# First Year Curriculum

## Admission Year 2026-27

# Diploma Engineering
# Computer Engineering

**Faculty of Engineering & Technology**

**Parul University**

**Vadodara, Gujarat, India**

**Semester 1**

a. **Course Name:** Python Programming
b. **Course Code:** 03061601P C01
c. **Prerequisite:** Basic Computer Knowledge and familiar with program concepts
d. **Rationale:** The course aims to develop proficiency in writing efficient Python code for problem-solving and real-world applications. It also covers core concepts like data structures, functions, and OOP principles.
e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understanding Ecosystem Structure and Describe the components of an ecosystem, including both biotic and abiotic factors and understand the significance of these cycles in maintaining ecosystem balance. |
| **CLOBJ 2** | Evaluate air and noise pollution sources, effects, and control measures, considering both natural and anthropogenic factors. Studying Air and Noise Pollution and Identify common air pollutants and their sources. Evaluate noise pollution sources, measurement techniques, and regulatory measures |
| **CLOBJ 3** | Analyse characteristics such as turbidity, pH, BOD, and COD in water. Examine primary, secondary, and tertiary methods of wastewater treatment. Investigate causes, effects, and preventive measures of soil pollution. |
| **CLOBJ 4** | Explore the basics of solar energy and different solar technologies and Evaluate biomass as an energy source, including its thermal characteristics and biogas production. Investigate new energy sources like hydrogen, ocean energy, tidal energy, and geothermal energy. |
| **CLOBJ 5** | Understand the principles of the 3Rs (Reduce, Reuse, Recycle) in solid waste management. Evaluate methods of energy recovery and disposal, including sanitary landfill for municipal solid waste. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the fundamentals and importance of innovation and design thinking in problem-solving. |
| **CLO 2** | Develop the ability to identify user needs and define real-world problems effectively. |
| **CLO 3** | Apply creative thinking techniques to generate innovative ideas and solutions. |
| **CLO 4** | Design and develop prototypes using the stages of the design thinking process. |
| **CLO 5** | Analyse and evaluate innovative solutions for educational, social, and industrial applications. |

### g. Teaching & Examination Scheme:

| Teaching Scheme | | | | | Examination Scheme | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Internal Marks | | | External Marks | | |
| Lecture Hrs/Week | Tutorial Hrs/ Week | Lab Hrs/ Week | Hrs/Week | Credit | T | CE | P | T | P | |
| 3 | - | 4 | - | 5 | 20 | 20 | 100 | 60 | - | 200 |

SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

### h. Course Content:

| Sr. | Topics | W | T |
|---|---|---|---|
| 1 | **UNIT-1 Basics of Python**<br>History of python, comparison of different versions of python, difference of C and Python, different python editors, Installation of IDLE and setting up python environment, Basic python syntax, Comments in python, Features of Python. | 18 | 8 |
| 2 | **UNIT - 2 Data Type & Operator**<br>Variable, Assigning values to a variable, rules to name a variable Keywords, Datatype, User Input, Operators, List Tuples, Set, Dictionaries, Data Structure, String Inbuilt Function | 22 | 10 |
| 3 | **UNIT - 3 Control Statements**<br>If.. else, while loops, for loops, range, break, Continue | 22 | 10 |
| 4 | **UNIT-4 Function**<br>Introduction of functions, Defining user function, function documentation, optional parameter, default parameter, variable no. of argument, Keyword Arguments , scope of variable in function, Lamda, inbuilt function | 22 | 10 |
| 5 | **UNIT - 5 Modules**<br>Sys, Math, Date, Time ,Random | 16 | 7 |

### i. Text Book and Reference Book:


1. Introducing Python by Lubanovic Bill, O' ReILLY (TextBook)
2. Beginning Python: Using Python 2.6 and Python 3.1 By James Payne | Wrox Publication
3. Python for Everybody By Charles Severance | Pearson Publication
4. Learning Python By Mark Lutz | O'Reilly Media
5. Fluent Python By Luciano Ramalho | O'Reilly Media

**j. List of Experiment:**

| Sr. No. | Experiment List |
|---|---|
| 1. | Write a program to print Hello word. |
| 2. | Write a program to demonstrate use of comments. |
| 3. | Write a program which accepts the radius of a circle from the user and compute the area |
| 4. | Write a program which accepts the user's first and last name and print them in reverse order with a space between them |
| 5. | Write a program to demonstrate all data type in Python. |
| 6. | Write a program to do arithmetical operations |
| 7. | Write a program to do Logical operations |
| 8. | Write a program to find area of circle, rectangle & Triangle. |
| 9. | Write a program to Perform Type Conversion: i) convert kilometers to miles & ii) convert Celsius to Fahrenheit. |
| 10. | Write a program to demonstrate list datatype slicing & indexing operator & also any 10 inbuilt function list. |
| 11. | Write a program to demonstrate Tuple datatype slicing & indexing operator & also any 10 inbuilt function tuple. |
| 12. | Write a program to demonstrate Set datatype & also any 10 inbuilt function Set. |
| 13. | Write a program to demonstrate Dictionary datatype & also any 10 inbuilt function Dictionary. |
| 14. | Write a program to get a single string from two given strings, separated by a space and display the first two characters of each string. |
| 15. | Write a program to demonstrate 10 function of string. |
| 16. | Write a program to find the Maximum number from three numbers. |
| 17. | Write a program to display grade of students. |
| 18. | Write a program to make a simple calculator using if…. else as per user choice |
| 19. | Write a program to find given number is prime or not. |
| 20. | Write a program to find factorial of given number. |
| 21. | Write a program to Print Right Triangle using While Loop |
| 22. | Write a program to check if a given number is an Armstrong number. |
| 23. | Write a program to print a specified list after removing the 0th, 4th and 5th elements. Go to the editor Sample List: ['Red', 'Green', 'White', 'Black', 'Pink', 'Yellow'] Expected Output: ['Green', 'White', 'Black']" |
| 24. | Write a program to find reveres number of given number. |
| 25. | Write a program to Check Input Character is a Vowel on a Constant. |
| 26. | Write a program to demonstrate variable & optional parameter. |
| 27. | Write a program to display triangle pattern using while loop. |

| | |
|---|---|
| 28. | Write a program to display the current date and time. |
| 29. | Write a program to print the calendar of a given month and year. |
| 30. | Write a program to use of Random & Math module. |
| 18. | Write a program to make a simple calculator using if…. else as per user choice |
| 19. | Write a program to find given number is prime or not. |
| 20. | Write a program to find factorial of given number. |
| 21. | Write a program to Print Right Triangle using While Loop |
| 22. | Write a program to check if a given number is an Armstrong number. |
| 23. | Write a program to print a specified list after removing the 0th, 4th and 5th elements. Go to the editor Sample List: ['Red', 'Green', 'White', 'Black', 'Pink', 'Yellow'] Expected Output: ['Green', 'White', 'Black']" |
| 24. | Write a program to find reveres number of given number. |
| 25. | Write a program to Check Input Character is a Vowel on a Constant. |
| 26. | Write a program to demonstrate variable & optional parameter. |
| 27. | Write a program to display triangle pattern using while loop. |
| 28. | Write a program to display the current date and time. |
| 29. | Write a program to print the calendar of a given month and year. |
| 30. | Write a program to use of Random & Math module. |

a. **Course Name:** Mathematics I
b. **Course Code:** 03069101BS01
c. **Prerequisite:** Student must have passed class 10th examination from recognized board of education. Also, students has knowledge of basic concept studied till 10th standard.

d. **Rationale:** The goal of this Mathematics course is to give students a strong foundation in fundamental ideas and procedures that are essential for both everyday problem-solving and future education. This course aims to foster logical reasoning and critical thinking skills while covering subjects that are directly relevant to a variety of engineering, technology, business, and scientific domains.

e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understand the concept of logarithms and partial fractions for algebraic simplifications with examples |
| **CLOBJ 2** | Understand trigonometric functions and relationship between them with examples |
| **CLOBJ 3** | Solve the complex numbers in various forms like modulus-amplitude (polar) form, Exponential (Euler) form for engineering applications with examples |
| **CLOBJ 4** | Understand the concept of functions and limits with examples |
| **CLOBJ 5** | Understand concept of differentiation engineering related problems based on applications of differentiation with examples |

**f. Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Apply logarithms for calculations and convert rational fractions into sums of partial fractions with examples |
| **CLO 2** | Analyze basic functions used in trigonometry with examples |
| **CLO 3** | Explain complex numbers in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples |
| **CLO 4** | Evaluate and Interpret the function graphically, numerically and analytically with limit of function |
| **CLO 5** | Solve engineering related problems based on applications of differentiation |

**g. Teaching and Examination Scheme:**

| **Teaching Scheme** | | | | **Examination Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| **L** | **T** | **L** | **C** | **Internal Evaluation** | | | **ESE** | | |
| | | | | **MSE** | **CE** | **P** | **T** | **P** | |
| 3 | 1 | 0 | 4 | 20 | 20 | - | 60 | - | 100 |

