CSE/C.S.I.T/CEA/CE

Project Management Skills

UNIT NO	Unit skill set (In cognitive domain)	Topics / Subtopics	Hours L-T-P
1 Introduction	Use Basic Science, Maths skills to understand Project management and project planning, execution and control.	Introduction and definition, Features of a Project, Types of Projects, Benefits and Obstacles in Project Management, Project Management Profession, Role of Project manager, Consultants,	02-00-04
		Project and Operation, Project Management Process, Project Scope	
2 Project Administration	Able to develop WBS, PEP and PM processes for Project with given inputs	Project Administration, Project Team, Project Design, Work Breakdown Structure (WBS), Project Execution Plan (PEP), Systems and Procedure Plan, Project Direction, Communication and Coordination, Project Success Case Study I	06-00-12
3 Project Lifecycle	Use project administration and project lifecycle knowledge to Assess and plan for project risk	Project Life Cycle, Phases - Project Planning, Project Execution, Project Closure, Project Risks, Project Cost Risk Analysis, Time and Cost overruns Case Study 2a	04-00-08
4. Project Planning, Project Scheduling and Project Monitoring and Implementation	Able to develop a detailed project plan given the inputs on manpower, funds availability and time availability	Project Planning Function, Structure, Project Scheduling, Project monitoring and Project evaluation Case Study 2b	06-00-12
5.Project Control, Review and Audit	Use Project Management lifecycle knowledge to Control project parameters, review and audit project performance	Project Control, Problems of Project Control, Gantt Charts, Milestone Charts, Critical Path Method (CPM), Network Technique in Project Scheduling, Crashing Project Duration through Network, Project Review, Initial Review, Performance Evaluation, Abandonment Analysis, Project Audit Case Study 2c	06-00-12

6.Digital Project Management	Understand latest trends of digital technologies impacting the domain of project management and application of the same in multiple scenario	Digital Technology trends in Project management, Cloud Technology, IoT, Smart cities, Data and analytics, case studies Case study 3	02-00-04

STATISTICS AND ANALYTICS

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 **STATISTICAL DATA COLLECTION AND TYPES**	Able to collect statistical data. Able to distinguish the data types. Understands the usage of data collection tools Able to specify problem statement for data collection Able to collect data pointing the root cause of the problem statement.	a Definition of data and classification (qualitative quantitative discrete and continuous data). b Data collection tools i) Questionnaires. ii) Survey. iii) Interviews. iv) Focus group discussion. 1.3 Data cleaning.	4-0-8
UNIT-2 **SUMMARIZATION OF DATA**	Sketches bar, pie and histograms on Microsoft Excel spread sheet. Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. Sketches bar, pie and histograms on Microsoft Excel spread	a Descriptive statistics v) Datatabulation(frequency table vi) Relative frequency table. b Grouped data vii) Bar graph viii) Pie chart ix) Line graph x) Frequency polygon xi) Frequency curve xii) Relative frequency polygon xiii) Histograms xiv) Box plot xv) Leaf-stem plot To be done in Microsoft excel.	8-016

	sheet. Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet.		
UNIT-3 **MEASURE OF LOCATION AND DISPERSION**	Able to determine the descriptive statistical variables using Microsoft Excel. Able to determine the absolute measures of dispersion of the given data set. Explain the symmetry and asymmetry of the distributed data.	a Determination of central tendencies Range, Mean, Mode and Median for the data in Microsoft excel. b Determination of absolute measures of dispersion for data like range quartile deviation, mean deviation, standard deviation and variance in Microsoft Excel. c Skewness and kurtosis graphs in Microsoft excel and interpretations of results.	6-012
UNIT-4 **INTRODUCTION TO PYTHON PROGRAMMING**	Able Install and run the Python interpreter. Create and execute Python programs. Understand the concepts of file I/O. Able to read data from a text file using Python. Learn variable declarations in Python. Learn control structures.	4.1 Introduction to PYTHON. 4.2 Syntax of PYTHON. 4.3 Comments of PYTHON. 4.4 Data types of PYTHON. 4.5 Variables of PYTHON. 4.6 If-else in PYTHON. 4.6 Loops in PYTHON. 4.7 Arrays and functions in PYTHON.	8-016

