paper-Setter**

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

| Unit | Topics | Contact Hours |
|---|---|---|
| I | **Advanced Digital Modulation Technique**: DPCM, DM, ADM. Binary Line Coding Technique, Multi level coding, QAM (Modulation and Demodulation) | 10 |
| II | **Optical Communication:** Introduction of Optical Fibre, Types of Fibre, Guidance in Optical Fibre, Attenuation and Dispersion in Fibre, Optical Sources and Detectors, Block Diagram of optical communication system, optical power budgeting | 11 |
| III | **Cellular Communication:** Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, architecture (block diagram) of | 12 |

| | | |
|---|---|---|
| | cellular mobile communication network, CDMA technology (overview), Comparative study of GSM and CDMA, 2G, 3G, 4G and 5G concepts. | |
| IV | **Satellite communication**: Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse, path loss, ground station, simplified block diagram of earth station. Satellite access, TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA | 12 |
| V* | **Note:** A candidate is required to perform minimum 5 experiments out of the list provided during course of study in this semester.<br>1. Modulation of LED and detection through Photo detector.<br>2. Calculation of the transmission losses in an optical Communication system.<br>3. Study of 16 QAM modulation and Detection with generation of Constellation Diagram<br>4. Study of DPCM and demodulation.<br>5. Study of DM, ADM.<br>6. Study of Satellite Communication System.<br>7. Study of Optical Fiber Communication System<br>8. Detailed study of mobile phone as block diagram<br>9. Visit of any Telephone Exchange/ Communication Network site | 30 |

**Suggested Evaluation Methods**

| | |
|---|---|
| **Internal Assessment:**<br>➢ **Theory 20 Marks**<br>● Class Participation: **5 Marks**<br>● Seminar/presentation/assignment/quiz/class test etc.:**5 Marks**<br>● Mid-Term Exam: **10 Marks**<br>➢ **Practicum10Marks**<br>● Class Participation:<br>● Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks**<br>● Mid-Term Exam: | **End Term Examination:**<br>50 Marks<br><br><br><br>20 Marks |

**Part C-Learning Resources**

**Recommended Books/e-resources/LMS:**


1. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education, 3rd Edition
2. Martin S. Roden, Analog& Digital Communication Systems, Prentice Hall, Englewood Cliffs, 3rd Edition
3. Modern digital and analog Communication systems- B. P. Lathi, 4 rd Edition 2009 Oxford University press.
4. Thiagarajan Vishwanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India.
5. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2nd Edition, Pearson Education Asia.