**L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination**

**h. Course Content :**

| Sr. | Topics | W | T |
|---|---|---|---|
| **1** | **Logarithms and Partial Fractions**<br>**Logarithms:** Definition, Logarithm as a transformation, Antilogarithm, Rules of Logarithms and examples, Use logarithmic functions for simplifying arithmetic computations. **Partial fractions:** Definition of partial fractions, Types of partial fraction (denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors). | **17** | **8** |
| **2** | **Trigonometry**<br>Units of Angles (degree and radian), Trigonometric Functions, Allied & Compound Angles, Multiple –Submultiples angles, Graph of Sine and Cosine, Periodic trigonometric functions, Sum and factor formulae. | **23** | **9** |
| **3** | **Complex Numbers**<br>Definition of a complex number, real and imaginary parts of a complex number, Polar and Cartesian representations of complex number, Conjugate of complex number**,** Geometric representation of complex numbers and their operations, Modules and Amplitude form, De Moivre's Theorem, Root of Complex Number, Use of De Moivre's Theorem to simplify mathematical expressions. | **20** | **9** |
| **4** | **Function and Limit**<br>Definition and concept of function, Concept of limits and standard forms of limits, Standard formulae of Limit and related simple examples. | **17** | **8** |
| **5** | **Differentiation**<br>Definition of derivative, differentiation of standard function by first principle, Rule of Differentiation, Differentiation of algebraic, trigonometric, Exponential, Logarithmic, Implicit functions and Composite functions, Higher order derivatives. | **23** | **11** |

**i. Text Book and Reference Book:**


1. Advanced Mathematics for Polytechnic, By Pandya N R | Macmillan Publishers India Ltd.,2012
2. Mathematics-I, By Deepak Singh | Khanna Book Publishing Co
3. Mathematics II, By Garima Singh | Khanna Book Publishing Co.
4. A text book of Engineering Mathematics, By N.P. Bali and Manish Goyal | Laxmi Publications
5. Polytechnic Mathematics, By S P Deshpande | Pune Vidyarthi Gruh Prakashan
6. Applied Mathematics, By H.K.Das | S.Chand Publication
7. Calculus and Analytic Geometry, By G. B. Thomas, R. L. Finney | Addison Wesley | 9th Edition
8. Engineering Mathematics(Third edition), By Croft, Anthony | Pearson Education, New Delhi
9. Advanced Engineering Mathematics (9th Edition), By Erwin Kreyszig, Wiley India (13)

a. **Course Name:** Computer Hardware and Troubleshooting

b. **Course Code:** 03061601E S01

c. **Prerequisite:** Basic Computer Knowledge

d. **Rationale:** Computer maintenance is essential for ensuring the smooth functioning and longevity of computer systems. This course provides students with fundamental knowledge of computer hardware, operating systems, networking, and basic troubleshooting techniques. By understanding these concepts, students will be able to diagnose and resolve common hardware and software issues, perform preventive maintenance, and enhance system security. This foundational knowledge is crucial for careers in IT support, technical servicing, and network administration.

e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understand the basic components and functioning of computer hardware systems. |
| **CLOBJ 2** | Learn installation and configuration of operating systems and software applications. |
| **CLOBJ 3** | Develop practical skills in computer assembly, troubleshooting, and networking basics. |
| **CLOBJ 4** | Apply computer security, maintenance, and data backup techniques for system reliability. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Identify and explain the functions of various computer hardware components. |
| **CLO 2** | Install and configure operating systems and essential software applications. |
| **CLO 3** | Assemble, troubleshoot, and maintain basic computer systems and networks. |
| **CLO 4** | Apply computer security measures, backup methods, and preventive maintenance techniques. |

g. **Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | | **Examination Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lecture Hrs/Week** | **Tutorial Hrs/Week** | **Lab Hrs/Week** | **Hrs/Week** | **Credit** | **Internal Marks** | | | **External Marks** | | |
| | | | | | **T** | **CE** | **P** | **T** | **P** | |
| 3 | - | 2 | - | 4 | 20 | 20 | 50 | 60 | - | 150 |

**SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. **Course Content:**

| **Sr.** | **Topics** | **W** | **T** |
|---|---|---|---|
| **1** | **Introduction to Computer Hardware**<br>Basic Components of a Computer, CPU, RAM, Hard Drive, Motherboard, SMPS, Input & Output Devices (Keyboard, Mouse, Printer, Monitor) | **22** | **10** |
| **2** | **Operating System & Software Installation** | **16** | **7** |

| | | | |
|---|---|---|---|
| | Introduction to Operating Systems (Windows & Linux), Installing & Configuring an OS, Basic Software Installation (Drivers, Office Suite, Antivirus) | | |
| **3** | **Computer Assembly & Troubleshooting**<br>Assembling & Disassembling a Computer, Common Hardware Issues & Solutions, BIOS Setup & Booting Problems | **20** | **9** |
| **4** | **Networking Basics**<br>Introduction to Networking (LAN, WAN, Wi-Fi), Network Devices: Router, Switch, Modem, Basics of IP Addressing & Internet Configuration | **20** | **9** |
| **5** | **Basic Computer Security & Maintenance**<br>Importance of Computer Security, Introduction to Antivirus & Firewall, Basic Methods of Data Backup, Preventive Maintenance Tips | **22** | **10** |

**i. Text Book and Reference Book:**


1. Computer Hardware and Networking K.L. James, Scitech Publications
2. PC Hardware: The Complete Reference, Craig Zacker & John Rourke, McGraw Hill Education
3. Troubleshooting, Maintaining & Repairing PCs, Stephen J. Bigelow, McGraw Hill Education
4. A+ Guide to Hardware, Jean Andrews, Cengage Learning
5. Computer Networking: Principles, Protocols, and Practice, Olivier Bonaventure


**j. List of Experiment:**

| Sr. NO. | Experiment List |
|---|---|
| 1 | Identify various computer hardware components – Observe and list components like CPU, RAM, motherboard, storage devices, and power supply. |
| 2 | Assemble and disassemble a desktop computer – Properly connect and disconnect internal components while following safety precautions. |
| 3 | Configure BIOS and reset CMOS settings – Access BIOS, modify basic settings, and restore default configurations if needed. |
| 4 | Install Windows/Linux operating system – Perform a fresh installation, configure user settings, and verify system functionality. |
| 5 | Create and manage disk partitions – Use disk management tools to partition, format, and manage storage devices. |
| 6 | Install and update hardware drivers – Install missing drivers and update existing ones to ensure proper hardware functionality. |
| 7 | Set up a basic LAN and test network connectivity – Connect multiple computers in a network and verify communication using IP settings. |
| 8 | Crimp and test network cables – Create straight-through and crossover cables and check connectivity using a network tester. |

| | |
|---|---|
| 9 | Diagnose and troubleshoot common hardware issues – Identify and fix problems like no display, overheating, and system crashes. |
| 10 | Install antivirus software and configure security settings – Scan for malware, configure firewall settings, and enable real-time protection. |
| 11 | Perform data backup and recovery – Backup important files using external storage and restore lost data using recovery tools. |
| 12 | Execute basic OS commands in Windows and Linux – Use commands like dir, copy, ipconfig in Windows and ls, cp, ifconfig in Linux. |
| 13 | Monitor system performance using Task Manager – Analyze CPU, RAM, and disk usage to identify performance bottlenecks. |
| 14 | Troubleshoot RAM and storage device issues – Use diagnostic tools to test RAM and check storage devices for errors and bad sectors. |
| 15 | Set up Wi-Fi and troubleshoot internet connectivity – Configure Wi-Fi settings, diagnose network issues, and check router configurations. |

a. **Course Name:** Basic Electronics
b. **Course Code:** 03061801ES01
c. **Prerequisite:** Knowledge of Basic science and physics.
d. **Rationale:** Basic Electrical Engineering knowledge is fundamental as it provides a strong foundation for various engineering disciplines, promotes problem-solving skills, supports innovation, and opens doors to diverse career opportunities.