STATISTICS AND ANALYTICS LAB

SL NO	Practical outcomes/Practical exercises	Unit no	PO	CO	L:T:P
	Learn loop constructs.				
1	Prepare a questionnaire (closed end) containing 25 questions for a specified problem statement: for example experience of an individual in a restaurant.	1	1,2,4,5,7	1	0:0:2
2	Prepare a Google form for a specified problem statement to collect the dataset. (for example questionnaire to conduct online quiz)	1	1,2,4,5,7	1	0:0:2
3	Send out a survey on your problem statement to number of 50 (By Google forms) and collect the data.	1	1,2,4,5,7	1	0:0:2
4	Remove duplicate or irrelevant observations. Remove unwanted observations from the dataset provided, including duplicate observations or irrelevant observations.	1	1,2,4,5,7	1	0:0:2
5	In Microsoft Excel spread sheet draw the frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
6	In Microsoft Excel spread sheet draw the relative frequency distribution table for the given data (data set should contain minimum 50 data).	2	1,2,4,5,7	2	0:0:2
7	Using Microsoft Excel spread sheet plot bar graph for the data collected from 100 people(for example, conduct a survey on the favorite fruit of a person in your locality(restricting to 5 to 6 fruits). Explain the bar graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
8	Using Microsoft Excel spread sheet plot pie chart for the data collected from 50 people(for example, conduct a survey on the smokers with respect to their ages in your locality. Explain the pie chart with minimum 30 words.	2	1,2,4,5,7	2	0:0:2
9	Using Microsoft Excel spread sheet draw a line graph for the given dataset.	2	1,2,4,5,7	2	0:0:2
10	Using Microsoft Excel spread sheet draw frequency polygon and frequency curve for the data collected from 50 people. (For example, marks obtained by the students in your class in 5 subjects in previous examination). Explain your observations from the graph in minimum 30 words.	2	1,2,4,5,7	2	0:0:2
11	Using Microsoft Excel spread sheet construct a box plot for the given dataset. (For example dataset can be the number of passengers in a flat form at different time in a day).	2	1,2,4,5,7	2	0:0:2
12	Using Microsoft Excel spread sheet construct a leaf plot for the given dataset. Explain the graph with minimum 30 words.	2	1,2,4,5,7	2	0:0:2

13	Using Microsoft Excel spread sheet find the Mean, Mode and Median for the data (univariate data) given and also represent them in a Histogram.	3	1,2,4,5,7	2	0:0:2
14	Generate a 50 random data sample (even and odd number dataset) using Microsoft Excel spread sheet and determine the range and Quartiles.	3	1,2,4,5,7	2	0:0:2
15	Collect the current yield of a crop from 50 different persons (problem statement can be changed according	3	1,2,4,5,7	3	0:0:2
	to priorities of the tutor) in your locality and determine mean deviation and Quartile deviation in Microsoft excel spread sheet and brief your inference with less than 30 words.				
16	Collect the data of any 2 livestock population from 50 different houses in your locality (problem statement can be changed according to priorities of the tutor) and determine standard deviation for both the two separately in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
17	Collect the data of two wheeler (with a rider and a pillion) crossing a busy junction in your locality in the peak hours (problem statement can be changed according to priorities of the tutor) and determine the variance of the data in Microsoft excel spread sheet and brief your inference with less than 30 words.	3	1,2,4,5,7	3	0:0:2
18	Using Microsoft Excel spread sheet draw a Skewness graph and kurtosis graph for randomly generated dataset.	3	1,2,4,5,7	3	0:0:2
20	Write a python program to add 2 integers and 2 strings and print the result.	4	1,2,4,5,7	4	0:0:2
21	Write a python program to find the sum of first 10 natural numbers.	4	1,2,4,5,7	4	0:0:2
22	Write a python program to find whether the number is odd or even.	4	1,2,4,5,7	4	0:0:2
23	Write a python program to find the variance and standard deviation for the given data..	4	1,2,4,5,7	4	0:0:2
24	Write a python program to display student marks from the record.	4	1,2,4,5,7	4	0:0:2
25	Write a python program to create a labeled bar graph using matpoltlib. pyplot.	4	1,2,4,5,7	4	0:0:2
26	Write a python program to create a labeled pie chart using matpoltlib. pyplot.	4	1,2,4,5,7	4	0:0:2
Total Hours					**0:0:52=52**

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Sl No	Unit skill set (In cognitive domain) *On successful completion of the class, the students will be able to*	Topics/Sub topics	Practical	Hours L-T-P
		UNIT-1 Electrical Safety		
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety • Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation http://nreeder.com/Flash/sym	1. Electrical symbols related to electrical engineering. 2. Electrical safety	02-00-04
		bols.htm http://bouteloup.pierre.free.fr/iufm/as/de/house/safety.html		
		UNIT-2 Electrical Fundamentals		
2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. 4. Explain supply systems like AC, DC. 5. Describe open circuit, close circuit and short circuit http://nreeder.com/Flash/units.htm	1. Identification of measuring devices. 2. Measure current, voltage and analyses the effects of shorts and opens in series/parallel circuits.	1:0:2

