**Shri Acharyaratna Deshbhooshan Shikshan Prasarak Mandal, Kolhapur**

# Mahavir Mahavidyalaya, Kolhapur (Autonomous)

## Affiliated to Shivaji University, Kolhapur

## Syllabus for Choice Based Credit System (NEP 2020)
## Bachelor of Science (B. Sc.) Programme

| Part | I | Course | Electronics |
|---|---|---|---|

## Under the Faculty of Science & Technology

(To be introduced from Academic Year 2025 – 26 onwards)
Subject to the revisions & modifications made from time to time

# Mahavir Mahavidyalaya, Kolhapur (Autonomous)
## Affiliated to Shivaji University, Kolhapur

**(New syllabus under Autonomy to be introduced from June, 2025 onwards)**

| Primary Information: | | | |
|---|---|---|---|
| Programme | **Bachelor of Science (B. Sc.) NEP 2** | | |
| Part | **I** | Semester | **I** |
| Course | **Electronics** | Course Code | **DSC-I** |
| Paper No. | **I** | Course Type | **Semester** |
| Total Marks | **50 Marks** | Implementation | **2025 – 26** |
| Total Credits | **02** | Contact Hours | **02 / Week** |
| Course Title | **Electronics Circuit Element** | | |

| **Course Objectives:** | |
|---|---|
| i) | **Learn the concept of electronics components .** |
| ii) | **Study the transistor applicatons.** |
| iii) | **Study and understand the amplifier and oscillator concept.** |
| iv) | **Study the concept of operational amplifier and integrated circuit.** |

**Course Syllabus**
(CR = Credits / IH: Instructional Hours)

| Modules | CR | IH |
|---|---|---|
| **Unit I :**<br><br>**A) Semiconductors Diode:**<br>Types of diodes, Symbols, Forward & reverse biasing of a diode, Zener diode.Semiconductors, intrinsic semiconductor, extrinsic semiconductor. Construction of PN junction diode, formation of depletion layer.<br><br>**B) Bipolar Junction Transistor:**<br>Types of Transistors, Symbols, Construction details & working of NPN & PNP transistors, Operating modes of transistor, Applications: Transistor as an Amplifier. | 01 | 15 |

| | | |
|---|---|---|
| **Unit II -** | | |
| **A) Amplifiers & Oscillators:**<br>Classification of Amplifiers (based on frequency range, Q point, coupling & stages) class-A, class-B, class-C & class-AB amplifiers,Concept of positive and negative feedback (only equations, no mathematical analysis).<br>• **Oscillators :**<br>RC-phase shift, LC type: Colpitt's oscillator, Hartley's oscillator, Applications of Amplifiers and Oscillators.<br>**B) Operational Amplifier:**<br>Definition of Operational Amplifier, Concept of Differential amplifier, Internal block diagram of Op-Amp **IC-741**, Symbol & Pin diagram of IC-741**,** Configurations of Op-Amp: Open-Loop & Closed Loop.<br>• **Linear & Nonlinear applications of Op-Amp**:<br>Inverting mode amplifier, Virtual ground, Non-inverting amplifier,Unity gain amplifier, Op-Amp Adder, Op-Amp-Subtractor, Op-Amp Comparators, **IC-555:** Pin diagram &internal block diagram of IC-555. | 01 | 15 |

| **Course Outcomes:** |
|---|
| On completion of the course, students will be able to: |
| CO1: Understand the concept of electronics components. |
| CO2: Understand the transistor Applications. |
| CO3: To study and understand the amplifier and oscillator concept. |
| CO4: To study the concept of operational amplifier and Integrated circuit |

| Primary Information: | | | |
|---|---|---|---|
| Programme | **Bachelor of Science (B. Sc.) NEP 2** | | |
| Part | **I** | Semester | **I** |
| Course | **Electronics** | Course Code | **DSC- II** |
| Paper No. | **II** | Course Type | **Semester** |
| Total Marks | **50 Marks** | Implementation | **2025 – 26** |
| Total Credits | **02** | Contact Hours | **02/ Week** |
| Course Title | **Digital System I** | | |

| **Course Objectives:** |
|---|
| 1) Study and understanding concept of Number System. |
| 2) Study and understanding different Computer Codes. |
| 3) Study and understanding Logic gates. |
| 4) Study and understanding combinational circuits. |