**e. Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | To develop understanding of basic electronic components, signals and their role in electronic circuits. |
| **CLOBJ 2** | To explain the working and applications of semiconductor devices such as PN junction diodes, rectifiers and filters. |
| **CLOBJ 3** | To study the operation and characteristics of transistors and apply them in amplifier and switching circuits. |
| **CLOBJ 4** | To build fundamental knowledge of digital electronics including number systems, logic gates and combinational circuits. |
| **CLOBJ 5** | To familiarize students with different cables, connectors and electronic measuring instruments used in practical applications. |

**f. Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Identify basic electronic components, including active and passive components and different types of signals |
| **CLO 2** | Explain the properties of semiconductors, PN junction diodes and their applications in rectifiers and filters. |
| **CLO 3** | Design and implement transistor-based amplifier and switching circuits using appropriate biasing techniques |
| **CLO 4** | Analyse and simplify digital logic circuits using Boolean algebra, number systems and combinational logic design techniques. |
| **CLO 5** | Classify different types of cables, connectors and measuring instruments based on their construction and applications. |

**g. Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | | **Examination Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lecture Hrs/Week** | **Tutorial Hrs/Week** | **Lab Hrs/Week** | **Seminar Hrs/Week** | **Credit** | **Internal Marks** | | | **External Marks** | | |
| | | | | | **T** | **CE** | **P** | **T** | **P** | |
| 3 | 0 | 2 | 0 | 4 | 20 | 20 | 50 | 60 | - | 150 |

SEE - Semester End Examination, T - Theory, P – Practical

h. **Course Content:**

| Sr. No. | Content | W | T |
|---|---|---|---|
| **1** | **Basic Electronic Components**<br>Introduction to electronics, active and passive components explanation with example, Active components: voltage source, current source, Signal Processing components. Passive components: Resistors: Concept of resistors, Capacitors: Concept of capacitor, Inductors: Concept of Inductor. Types of Signals: Periodic signal & non periodic signal with example. | 15 | 07 |
| 2 | **Semiconductor Components and its application**<br>Review of basic atomic structure and energy levels, concept of insulators, conductors and semiconductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds, Concept of intrinsic and extrinsic semiconductor, Process of doping, P and N type semiconductors, PN junction diode, forward and reverse biased PN junction, V-I characteristics of P-N junction diode, Zener diode, Application of diode as half-wave, full wave and bridge rectifiers. C, L, LC, π filters. | 22 | 10 |
| **3** | **Transistor and amplifiers**<br>Introduction of Transistor, PNP and NPN transistors. Working of Transistor, Transistor configuration & Characteristics. Biasing methods of Transistor. Relation between current gain, alpha and beta. CE Transistor as Amplifier, Transistor as switch. | 20 | 08 |
| **4** | **Digital logic and circuits Number System:**<br>Decimal number, binary number, octal and Hexadecimal number and Conversion: Binary, Octal, Decimal and Hexadecimal number systems. Perform binary arithmetic operations: Binary addition, subtraction. Complements: 1's, 2's, 9's and 10's complement. Symbol, operation and truth-table: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR. Universal gates. Laws and theorems of Boolean algebra. Combinational logic Circuit: Half Adder, Full Adder, Half subtractor, Full subtractor, Multiplexer (2 to 1, 4 to 1), Demultiplexer (1 to 2, 1 to 4). | 30 | 14 |
| **5** | **Cable, connectors and Measuring Instruments**<br>Analog and Digital display. Cables: coaxial cable, twisted pair cable and fiber optic cable. Connectors: coaxial cable connectors, RJ45, RS-232, HDMI connectors. Multimeters: Analog and digital multimeter. CRO: front panel controls and application. | **13** | **6** |

**i. Text Book and Reference Book:**


1. Principles of Electronics, by V.K. Mehta ,S. Chand and Company.
2. Digital Electronics By Anand Kumar
3. Electronics devices and circuits by J.B.Gupta , S.K.kataria & Sons, 2013
4. Basic Electronics and Linear Circuits By N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta, | McGraw Hill Education


**j. Experiment List:**

| Sr. NO. | Experiment List |
|---|---|
| **1.** | To identify and understand the characteristics of passive components. |
| **2.** | Perform the V-I Characteristics of PN Junction Diode. |
| **3.** | Measure voltage and frequency of any given signal using oscilloscope. |
| **4.** | Test performance of Half-wave rectifier using CRO. |
| **5.** | Test performance of full wave and bridge rectifier using CRO. |
| **6.** | Test the performance of V-I characteristics of Zener diode. |
| **7.** | Perform the characteristics of CE NPN Transistor. |
| **8.** | Realize the basic logic gates. |
| **9.** | Realize the NAND gate as a universal building block. |
| **10.** | Realize the NOR gate as a universal building block. |
| **11.** | Design and implement Half Adder and full adder circuit. |
| **12.** | Design and implement Half Subtractor and full Subtractor circuit. |
| **13.** | Realize Multiplexer and Demultiplexer circuit. |
| **14.** | Identify various cables and connectors & draw their diagram. |

a. **Course Name:** Fundamentals of Communication Skills
b. **Course Code:** 03060001HM01
c. **Prerequisite:** Knowledge of English Language till 10th standard.
d. **Rationale:** Basic Communication Skills are essential for all Engineers.

e. **Course Learning Objectives:**

| | |
|---|---|
| **CLOBJ 1** | Develop basic interpersonal communication skills through effective listening, structured self and peer introductions, ice-breaker activities, and role plays in everyday contexts. |
| **CLOBJ 2** | Understand and apply fundamental grammatical structures including parts of speech, tenses, and voice for accurate sentence construction. |
| **CLOBJ 3** | Enhance pronunciation and vocabulary usage through basic phonetics, IPA symbols, one-word substitutions, synonyms, antonyms, and contextual application. |
| **CLOBJ 4** | Develop reading and writing skills by applying reading strategies and constructing coherent narratives, picture-based descriptions, and functional written texts such as applications. |
| **CLOBJ 5** | Improve personal and academic development through goal-setting using SMARTER principles and reflective language use. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Remember and identify correct pronunciation patterns using basic phonetic symbols, and recall appropriate vocabulary—including one-word substitutions, synonyms, and antonyms—for accurate spoken and written communication. |
| **CLO 2** | Understand written texts using basic reading strategies and explain the concept of SMARTER goals for personal and academic development. |
| **CLO 3** | Demonstrate understanding of basic interpersonal communication skills through effective listening, structured self and peer introductions, ice-breaker activities, and simple role-plays in everyday contexts. |
| **CLO 4** | Apply fundamental grammatical structures including parts of speech, basic tenses, articles and determiners to construct grammatically correct sentences. |
| **CLO 5** | Analyse and organize information to produce coherent written texts such as short narratives, and formal or informal applications. |

g. **Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | **Evaluation Scheme** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **L** | **Tut** | **Lab** | **C** | **Internal Evaluation** | | | **ESE** | | **Total** |
| | | | | **T** | **CE** | **P** | **Theory** | **P** | |
| **0** | **-** | **2** | **1** | **-** | **-** | **20** | **-** | **30** | **50** |

**L-** Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

**h. Course Content:**

| Sr. No. | Content | W | T |
|---|---|---|---|
| **1** | Ice Breaker + Introducing your Friend<br>•Fun Fact Exchange (e.g., Two Truths and a Lie) Describing Personality and Hobbies<br>•Using Adjectives to Talk About People (Link to Parts of Speech)<br>Structured Self and Peer Introduction (Name, Interests, Goals) | 8 | 2 |
| **2** | Parts of Speech & Tenses<br>•Identification of Parts of Speech in Simple Sentences<br>•Sentence Formation Using Basic Parts of Speech<br>•Concept of time and verb forms<br>Sentence Construction and Error Correction Using Tenses | 12 | 6 |
| **3** | Introduction to Phonetics - symbols and pronunciation<br>•Basics of Phonetics<br>•Introduction to IPA (International Phonetic Alphabet)<br>•English Vowel & Consonant Sounds<br>•Pronunciation Practice | 10 | 4 |
| **4** | Articles & Determiners<br>•Definite, Indefinite Articles and Zero Articles<br>•Demonstrative & Possessive Determiners<br>•Quantifiers & Numerals<br>Common errors of Articles & Determiners | 10 | 2 |
| **5** | Vocabulary Building : One-word Substitution,<br>Synonyms, and Antonyms<br>•List and Practice Common One-word Substitutions<br>•Synonym-Antonym Match-Up Games<br>Use New Words in Sentences/Short Paragraphs | 10 | 2 |
| 6 | Listening Skills<br>•Introduction and Importance of Good Listening<br>•Difference Between Listening and Hearing<br>•Types of listening<br>•Barriers to effective Listening<br>•Traits of a good listener | 8 | 2 |
| 7 | Types of Application<br>• Formal vs Informal Applications<br>• Structure and Format of an Application<br>(Salutation, Body, Closing)<br>•Writing Leave Applications | 10 | 2 |
| 8 | Role Play<br>• Generic Situations (Buying, Asking for Directions, At a Doctor, etc.)<br>• Customer Service and Complaint Handling | 12 | 6 |
| 9 | Goal Setting<br>• SMARTER Goals (Specific, Measurable, Achievable, Relevant, Time-bound, Evaluate, Revise)<br>• Short-term vs. Long-term Goals<br>• Overcoming Obstacles to Goals | 10 | 2 |

| | | | |
|---|---|---|---|
| 10 | Reading Skills – Basic Level<br>• Types of reading<br>• Strategies of reading<br>• Reading comprehension | 10 | 2 |
| | | 100 | 30 |

**i. Reference Books:**


1. Murphy, Raymond. English Grammar in Use. Cambridge University Press, 2019.
2. Mohan, Krishna, and Meera Banerji. Developing Communication Skills. Macmillan Publishers India, 2009.
3. Lewis, Norman. Word Power Made Easy. Goyal Publishers, 2014.
4. Rizvi, M. Ashraf. Soft Skills: Enhancing Employability and Career Development. McGraw Hill Education, 2010.
5. Wren, P. C., and H. Martin. High School English Grammar and Composition. S. Chand Publishing, 2017.

a. **Course Name:** Environmental Science
b. **Course Code:** 03061501MC01
c. **Prerequisite:** Basic knowledge of science (biology, chemistry, physics), environmental awareness, geography, data interpretation, and ethical responsibility towards sustainability.
d. **Rationale:** Sustainable development is essential for a nation's progress, making environmental conservation and hazard management crucial for every Indian citizen. The country has endured numerous natural disasters, and significant energy wastage remains a challenge. Saving energy is as valuable as producing it. Industrial mismanagement and lack of discipline have led to rising environmental pollution. Embracing renewable energy is a key solution to both the energy crisis and pollution control. This course aims to raise awareness of these pressing issues, inspiring students to act responsibly and contribute to a cleaner, more sustainable future for the country and the world.

e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | To introduce the fundamental concepts of ecological balance and the flow of energy/matter in nature. |
| **CLOBJ 2** | To provide knowledge on pollutants affecting the atmosphere and sound levels, and the legal framework for control. |
| **CLOBJ 3** | To examine the chemical/biological nature of water and soil contaminants and evaluate technical treatment solutions. |
| **CLOBJ 4** | To explore the mechanics and benefits of green energy technologies like solar, wind, and biomass. |
| **CLOBJ 5** | To categorize different waste streams and understand the "3R" principles (Reduce, Reuse, Recycle) for waste management. |
| **CLOBJ 6** | To impart an understanding of seismic risks and the protocols for managing natural and man-made disasters. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Explain ecosystem structure, biotic/abiotic components, food chains, webs, and cycles. |
| **CLO 2** | Identify sources, types, effects, and control of air and noise pollution, including regulations. |
| **CLO 3** | Analyse water and soil pollution sources, characteristics, treatment, and prevention. |
| **CLO 4** | Describe various renewable energy sources, working principles, and environmental impacts. |
| **CLO 5** | Classify solid waste types, management techniques, recycling, and disposal methods. |
| **CLO 6** | Explain seismic engineering principles and disaster management strategies. |

**g. Teaching & Examination Scheme:**

| Teaching Scheme | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Internal Evaluation | | | ESE | | Total |
| | | | | MSE | CE | P | Theory | P | |
| 1 | - | - | 0 | 20 | 20 | - | - | - | 40 |

**L-** Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,**CE**- Continuous Evaluation, **ESE-** End Semester Examination

**h. Course Content:**

| Sr. No. | Content | W | T |
|---|---|---|---|
| 1 | **Ecosystem**<br>Structure of ecosystem, Biotic & Abiotic components, Food chain and food web Carbon, Nitrogen, Sulphur, Phosphorus cycle. | 10 | 2 |
| 2 | **Air and Noise Pollution** Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler). Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator). Gaseous Pollution Control: Absorber, Catalytic Converter, and Effects of air pollution due to Refrigerants, I.C., Boiler, Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000. | 25 | 3 |
| 3 | **Water and Soil Pollution**<br>Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation. Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis), Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste. | 25 | 3 |
| 4 | **Renewable Sources of Energy**<br>Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy. | 10 | 2 |
| 5 | **Solid Waste Management**<br>Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste. | 5 | 2 |

**i. Text Book and Reference Book:**


1. "Principles of Solar Engineering" By Yogi Goswami D., Frank Kreith, Jan F. Kreider | Taylor & Francis, 2003 | Second.
2. "Environmental Studies" By M.P. Poonia, S.C. Sharma | Khanna Publishing House, NewDelhi | 2017.
3. "Renewable Energy Sources" By Twidell J.W. and Weir. A | EFN Spon Ltd"Linear Systems and Signals" by B.P. Lathi.
4. "Environmental Sciences", By Daniel B Botkin & Edward A Keller, | John Wiley & Sons
5. "Air Pollution", By M. N. Rao and H. V. N. Rao | Tata McGraw-Hill Publishing Company
6. "Environmental Pollution Control Engineering", By Rao C.S | 2nd edition
7. "Solid Waste Treatment and Disposal", By G. Tchabanoglous | McGraw Hill Pub.

a. **Course Name:** E-Waste Management
b. **Course Code:** 03061802UE01
c. **Prerequisite:** Basic understanding of environmental science and general waste management concepts is recommended for this subject
d. **Rationale:** E-waste management is critical for environmental sustainability and public health. With the increasing consumption of electronic devices, understanding the impact of e-waste and implementing proper disposal and recycling methods is essential. This subject equips students with the knowledge to contribute to sustainable e-waste management practices, ensuring minimal harm to the environment and human health

**e. Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | To explain the fundamental characteristics of electronic waste and the critical necessity for systematic disposal practices. |
| **CLOBJ 2** | To examine specific instances of contamination and toxic exposure to determine the long-term effects on ecosystems and communities. |
| **CLOBJ 3** | To describe the technical lifecycle of e-waste, from gathering mechanisms to advanced material recovery technologies. |
| **CLOBJ 4** | To critically appraise the effectiveness of regulations like the E-Waste Rules 2016 and judge the responsibilities of producers and consumers. |
| **CLOBJ 5** | To investigate emerging green technologies and formulate strategies for a circular economy in the electronics industry. |

**f. Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the sources, types, and environmental significance of e-waste and the need for proper management. |
| **CLO 2** | Analyze the environmental and health impacts caused by improper e-waste disposal through case studies. |
| **CLO 3** | Explain the collection, dismantling, and recycling processes along with technological challenges. |
| **CLO 4** | Evaluate national and international e-waste policies, frameworks, and the roles of various stakeholders. |
| **CLO 5** | Explore innovations, sustainable practices, and the role of consumers in minimizing future impact. |

**g. Teaching & Examination Scheme:**

| Teaching Scheme | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Internal Evaluation | | | ESE | | Total |
| L | T | P | C | MSE | CE | P | Theory | P | |
| 3 | - | - | 3 | 20 | 20 | - | 60 | - | 100 |

**L-** Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation,**CE**- Continuous Evaluation, **ESE-** End Semester Examination

**h. Course Content:**

| Sr. No. | Content | W | T |
|---|---|---|---|
| 1 | **Introduction to E-Waste Management Overview of E-Waste:** Definition of e-waste and its components, Sources and types of e-waste: Consumer electronics, computers, mobile phones, etc. Importance of E-Waste Management: Environmental and health impacts of improper disposal of e-waste, Global statistics on e-waste production and recycling rates. E-Waste Disposal Methods: Common disposal practices and their environmental effects, The importance of recycling and proper disposal. Key Regulations and Policies for E-Waste: International regulations and agreements, Indian E Waste Management Rules and their implications. | 20 | 9 |
| 2 | **Environmental and Health Impacts of E-Waste** Environmental Impact of E-Waste: Contamination of soil, water, and air from hazardous substances, E-Waste dumping in landfills and illegal exports to developing countries. Health Risks from E-Waste: Exposure to toxic chemicals from e-waste and its effects on human health, Long-term consequences for workers and communities involved in e-waste recycling. Case Studies of E-Waste Disposal and Impact: Case studies of e-waste disposal in various countries and its effects, Local examples of e-waste impact in India. | 20 | 9 |
| 3 | **E-Waste Collection and Recycling Processes** E-Waste Collection Mechanisms: Methods for collecting e-waste from households, industries, and institutions, Role of take-back programs, collection centres, and awareness campaigns. E-Waste Recycling Techniques: Dismantling of electronic devices: Manual and automated methods, Extraction and recycling of valuable materials. E-Waste Recycling Technologies: Introduction to mechanical, chemical, and biological recycling technologies, Advanced recycling processes like shredding, thermal processes, and material recovery. Challenges in E-Waste Recycling: Technical and financial barriers in the e-waste recycling process, Lack of awareness, illegal recycling, and improper handling of toxic materials. | 20 | 9 |
| 4 | **E-Waste Management Strategies and Policies** E-Waste Management Framework: Understanding a circular economy model in relation to e-waste, Effective e waste management strategies. E-Waste Policy and Regulations: National and international policies regarding e waste, India's E-Waste Management Rules 2016 and Extended Producer Responsibility (EPR). Role of Stakeholders in E-Waste Management: Roles of government, industry, manufacturers, and consumers in managing e-waste, Importance of public-private partnerships and collaborations for sustainable e-waste management. | 20 | 9 |

| | | | |
|---|---|---|---|
| **5** | **Future of E-Waste Management and Sustainable Solutions**<br>Innovations in E-Waste Management: Emerging technologies for safer e-waste recycling, Development of eco-friendly alternatives to hazardous materials in electronics. Role of Consumers in E-Waste Management: Importance of consumer awareness in e-waste management (e.g., responsible disposal, repair, and reuse), Programs like take-back schemes and drop-off locations for consumers to recycle their electronics. The Future Outlook of E-Waste Management: Predictions for e-waste growth in the coming years and solutions to address this issue, the potential role of global collaboration and new technologies in reducing the environmental impact of e-waste. | **20** | **9** |

**i. Text Book and Reference Book:**


1. E-Waste Management: From Waste to Resource S. K. Agarwal
2. Environmental Impact of E-Waste Recycling R. K. Gupta
3. Handbook of E-Waste Management: From Waste to Resources B. D. Agrawal