**Course Syllabus**
(CR = Credits / IH: Instructional Hours)

| | **CR** | **IH** |
|---|---|---|
| **UNIT I:** | 01 | 15 |
| **A) Number System & Computer Codes**<br>Introduction and definition, Classification (Positional & Non – Positional), Positional Number System – Binary Number System, Decimal Number System, Octal Number System, Hexadecimal Number System, Conversion from one base to another base, 1's & 2's complement of binary numbers.<br>**B) Computer Codes**:<br>Introduction and definition, BCD, ASCII & Gray Code. | | |
| **UNIT II :** | 01 | 15 |
| **A) Logic Gates :**<br>Definition, AND, OR, NOT, NOR, NAND, EX-OR (Symbol, Expression and Truth Table), Universal Gate ,Boolean algebra and identities, De Morgan's theorem and Inter conversion of logic Gates (NAND and NOR) . | | |

| | | |
|---|---|---|
| B) **Combinational Circuits** :<br>Introduction,Half adder, Full adder, Half & Full Subtractor, Multiplexer and De-multiplexer . | | |

| **Course Outcomes:** |
|---|
| After completion of the unit, students will be able to: |
| CO1: Understanding concept of Number Systems. |
| CO2 : Understanding different Computer Codes. |
| CO3 : Understanding Logic Gates. |
| CO4 : Understanding Combinational circuits. |

| **Primary Information:** | | | |
|---|---|---|---|
| Programme | **Bachelor of Science (B. Sc.) NEP** | | |
| Part | **I** | Semester | **II** |
| Course | **Electronics** | Course Code | **DSC-III** |
| Paper No. | **III** | Course Type | **Semester** |
| Total Marks | **50 Marks** | Implementation | **2025 – 26** |
| Total Credits | **02** | Contact Hours | **02 / Week** |
| Course Title | **Sensors & Signal Conditioning** | | |

| **Course Objectives:** | |
|---|---|
| i) | Learn the concept of sensors. |
| ii) | Study the working principle, selection criteria and applications of various transducers used in the instrumentation systems. |
| iii) | Understanding signal conditioning circuits, data converters& digital instruments. |
| iv) | Study of different Actuators, Data Acquisition Systems & Data loggers. |

**Course Syllabus**
(CR = Credits / IH: Instructional Hours)

| **Modules** | **CR** | **IH** |
|---|---|---|
| **Unit I :** | 01 | 15 |
| **A) Sensors& Transducers:**<br>Definition of Transducers & Sensors, Classification of transducers & Sensors, Characteristics of Transducers, Specifications of Transducers (Accuracy, Range, Linearity, | | |

| | | |
|---|---|---|
| Sensitivity, Resolution, Reproduciability), Temperature Sensor : Thermocouple, RTD, LM35.<br><br>**B) Signal Conditioning& Data Convertors:**<br>Introduction, Signal conditioning of passive sensors using Wheatstone's bridge.<br>**Filters:** Concept, Active filters, Passive Filters (Low Pass, high pass) .<br>**Digital Signal conditioning:** Types of ADC, Flash-ADC, Specifications of ADC (Linearity, Resolution, Conversion time, Accuracy), Types of DAC : weighted resistors, R-2R Ladder DAC. | | |
| **UNIT II:** | | |
| **A)Actuators & Data Acquisition Systems:**<br>Definition of Actuators, Types of Actuators, Electrical Actuators : Relays, Motors: AC, DC, Servo, Stepper.<br>**Data Acquisition Systems:** Generalized DAS system, Signal conditioning for DAS, Types of DAS systems.<br><br>**B)Digital Instruments & Display devices:**<br>Digital Multimeter, Digital Frequency Meter, Concept of Digital Storage Oscilloscope, Digital Displays : LCD, LED. | 01 | 15 |

| **Course Outcomes:** |
|---|
| After completion of the unit, students will be able to: |
| CO1: After completion of this course, student will be able to understand the sensor. |
| CO2: Describe the working principle, selection criteria and applications of various transducers used in the instrumentation systems. |
| CO3: Getting a knowledge of signal conditioning circuits, data converters& digital instruments. |
| CO4: Understanding of different Actuators, Data Acquisition Systems & Data loggers. |

| Primary Information: | | | |
|---|---|---|---|
| Programme | **Bachelor of Science (B. Sc.) NEP** | | |
| Part | **I** | Semester | **II** |
| Course | **Electronics** | Course Code | **DSC-IV** |
| Paper No. | **IV** | Course Type | **Semester** |
| Total Marks | **50 Marks** | Implementation | **2025 – 26** |
| Total Credits | **02** | Contact Hours | **02 / Week** |
| Course Title | Digital Systems - II | | |

| **Course Objectives:** | |
|---|---|
| i) | Study and understanding sequential circuit ,/ flip -flop. |
| ii) | Study of counters. |
| iii) | Study and understanding Microprocessor 8085. |
| iv) | Study and understanding Instruction set of 8085. |