**Semester 2**

a. **Course Name:** Problem Solving using C
b. **Course Code:** 03061602P C01
c. **Prerequisite:** Ability to read and understand programming documentation
d. **Rationale:** C is a powerful and efficient programming language that provides a solid foundation for learning other languages. It offers low-level memory access, making it ideal for system programming. C encourages structured programming, helping students write clear, maintainable code. It's portable across different platforms and widely used in fields like embedded systems, game development, and operating systems. Learning C enhances understanding of memory management and prepares students for diverse careers in software development.
e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understand the fundamentals of programming concepts, algorithms, flowcharts, and the structure of C programming language. |
| **CLOBJ 2** | Apply C language syntax, data types, operators, and input/output functions to develop simple programs. |
| **CLOBJ 3** | Develop problem-solving skills using decision-making statements, looping constructs, functions, arrays, and strings in C. |
| **CLOBJ 4** | Demonstrate the use of structures, unions, pointers, and dynamic memory allocation for efficient data handling. |
| **CLOBJ 5** | Implement file handling operations and command-line arguments to create efficient and real-world C programming applications. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the fundamentals and importance of innovation and design thinking in problem-solving. |
| **CLO 2** | Develop the ability to identify user needs and define real-world problems effectively. |
| **CLO 3** | Apply creative thinking techniques to generate innovative ideas and solutions. |
| **CLO 4** | Design and develop prototypes using the stages of the design thinking process. |
| **CLO 5** | Analyse and evaluate innovative solutions for educational, social, and industrial applications. |

g. **Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | | **Examination Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lecture Hrs/ Week** | **Tutorial Hrs/ Week** | **Lab Hrs/ Week** | **Hrs/ Week** | **Credit** | **Internal Marks** | | | **External Marks** | | |
| | | | | | **T** | **CE** | **P** | **T** | **P** | |
| 3 | - | 4 | - | 5 | 20 | 20 | 100 | 60 | - | 200 |

**SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

**h.** Course Contents:

| Sr. | Topics | W | T |
|---|---|---|---|
| 1 | **INTRODUCTION TO C PROGRAMMING LANGUAGE -** Overview of programming, Understanding Algorithms and Flowcharts, History C programming language , Features of C , Structure of a C program, Compilation and execution process , Applications of C | 11 | 5 |
| 2 | **C FUNDAMENTALS, INPUT/OUTPUT AND OPERATORS** - Constants, Variables, Identifiers, Keywords, Data types , Storage classes, Unformatted and formatted input/output functions ,Arithmetic, Relational, Logical, Assignment, and Special operators, Increment/Decrement and Bitwise operators, Associativity and precedence of operators | 16 | 7 |
| 3 | **CONTROL STRUCTURES-DECISION MAKING AND LOOPING-** Conditional statements: if, if-else, if-else-if, and switch-case, continue, goto, break, Looping statements: for, while, do-while, Nested loops, Jumping inside loops: break, continue | 18 | 8 |
| 4 | **FUNCTIONS,ARRAYS AND STRINGS** - Overview Functions , Defining and declaring functions, standard library and user-defined, ,Nesting functions and recursion ,Parameter passing methods , Arrays, Array initialization and accessing element, Single-dimensional arrays ,Multi-dimensional arrays ,Array operations, Strings ,String handling functions ,String manipulation operations ,Dynamic memory allocation for strings. | 22 | 10 |
| 5 | **STRUCTURE, UNION AND POINTERS** - Defining structures and unions, accessing structure members, Structures and arrays, Pointers to structures, differences between structures and unions, Introduction to Pointers, Declaring and Initializing Pointers , Pointer operations , Pointers and arrays, Dynamic memory allocation . | 22 | 10 |
| 6 | **FILE MANAGEMENT** - Introduction to Files in C, File Operations, File Input/output Functions, Command-line arguments | 11 | 5 |

**i. Text Book and Reference Book:**

1. C Programming Language, Brian W. Kernighan and Dennis M. Ritchie
2. Let Us C Yashavant P. Kanetkar
3. Programming in C , by Stephen G. Kochan
4. ANSI C Programming,, Balaguru samy

**j. List Of Experiments:**

| Sr. No. | Experiment List |
|---|---|
| 1. | Write a simple program that displays "Hello, World!" on the screen. |
| 2. | Write a program to input two numbers and display their sum. |

| | |
|---|---|
| **3.** | Write a program to implement a simple calculator that performs addition, subtraction, multiplication, and division using arithmetic operators. |
| **4.** | Write a program that takes two numbers as input and outputs the largest number using if-else. |
| **5.** | Write a program to determine if the given input is even or odd using the modulo operator %. |
| **6.** | Write a program to convert temperature from Celsius to Fahrenheit. |
| **7.** | Write a program to calculate the factorial of a number using a for loop. |
| **8.** | Write a program to calculate the sum of the first n natural numbers using a while loop. |
| **9.** | Write a program to calculate simple interest: SI = (P * R * T) / 100 using arithmetic operators. |
| **10.** | Write a program to reverse a number using a while loop. |
| **11.** | Write a program to count the number of digits in a given number using a loop. |
| **12.** | Write a program that prints the multiplication table for a given number using a for loop. |
| **13.** | Write a program to reverse a string without using built-in functions. |
| **14.** | Write a program to concatenate two strings entered by the user using string operations. |
| **15.** | Write a program to find the length of a string without using the built-in strlen() function. |
| **16.** | Write a program to create a structure for a student's roll number and name, then display the records. |
| **17.** | Write a simple calculator program to perform addition, subtraction, multiplication, and division using the switch-case operator. |
| **18.** | Write a program to perform insertion operation in a 1D array. |
| **19.** | Write a program to check if a number is prime using loops. |
| **20.** | Write a program to find the largest element in an array. |
| **21.** | Write a program to perform merging operation in a 1D array. |
| **22.** | Write programs to demonstrate the use of common math functions like sqrt(), pow(), round(), sin(), cos(), tan(), div(), abs(). |
| **23.** | Write a program that swaps two numbers using a temporary variable and functions. |
| **24.** | Write programs to demonstrate the use of pointers. |
| **25.** | Write a program to check whether a given year is a leap year or not. |
| **26.** | Write a program to display the result of student with following details using if-else if conditional structure:<br>Student_name, three subjects marks, conditions for percentage (>=75% =distinction, >=60 and <75 = first class, <60 and >=50 = Second class and below 50 Fail) |
| **27.** | Write a program that writes data to a text file and reads it back to display on the screen using file handling operations. |
| **28.** | Write a Program for following pattern:<br>*<br>* *<br>* * *<br>* * * *<br>* * * * * |
| **29.** | Write a program to find the GCD (Greatest Common Divisor) of two numbers using recursion. |
| **30.** | Write a program to check whether a given string is a palindrome or not. |

**a. Course Name:** Mathematics II

**b. Course Code:** 03069102BS01

**c. Prerequisite:** Knowledge of Basic concept of mathematics studied till first semester.

**d. Rationale:** This course is an extension of the course Mathematics-I of first semester namely Mathematics II. Using the methods of differentiation, integration, differential equations, matrix theory, geometry, and differential equations, the course aims to instill its applications in pertinent engineering and technological fields.

**e. Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understand the concept of determinant and matrix with examples |
| **CLOBJ 2** | Analyze engineering related problems based on concepts of vectors with examples |
| **CLOBJ 3** | Understand basic engineering problems under given conditions of straight lines and circle. |
| **CLOBJ 4** | Understand the concept of functions and limits with examples |
| **CLOBJ 5** | Understand differential equations to significant applied problems. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Solve engineering related problems based on determinant and matrices. |
| **CLO 2** | Solve engineering related problems based on concepts of vectors with examples |
| **CLO 3** | Analyze basic engineering problems under given conditions of straight lines and circle |
| **CLO 4** | Apply integral calculus to engineering related problems |
| **CLO 5** | Obtain solution of differential equations to significant applied problems |

**g. Teaching and Examination Scheme :**

| **Teaching Scheme** | | | | **Examination Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **Internal Evaluation** | | | **ESE** | | |
| **L** | **T** | **L** | **C** | **MSE** | **CE** | **P** | **T** | **P** | |
| 3 | 1 | 0 | 4 | 20 | 20 | - | 60 | - | 100 |

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

**h. Course Content :**

| **Sr.** | **Topics** | W | T |
|---|---|---|---|
| **1** | **Determinants and Matrices**<br>Elementary properties of determinants up to 3rd order, consistency of equations, Crammer's rule. Algebra of matrices, Inverse of a matrix, matrix inversion method to solve a system of linear equations in 3 variables. | **23** | **10** |
| **2** | **Vector Algebra**<br>Definition notation and rectangular resolution of a vector. Addition and subtraction of vectors. Scalar and vector products of 2 vectors. Simple problems related to work, moment and angular velocity. | **20** | **9** |

| | | | |
|---|---|---|---|
| **3** | **Co-Ordinate Geometry**<br>Straight line Inclination and slope of a line, different forms of equations to a straight line, Slope-intercept form, Point slope form ,Two-point form , Intercept form. General equation of a Straight line, Family of lines. Conditions for concurrency of lines. Circle Definition, Equation of a circle with given center and radius, General form of equation of circle, Equation of a circle when intercepts are given, circle passing through three points, Equation of chord, Equations of tangents and normal at a point on a circle | **17** | **8** |
| **4** | **Integral Calculus**<br>Integration as inverse operation of differentiation, Integration of simple functions, Integration by substitution, by parts and by partial fractions (for linear factors only). Definite integral: Definition, Properties of Definite integral, Odd and Even functions, Use of formulas, and for solving problems Where m and n are positive integers.<br>Applications of integration for i. Simple problem on evaluation of area bounded by a curve and axes. ii. Calculation of Volume of a solid formed by revolution of an area about axes. (Simple problems) | **23** | **10** |
| **5** | **Differential Equations**<br>Solution of first order and first degree differential equation by variable separation method (simple problems), Exact differential equations (simple problems), Linear differential equations (simple problems), MATLAB – Simple Introduction. | **17** | **8** |

i. **Text Book and Reference Book:**


1. Advanced Mathematics for Polytechnic, By Pandya N R | Macmillan Publishers India Ltd.,2012
2. Mathematics-I, By Deepak Singh | Khanna Book Publishing Co
3. Mathematics II, By Garima Singh | Khanna Book Publishing Co.
4. A text book of Engineering Mathematics,By N.P. Bali and Manish Goyal | Laxmi Publications
5. Polytechnic Mathematics, By S P Deshpande | Pune Vidyarthi Gruh Prakashan
6. Applied Mathematics, By H.K.Das | S.Chand Publication
7. Calculus and Analytic Geometry, By G. B. Thomas, R. L. Finney | Addison Wesley | 9th Edition
8. Engineering Mathematics(Third edition),By Croft, Anthony | Pearson Education, New Delhi
9. Advanced Engineering Mathematics (9th Edition),By Erwin Kreyszig, Wiley India

a. **Course Name:** Basic Physics
b. **Course Code:** 03069202BS01
c. **Prerequisite:** Knowledge of Physics, Chemistry and Mathematics up to 12th science level and Biology up to 10th science level
d. **Rationale:** Applied Physics aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content. The course will help the diploma engineers to apply the basic concepts and principles to solve broad-based engineering problems and to understand different technology-based applications.
e. **Course Learning Objective**

| | |
|---|---|
| **CLOBJ 1** | Develop understanding of fundamental physics concepts including measurements, electricity, magnetism, semiconductors, and modern physics relevant to engineering applications. |
| **CLOBJ 2** | Apply principles of electrical and electronic physics to analyze basic circuits, semiconductor devices, and electromagnetic systems used in information technology and engineering fields. |
| **CLOBJ 3** | Build scientific and analytical skills through practical experiments, measurements, error analysis, and interpretation of physical phenomena for technological problem solving. |
| **CLOBJ 4** | Understand the working principles and applications of modern technologies such as lasers, optical fibers, solar cells, and nanotechnology used in communication and electronic systems. |
| **CLOBJ 5** | Develop competency in conducting physics laboratory experiments, interpreting observations, and presenting results systematically using scientific methods and engineering practices. |

**f. Course Learning Outcomes**

| | |
|---|---|
| **CLO 1** | Apply concepts of units, measurements, and error analysis to perform accurate physical measurements and validate results using dimensional analysis. |
| **CLO 2** | Analyze basic electric and magnetic phenomena, including electrostatics, current electricity, and electromagnetic induction, and solve related numerical problems. |
| **CLO 3** | Interpret the characteristics and functioning of semiconductor devices such as diodes and transistors, and apply them in basic electronic circuits. |
| **CLO 4** | Explain the working principles and applications of modern physics tools including lasers, optical fibers, and nanotechnology-based devices. |
| **CLO 5** | Demonstrate the ability to relate theoretical physics concepts to practical engineering applications across electrical, electronics, and communication fields. |

g. **Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | **Evaluation Scheme** | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **Internal Evaluation** | | | **ESE** | | |
| **L** | **T** | **P** | **C** | **MSE** | **CE** | **P** | **Theory** | **P** | |
| 3 | 0 | 2 | 4 | 20 | 20 | 50 | 60 | - | 150 |

**L**- Lectures; **T**- Tutorial; **P**- Practical; **C**- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

**h. Course Content:**

| Sr. | Topics | W | T |
|---|---|---|---|
| 1 | **Physical world, Units and Measurements**<br>Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units),Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures. | **15** | **8** |
| 2 | **Electrostatics Current Electricity**<br>Coulombs law, unit of charge, Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference, Gauss law. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down. Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and color coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electro motive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy. | **25** | **10** |
| 3 | **Electromagnetism and Magnetic materials**<br>Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter. | **20** | **8** |
| 4 | **Semiconductor Physics**<br>Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (center taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications | **20** | **10** |
| 5 | **Modern Physics**<br>Lasers: Energy levels, ionization and excitation potentials; spontaneous and stimulated emission; population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers. Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors. Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties | **20** | **9** |

| | | | |
|---|---|---|---|
| | at nanoscale, nanotechnology, and nanotechnology-based devices and applications. | | |

**i. Text Book and Reference Book:**

1. Comprehensive Practical Physics - Volume I and II, By by IN Jaiswal | Laxmi Publishers
2. Text Book of Physics for Class XI& XII (Part-I, Part-II), By N.C.E.R.T., Delhi

**j. List of Practical**

| Sr. No. | Experiment List |
|---|---|
| **1.** | To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object. |
| **2.** | To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge. |
| **3.** | To verify Ohm's law by plotting graph between current and potential difference. |
| **4.** | To verify laws of resistances in series and parallel combination. |
| **5.** | To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage. |
| **6.** | To verify Kirchhoff's law using electric circuits. |
| **7.** | To determine A.C. frequency with the help of sonometer. |
| **8.** | To calculate SA/V ratio of simple objects to understand nanotechnology. |

a. **Course Name:** Web Design & Development
b. **Course Code:** 03061602ES01
c. **Prerequisite:** Basic Computer Knowledge
d. **Rationale:** The objective of this course is to provide students with foundational knowledge in web development. This course covers essential topics such as G-Suite tools, basic hardware understanding, and fundamental web technologies like HTML and CSS. By the end of the course, students will be equipped with the skills to create and manage basic web applications and understand the underlying hardware.
e. **Course Learning Objective**

| | |
|---|---|
| **CLOBJ 1** | Understand the fundamentals of web development, including web technologies, web browsers, client-server architecture, domains, hosting, DNS, and the role of front-end and back-end technologies in web applications. |
| **CLOBJ 2** | Learn and implement the structure of HTML documents, commonly used HTML tags, hyperlinks, multimedia integration, and form creation with validation techniques. |
| **CLOBJ 3** | Develop knowledge of advanced HTML5 features such as semantic elements, audio, video, canvas, SVG, accessibility standards, and best practices for designing structured web pages. |
| **CLOBJ 4** | Apply CSS concepts including selectors, box model, positioning, Flexbox, Grid system, and media queries for creating responsive and visually appealing web pages. |
| **CLOBJ 5** | Understand the Bootstrap framework, its features, layout system, typography, buttons, forms, and responsive design techniques for efficient web interface development. |

f. **Course Learning Outcomes**

| | |
|---|---|
| **CLO 1** | Explain the fundamentals of web development, client-server architecture, and web technologies used in modern web applications. |
| **CLO 2** | Create structured web pages using HTML elements, forms, hyperlinks, and multimedia components. |
| **CLO 3** | Develop web pages using advanced HTML5 features and apply accessibility and best design practices. |
| **CLO 4** | Design responsive and visually effective web interfaces using CSS concepts such as Flexbox, Grid, positioning, and media queries. |
| **CLO 5** | Build responsive and user-friendly web applications using Bootstrap components, layouts, typography, and form controls. |

**g.** Teaching and Examination Scheme

| Teaching Scheme | | | | | Examination Scheme | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Lecture Hrs/Week | Tutorial Hrs/Week | Lab Hrs/Week | Hrs/Week | Credit | Internal Marks | | | External Marks | | |
| | | | | | T | CE | P | T | P | |
| 3 | - | 4 | - | 5 | 20 | 20 | 100 | 60 | - | 200 |

**SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

**h. Course Content:**

| Sr. | Topics | W | T |
|---|---|---|---|
| 1 | **INTRODUCTION TO WEB DEVELOPMENT**<br>Overview of web technologies, Understanding web browsers and their functions, Client-server architecture and request-response cycle, Introduction to domains, hosting, and DNS, Role of front-end and back-end in web applications | 18 | 8 |
| 2 | **BASICS OF HTML**<br>Structure of an HTML document, Common HTML tags, Creating forms: input types, labels, and validation, Hyperlinks and navigation between pages, Embedding multimedia. | 18 | 8 |
| 3 | **ADVANCED HTML**<br>New HTML5 elements (semantic elements, audio, video, canvas, SVG), Enhanced form elements and input types, Accessibility in HTML,Best practices for structuring web pages | 22 | 10 |
| 4 | **CSS BASICS**<br>Introduction to CSS and its role in styling HTML,CSS syntax: selectors, properties, and values, Box model: margin, padding, border, and content, Flexbox and Grid for responsive layouts, CSS positioning: static, relative, absolute, fixed, Media queries for responsive web design | 22 | 10 |
| 5 | **BASICS OF BOOTSTRAP**<br>Introduction of Bootstrap, Features of Bootstrap, Applications of Bootstrap, Bootstrap Layout, Installation Methods (CDN, Download, npm), Bootstrap Grid system, Typography, Bootstrap Button and Form controls | 20 | 9 |