**Course Syllabus**
(CR = Credits / IH: Instructional Hours)

| Modules | CR | IH |
|---|---|---|
| **Unit I :** | 01 | 15 |
| **Sequential Circuits:**<br>**A)Concept of sequential circuits :**<br>Types of Flip-flops: RS, Clocked RS, Latch, D (edge triggered), JK, Master-Slave JK.<br><br>**B)Counter :**<br>Types of counters, concept of synchronous counters, asynchronous counters, 4-bit Ripple counter, Shift Register. | | |
| **UNIT II :** | 01 | 15 |
| **A)Memory Organization :**<br>Introduction, Characteristics of memory systems, Memory hierarchy, Cache memory, Memory mapping techniques, Virtual Memory, Memory management concepts (paging and Segmentation). | | |

| | | |
|---|---|---|
| **B)Introduction to Microprocessors :**<br>General block diagram, Introduction & evolution of Microprocessors (4, 8, 16, 32….. Bits), Features, Pin Diagram and Architecture of 8085, Instruction Set of 8085 & Programming - Instruction format, addressing modes, ALP 's for Data transfer, Addition, Subtraction, Multiplication, Division, Block Transfer & Exchange operations. | | |

| **Course Outcomes:** |
|---|
| After completion of the unit, students will be able to: |
| CO1: Understanding sequential circuit flip/flop . |
| CO2: Understanding Counters. |
| CO3 :Understanding Microprocessor 8085. |
| CO4: Understanding Instruction set of 8085. |

# Practical Course

| **Course Objectives:** |
|---|
| 1. Learn measuring skills in practical. |
| 2. To make the students aware about handling of instruments . |
| 3. To make them aware of basic components. |

| **Course Syllabus**<br>(CR = Credits / IH: Instructional Hours) | | | |
|---|---|---|---|
| **SEMISTERS** | | **CR** | **IH** |
| **SEM I** | | 02 | |
| | | | |
| 1. | Study of various Electronic components, equipment& measuring devices. | | |

| | | | |
|---|---|---|---|
| 2. | Measurement of Amplitude, Frequency & Phase of waveforms by using CRO. | | |
| 3. | Analyze the operation of Transistor working as Electronic switch (Use LED & Relay in the circuit). | | |
| 4. | Demonstrate Op-Amp Adder by using IC741. | | |
| 5. | Demonstrate Op-Amp Subtractor by using IC741. | | |
| 6. | Demonstrate Monostable multivibrator by using Timer IC-555. | | |
| 7. | Demonstrate Astable multivibrator by using Timer IC-555. | | |
| 8. | Implementation of Logic gates. | | |
| 9. | Implementation of Universal building block (NAND & NOR). | | |
| 10. | Demonstrate the Half Adder. | | |
| 11. | Demonstrate the Full Adder. | | |
| 12. | Implementation of Half Subtractor. | | |
| 13. | Implementation of Full Subtractor. | | |
| 14. | Implementation of multiplexer and demultiplexer. | | |
| 15. | Implementation of De-Morgan's Theorems. | | |
| | | | |
| | **SEM II** | 02 | |
| 1. | Execute the program of 1's Complement of 8 bit number using 8085 microprocessor. | | |
| 2. | Execute the program of 1's Complement of 16 bit number using 8085 microprocessor. | | |
| 3. | Execute the program of 2's Complement of 8 bit number using 8085 Microprocessor. | | |
| 4. | Execute the program 2's Complement of 16 bit number using 8085 microprocessor. | | |
| 5. | Execute the program of Addition of two 8 bit data using 8085 microprocessor. | | |
| 6. | Execute the program Addition of two 16 bit data using 8085 microprocessor using 8085 microprocessor. | | |
| 7. | Execute the program of Subtraction of two 8 bit data using 8085 microprocessor. | | |
| 8. | Execute the program of Subtraction of two16 bit data using 8085 microprocessor. | | |
| 9. | Execute the program of Memory Block Transfer or Memory block Exchange. | | |
| 10. | Execute the program of to find odd number or even number. | | |
| 11. | Execute the program of 8 bit Multiplication using 8085 microprocessor. | | |