**i. Text Book and Reference Book**


1. HTML & CSS: Design and Build Websites – Jon Duckett
2. Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics – Jennifer Niederst Robbins
3. Beginning CSS: Cascading Style Sheets for Web Design -Ian Pouncey, Richard York
4. Mastering Bootstrap 5 – Hugh Howey

**j.** List of Experiment

| Sr. No. | Experiment List |
|---|---|
| **1.** | Study of webpage using browser Developer Tools (Chrome/Firefox). |
| **2.** | Simulate an HTTP request using Postman (GET, POST, PUT, DELETE) |
| **3.** | Create a simple webpage with headings, paragraphs, and lists. |
| **4.** | Add an image and a hyperlink to another web page. |
| **5.** | Design a basic contact form with text inputs, radio buttons, checkboxes, and a submit button. |
| **6.** | Design the webpage of student data (name, roll number, address) using HTML table. |
| **7.** | Embed a video and an audio file in a webpage. |
| **8.** | Link multiple webpages together using a navigation menu. |
| **9.** | Apply colors, fonts, and background styles using CSS. |
| **10.** | Use margins, padding, and borders to style webpage elements. |
| **11.** | Create a responsive layout using Flexbox. |
| **12.** | Create a webpage with different types of buttons and style them using CSS. |
| **13.** | Design a login form with username and password fields. |
| **14.** | Implement hover effects using CSS. |
| **15.** | Use CSS Grid to create a webpage layout with a header, sidebar, and footer. |
| **16.** | Install Bootstrap using different methods. |
| **17.** | Create a simple webpage with Bootstrap components. |
| **18.** | Create a responsive layout using the Bootstrap grid system. |
| **19.** | Create a responsive contact form. |
| **20.** | Apply Bootstrap typography classes for better text styling. |
| **21.** | Create stylized buttons using Bootstrap. |
| **22.** | Create and style a form using Bootstrap’s form controls |
| **23.** | Design a navigation bar using Bootstrap. |
| **24.** | Create a webpage using CSS animations and transitions. |
| **25.** | Implement a responsive webpage using media queries. |
| **26.** | Designing with cascading style sheet-Internal style sheet |
| **27.** | Designing with cascading style sheet-External style sheet |

a. **Course Name:** Verbal Ability

b. **Course Code:** 03060002HM01

c. **Prerequisite:** Knowledge of Fundamentals of Communication Skills.

d. **Rationale:** Practical language proficiency and essential soft skills for academic and professional success.

e. **Course Learning Objectives:**

| | |
|---|---|
| **CLOBJ 1** | Develop effective listening and speaking skills by understanding listening processes, overcoming barriers, and applying basic public speaking techniques. |
| **CLOBJ 2** | Strengthen grammatical accuracy by applying rules of subject–verb agreement, direct–indirect speech and active passive voice in spoken and written communication. |
| **CLOBJ 3** | Expand advanced vocabulary knowledge including homophones, homonyms, homographs, phrasal verbs, and idioms for contextual and practical usage. |
| **CLOBJ 4** | Enhance analytical and creative thinking skills through activities such as SWOT analysis, problem-solving exercises, and guided story writing. |
| **CLOBJ 5** | Apply professional written communication skills by producing well-structured letters, emails and presentations with appropriate tone and format. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the use of vocabulary including homonyms, idioms, and phrasal verbs in spoken and written communication. |
| **CLO 2** | Apply grammatical structures related to subject–verb agreement, direct– indirect speech and active passive voice in sentences and short texts. |
| **CLO 3** | Apply formal and informal letters, professional emails, and simple product presentations using appropriate structure, tone, and language conventions. |
| **CLO 4** | Analyse personal SWOT charts, simple problem-solving responses, and guided stories by organizing ideas logically. |
| **CLO 5** | Create a logical and grammatically correct oral or written narrative based on a given picture, organizing ideas clearly and coherently. |

g. **Teaching & Examination Scheme:**

| **Teaching Scheme** | | | | **Evaluation Scheme** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **L** | **Tut** | **Lab** | **C** | **Internal Evaluation** | | | **ESE** | | **Total** |
| | | | | **T** | **CE** | **P** | **Theory** | **P** | |
| **1** | **-** | **2** | **2** | **40** | **-** | **20** | **60** | **30** | **150** |

**L**- Lectures; **T**- Tutorial; **P**- Practical; **C**- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

**h. Course Content:**

| Sr. No. | Content | W | T |
|---|---|---|---|
| 1 | **Active – Passive Voice**<br>• Rules of Active and Passive<br>• Structures of Passive Voice<br>• Conversion from Active to Passive and Vice Versa | 10 | 1 |
| 2 | **Crazy Scientist**<br>• Invent a product<br>• Presentation of a product | 10 | 1 |
| 3 | **Vocabulary Building: Homophones,Homonyms, Homographs, Phrasal Verbs &Idioms**<br>• Homophones and Their Confusing Pairs<br>• Homographs and Contextual Meaning<br>• Homonyms: Words with Multiple Meanings<br>• Common Phrasal Verbs in Conversation<br>Popular Idioms and Their Real-Life Application | 12 | 2 |
| 4 | **Subject–Verb Agreement**<br>• Basic Rules and Exceptions<br>• Spot the Error & Correction Exercises | 10 | 2 |
| 5 | **SWOT Analysis**<br>• Introduction to SWOT<br>• Creating a Personal SWOT Chart<br>• Applying SWOT for Goal Setting | 8 | 1 |
| 6 | **Letter Writing & E-mail Writing**<br>• Formal vs Informal Letter Format<br>• Structure of a Professional Email<br>• (Subject, Greeting, Body, Sign-off)<br>• Tone and Language Appropriateness<br>Common Mistakes in Letters/Emails | 12 | 2 |
| 7 | **Direct-Indirect Speech**<br>• Rules for Changing Tenses, Pronouns, and Time Expressions<br>• Reporting Statements, Questions, Commands, and Requests<br>• Reporting Modal Verbs | 8 | 2 |
| 8 | **Picture Perception**<br>• Sequencing ideas – Beginning-Middle - End<br>• Description<br>Creating short narratives based on Pictures | 8 | 1 |
| 9 | **Story Writing Using Hints**<br>• Elements of a Story (Characters, Setting, Plot, Conflict, Resolution | 10 | 1 |

| | | | |
|---|---|---|---|
| | Types of Stories (Narrative, descriptive, imaginative, moral-based, fables) | | |
| **10** | **Self-Introduction**<br>• Overcoming Stage Fear and Speaking Anxiety<br>• Voice Modulation and Pronunciation Tips<br>• Organizing Thoughts Before Speaking<br>• Basic Public Speaking Formats<br>(Self-Intro, Small Speeches) | 12 | 2 |
| | | 100 | 15 |

**i. Text Book and Reference Book**


1. Murphy, Raymond. English Grammar in Use. Cambridge University Press, 2019.
2. Aggarwal, R. S. A Modern Approach to Logical Reasoning. S. Chand Publishing, 2018.
3. Lewis, Norman. Word Power Made Easy. Goyal Publishers, 2014.
4. Maxwell, John C. Developing the Leader within You. Thomas Nelson, 2013.
5. Cambridge Listening and Speaking Skills Series (B1–B2 Level).
6. Cambridge University Press, various editions, 2017–2020.
7. Covey, Stephen R. *The 7 Habits of Highly Effective People*. Simon & Schuster, 2020.


**j. List Of Experiments**

| Sr. No. | Experiment List |
|---|---|
| 1 | Active – Passive Voice<br>• Identifying active and passive sentences from audio clips Oral transformation drills(Active → Passive, Passive → Active)<br>• Pair activity: One student speaks in active, partner converts to passive |
| 2 | Crazy Scientist<br>• Presentation of a product |
| 3 | Vocabulary Building: Homophones,Homonyms, Homographs, Phrasal Verbs & Idioms<br>• Matching words with correct meanings<br>• Fill-in-the-blanks exercises<br>• Sentence construction using homophones<br>• Dialogue creation using phrasal verbs<br>• Error correction exercises |
| 4 | Subject–Verb Agreement<br>• Error spotting exercises<br>• Creating sentences using tricky subjects<br>• Fill-in-the-blanks practice |
| 5 | SWOT Analysis<br>• SWOT Presentation by students<br>• Action plan preparation based on SWOT |

| | |
|---|---|
| | • Peer feedback session |
| 6 | Letter Writing & E-mail Writing<br>• Letter & E-mail writing practice<br>• Peer review activity<br>• Editing poorly written letter & Emails<br>• Writing reply emails |
| 7 | Direct-Indirect Speech<br>• Converting direct speech to Indirect speech exercises<br>• Dialogue transformation activity<br>• Error correction exercises |
| 8 | Picture Perception<br>• Visual Observation Practice<br>• Listing visible elements<br>• Identifying emotions and setting<br>• Formation and discussion of the story |
| 9 | Story Writing Using Hints<br>• Story presentation<br>• Twist ending activity<br>• Peer editing session |
| 10 | Self-Introduction – Practice<br>• Pronunciation practice<br>• Confidence building activity<br>• Fluency development |

a. **Course Name:** - Universal Human Values
b. **Course Code**03060002MC01
c. **Prerequisite:** Zeal to Learn the Subject.
d. **Rationale:** The Universal Human Values (UHV) course aims to develop a holistic understanding of life, fostering ethical behaviour, responsible decision-making, and harmonious living. It helps students align their personal and professional actions with core human values, ensuring happiness, well-being, and sustainable development in society.

e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | Understanding of the concept and significance of value education in achieving holistic human development. It focuses on building clarity about right understanding, relationships, and physical facilities while introducing self-exploration as a key process for value education. It also enables learners to analyse the ideas of continuous happiness and prosperity as basic human aspirations and to identify appropriate methods for fulfilling these aspirations in the present scenario. |
| **CLOBJ 2** | The human being as a co-existence of the self and the body. It emphasizes distinguishing between the needs of the self and the body and recognizing the body as an instrument of the self. The chapter further develops an understanding of harmony within the self and between the self and the body, along with practices to ensure self-regulation and maintain good health. |
| **CLOBJ 3** | Harmony in the family and society, considering the family as the basic unit of human interaction. It develops clarity about foundational values such as trust and respect in relationships and explores the concept of justice in human-to-human interactions. It also helps learners understand harmony at the societal level while encouraging the development of a vision for a universal human order based on values. |
| **CLOBJ 4** | Build an understanding of harmony in nature and existence by highlighting the interconnectedness and mutual fulfilment among the different orders of nature. It enables learners to realize existence as co-existence at all levels while developing a holistic perception of harmony in nature and the environment. |
| **CLOBJ 5** | Implications of holistic understanding in professional ethics. It helps learners understand the natural acceptance of human values and the definitiveness of ethical human conduct. The chapter also emphasizes the importance of humanistic education and constitution, analyzes professional ethics through case studies, and develops competence in value-based decision-making and ethical practices in professional life. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the importance of value education and develop clarity about human aspirations, self-exploration, and holistic development. |
| **CLO 2** | Comprehend the co-existence of self and body while developing harmony, self-regulation, and health awareness. |
| **CLO 3** | Understand values in relationships and develop harmony within family and society with a vision of universal human order. |

| | |
|---|---|
| **CLO 4** | Analyse interconnectedness in nature and develop a holistic understanding of harmony at all levels of existence. |
| **CLO 5** | Apply holistic understanding to professional ethics and develop competence in value-based decision-making in profession. |

**g. Teaching & Examination Scheme:**

| Teaching Scheme | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **L** | **T** | **P** | **C** | **Internal Evaluation** | | | **ESE** | | **Total** |
| | | | | **MSE** | **CE** | **P** | **Theory** | **P** | |
| 1 | 0 | 0 | 0 | 20 | 20 | 0 | 60 | 0 | 100 |

**L-** Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

**h. Course Content:**

| Unit No. | Topic | Weightage | Teaching Hrs. |
|---|---|---|---|
| 1. | **Introduction to Value Education**<br>Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations. | 20 | 03 |
| 2. | **Harmony in the Human Being**<br>Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health | 20 | 03 |
| 3. | **Harmony in the Family and Society**<br>Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to- Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order | 25 | 03 |
| 4. | **Harmony in the Nature/Existence**<br>Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. | 15 | 03 |
| 5. | **Implications of the Holistic Understanding – a Look at Professional Ethics** | 20 | 03 |

| | | | |
|---|---|---|---|
| | Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession | | |

**i. Text Book and Reference Book:**


1. Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers
3. The Story of My Experiments with Truth By M K Gandhi
4. Small is Beautiful By E. F Schumacher
5. Rediscovering Indi

a. **Course Name:** Introduction to Robotics and Automation

b. **Course Code:** 03061901UE01

c. **Prerequisite:** Introduction to Robotics and Automation requires basic understanding of physics, mathematics, and computer fundamentals. Familiarity with programming logic and mechanics enhances learning of robotic systems and automation concepts

d. **Rationale:** This course introduces diploma students to the exciting world of Robotics and Automation, which are revolutionizing industries by improving efficiency, precision, and safety. Students will gain fundamental knowledge about robotic systems, automation technologies, and their real-world applications in manufacturing and beyond. The course covers essential topics such as robot anatomy, types of robots, robotic sensors and actuators, basics of robot programming, and automation tools like PLCs (Programmable Logic Controllers). Students will also learn about automated material handling systems, robotic control systems, and how automation enhances productivity in industries.

e. **Course Learning Objective:**

| | |
|---|---|
| **CLOBJ 1** | To understand the fundamentals, history, laws, specifications, and importance of robotics and automation in industry and society. |
| **CLOBJ 2** | To study robot configurations, movements, degrees of freedom, kinematics, and motion planning concepts. |
| **CLOBJ 3** | To understand different robot drive systems, end effectors, control systems, and gripper design principles. |
| **CLOBJ 4** | To analyze and apply robot path planning techniques using joint space and Cartesian space methods. |
| **CLOBJ 5** | To study industrial and non-industrial applications of robots in various fields such as manufacturing, medical, agriculture, and unmanned systems. |

f. **Course Learning Outcomes:**

| | |
|---|---|
| **CLO 1** | Understand the basics of robotics and automation, including robot history, laws, specifications, types, and their impact on society and industry. |
| **CLO 2** | Identify robot configurations, movements, and degrees of freedom, and understand the basics of robot kinematics and motion planning. |
| **CLO 3** | Compare different robot drive systems and types of end effectors, and understand robot control types and gripper design principles. |
| **CLO 4** | Analyze and apply path planning techniques using joint space and Cartesian space methods for robot movement and positioning. |

| | |
|---|---|
| **CLO 5** | Describe various industrial and non-industrial applications of robots, including material handling, welding, medical, agricultural, and unmanned vehicle applications. |

**g. Teaching & Examination Scheme:**

| Teaching Scheme | | | | Evaluation Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| L | T | P | C | Internal Evaluation | | | ESE | | Total |
| | | | | MSE | CE | P | Theory | P | |
| 3 | 0 | 2 | 4 | 20 | 20 | 0 | 60 | - | 100 |

**L-** Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

| Sr. No. | Content | Weightage | Teaching Hours |
|---|---|---|---|
| **1** | Introduction to Robotics: Introduction to Robotics and Automation, Laws of Robotics, Brief History of Robotics, Basic Components of Robot, Robot Specifications, Classification of Robots, Human System and Robotics, Safety Measures in Robotics, Social Impact, Robotics Market and Future Prospects, Advantages and Disadvantages of Robots. | 20 | 10 |
| **2** | Robot Anatomy and Motion Analysis: Anatomy of a Robot, Robot Configurations: Polar, Cylrical, Cartesian and Jointed Arm Configurations, Robot Links and Joints, Degrees of Freedom and Types of Movements, Vertical, Radial and Rotational Traverse, Roll, Pitch and Yaw, Work Volume/Envelope, Introduction to Direct and Inverse Kinematics, Transformations and Rotation Matrix. | 25 | 10 |
| **3** | Robot Drives and End Effectors: Robot Drive Systems: Hydraulic, Pneumatic and Electric Drives, Classification of End Effectors, Mechanical, Vacuum, Magnetic and Adhesive Grippers, Gripper Force Analysis and Design, 1 DoF, 2 DoF and Multi DoF Robot Hands, Tools as End Effectors, Robot Control Types: Limited Sequence, Point-to-Point, Continuous Path and Intelligent Control. | 20 | 9 |
| **4** | Path Planning: Definition of Path Planning, Joint Space Technique, P-Degree Polynomial and Cubic Polynomial, Cartesian Space Technique, Parametric Descriptions, Straight Line and Circular Paths, Position and Orientation Planning. | 10 | 6 |

| | | | |
|---|---|---|---|
| **5** | Robotics Applications: Material Handling Operations such as Pick and Place, Palletizing and Depalletizing, Machine Loading and Unloading, Welding and Assembly, Medical, Agricultural and Space Applications, Unmanned Ground, Aerial and Underwater Vehicles, Robotics for Computer Integrated Manufacturing, Types of Robots: Manipulator, Legged, Wheeled, Aerial, Industrial, Humanoid, Autonomous and Swarm Robots. | 25 | 10 |

### i. Text Book and Reference Book:


1. Introduction to Robotics: Mechanics and Control
   **By** J. J. Craig **|** Pearson Education, Inc. **|** 2nd Edition
2. Robotics and Control
   **By** R. K. Mittal and I. J. Nagrath **|** Tata McGraw-Hill
3. Automation, Production Systems and Computer Integrated Manufacturing
   **By** Mikell P. Groover **|** Prentice Hall of India, New Delhi **|** 2003 Edition
4. Industrial Robotics: Technology, Programming and Applications
   **By** M. P. Groover **|** McGraw-Hill Book Company