| | | | |
|---|---|---|---|
| 12. | Execute the program of 8 bit Division using 8085 microprocessor | | |
| 13. | Study (R-2R Ladder) Using DAC. | | |
| 14. | Study of Asynchorous UP Or Down counter. | | |
| 15. | Study of Universal Shift Register. | | |

| **Course Outcomes:** |
|---|
| • On completion of this course students will be expected to: |
| 1) Learn measuring skills in practical. |
| 2) Understand theoretical concepts by performing experiments. |
| 3) To handle various instruments. |
| 4) Develop awareness of minimizing errors . |

| **Text Books for Reading** | |
|---|---|
| **1.** | Phadke Prakashan |
| **2.** | Nirali Prakashan |
| **Books for Reference** | |
| 1. | Linear Integrated Circuits: by Ramakant Gaikwad. |
| 2. | Principles of Electronics: by A.P.Malvino, Tata Mc-Graw Hill Publication, |
| 3. | A text Book of Applied Electronics: by R. S. Shed, S. chand Publication. |
| 4. | Digital principals and applications ; Malvino Leach, Tata McGraw Hill, 4th Edition. |
| 5. | Fundamentals of Digital Electronics: A. Anand Kumar PHI Publication 2001. |
| 6. | Digital principals: T. L. Floyd 3 rd edition. |
| 7. | Digital Electronics: C. F. Strangio. |
| 8. | Electronic Instrumentation: by Kalsi, TMH. |
| 9. | Instrumentation Measurements & Analysis: by Nakra & Chaudhary TMH. |
| 10. | Instrumentation Devices & Systems: by Rangan, Sharma, Mani, TMH. |
| 11. | Transducers & Instrumentation: by Murthy PHI (Unit1) |
| 12. | Principles of Electronics - V.K.Mehta, Rohit Mehta S. Chand Publications, 11thedition(2008). |

| Suggested methods of Teaching: | |
|---|---|
| i) | Offline Traditional Board Teaching |
| ii) | Power Point Presentation |
| iii) | Online Teaching on platform of Zoom or Google Meet |

| Scheme of Course Evaluation | | |
|---|---|---|
| **1.** | End Semester Examination (ESE) | 30 |
| **2.** | Continuous Internal Evaluation (CIE) | 20 |
| **3.** | **Total Marks** | **50** |

| Suggested techniques for Continuous Internal Evaluation ( 20 Marks) | |
|---|---|
| **1.** | Assignments |
| **2.** | Offline / online MCQ test |
| **3.** | Unit test |
| **4.** | Open book test |
| **5.** | Seminar |

| Question Paper Pattern (30 Marks) Theory Exam | | |
|---|---|---|
| **Q. No.** | **Nature / Type of Question** | **Marks** |
| **1.** | Multiple Choice Questions (MCQ)<br>6 Questions | **6 Marks**<br>(1 Marks for each question) |
| **2.** | One answer question. | **6 Marks**<br>(1 Marks for each question) |
| **2.** | Short Answer Questions<br>Attempt any 2 out of 3 questions | **6 Marks**<br>(3 Marks for each question) |
| **3.** | Essay type /Broad Questions<br>Attempt any 2 out of 5 questions | **12Marks**<br>(6 Marks for each question) |
| | **Total** | **30 Marks** |

# Practical Examination

(A) The practical examination will be conducted on one day for three hours per day per batch of the practical examination.

(B) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the semester. Candidates must produce their journals at the time of practical examination.

| **Question Paper Pattern (50 Marks)**<br>**Semester wise Practical Exam** | | |
|---|---|---|
| **Semester** | **Nature / Type of Question** | **Marks** |
| **I** | One experiment<br>Second experiment<br>Certified Journal (05 marks) & Oral (05 marks) | **20**<br>**20**<br>**10** |
| | Total Marks (For Semester I) | **50** |
| **II** | One experiment<br>Second experiment<br>Certified Journal (05 marks) & Oral (05 marks) | **20**<br>**20**<br>**10** |
| | Total Marks (For Semester II) | **50** |
| **Total Marks** | | **100** |