3	Calculate basic electrical quantities	• Behavior of V, I in Series and Parallel DC circuits. • Relationship between V, I and R. http://nreeder.com/Fla sh/ohmsLa w.htm	1. Measure the voltage and current against individu al resistance in electrical circuit. 2. Compare the theoretical values with actual in the circuit.	1:0:2
4	Connect resistances in different combination	1. Equation to find the Resistances connected in series 2. Equation to find Resistances connected in parallel series and 3. Resistances connected parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.	1:0:2
5	Calculate and measurement of different parameters of an AC quantity.	**Ac sinewave: S**inusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. http://nreeder.com/Flash/freqPe riod.htm http://nreeder.com/Flash/oscillo scope.htm	Demonstrate the measure ment of frequency, time period and phase difference of AC quantity using CRO and function generator.	1:0:2
6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, energy, power and power factor • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply http://nreeder.com/Flash/powerLa w.htm	• Measure the voltage, current, power and energy using relevant measuring instruments in a single-phase load. • Compare the theoretical values with actual in the circuit. • Measure the voltages in Single phase and Three phase supply.	1:0:2
UNIT-3 Protective Devices and Wiring circuit s				
7	Identify and select Protective Devices for given current and voltage rating	1. Necessity of Protective Devices 2. Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB • RCCB • ELCB • Relay 3. Earthing • Types • Pipe earthing • Plate earthing	1. Identification and Selection of various prot ective devices 2. Inspection of their instal lation in the college buil ding/public building.	1:0:2

8	Identify and select the various electrician tools	1. Different types of electrician tools and their function. 2. Describe various wiring tools. 3. State procedure of care and maintenance of wiring tools.	Identification and selection of different tools.	1:0:2
9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cables used for different current and voltage ratings.	1. Identification and selection of different Wiring systems. 2. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps. 3. Wire up and test PVC Conduit wiring to control one lamp from two different places.	2:0:4
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	1:0:2
UNIT-4 Electrical Machines and Batteries and UPS				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	**Transformer** • working principle • Transformation ratio • Types and applications with their ratings	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	1:0:2
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Stardelta starter and induction motor	1. **Induction motor** • Types Induction motor and applications • Difference between single and three phase motors • Necessity of starters for AC motors • Describe different types of starters and applications 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Stardelta starter. 2. Troubleshoot the DOL/Star-delta starter and induction motor	2:0:4
13	Select and test the battery for a given application	**Battery** • Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). • Selection criteria of batteries for different applications. • Ampere-Hour Capacity. • Efficiency	Testing Condition of a Lead-acid battery	1:0:2
14	Select the size of the UPS for a given application	**UPS** • List the types and applications • Selection criteria of UPS • Sizing of UPS	Sizing of UPS	1:0:2
UNIT-5 Introdu ction to Electronic Devices and Digital Electronics				

15	Identify and differentiate Conductors, insulators and semiconductors.	Compare Conductors, insulators and semiconductors with examples http://nreeder.com/Flash/resistor. htm	Identification of types and values of resistors-color codes. Determine the value of resistance by color code and compare it with multimeter readings.	1:0:2
16	Identify and test PN junction Diode	**PN junction diode** • Symbol • Characteristics • Diode as switch. • Types of diodes and ratings • Applications	Identify the terminals of a Diode and test the diode for its condition.	1:0:2
17	Build and test bridge rectifier circuit	**Rectifier** • Need for AC to DC conversion • Bridge rectifier with and without C filter, • Rectifier IC.	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	1:0:2
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	**Transistor (BJT)** • Symbol • Structure • Working principle	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	1:0:2
19	1. Identify and test various Sensors and actuators.	**1.Sensors** • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/ specifications, cost, and applications) **2.Actuators** • Concept • Types and applications. • Relay as an actuator.	1. Connect and test an IR proximity sensor to a Digital circuit. 2. Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	2:0:4
20	1. Identify and test different digital IC	• Comparison of analog and digital signal • Digital systems, examples. • Binary numbers, Boolean identities and laws. • Digital system building blocks: Basic logic gates, symbols and truth tables. • IC-Definition and advantages.	• Test a Digital IC. • Identification and selection of suitable ICs for basic gates. • Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	2:0:4
21	Know the application of Microcontroller and PLC	• Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications.	• Identify different application microcontroller. • Identify commercially available PLC and their specifications	1:0:2
			TOTAL	**26-052=78 Hours**

FUNDAMENTAL OF ELE. & ELECTRONICS PRATICAL

Sl. No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO	L: T:P Hrs.
1	1. Collect/draw standard prominent electrical symbols related to electrical engineering. 2. Identify Various types of safety signs and what they mean	1	1,4	1	0:0:2
2	• Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation	1	1,4	1	0:0:2
3	1.Identification Measuring devices • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 2. Measure current, voltage and analyses the effects of shorts and opens in series / parallel circuits.	2	1,4	2	0:0:2
4	Measure the voltage and current against individual resistance in electrical circuit. Compare the theoretical values with actual in the circuit.	2	1,4	2	0:0:2
5	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.	2	1,4	2	0:0:2
6	Demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.	2	1,4	2	0:0:2
7	Measure the voltage, current, power and energy using relevant measuring instruments in a Single-phase load.Compare the theoretical values with actual in the circuit.	2	1,4	2	0:0:2
	Measure the voltages in Single phase and Three phase supply.				

8	1.Identification and selection of various protective devices. • HRC fuse • Kit kat fuse • MCB • MCCB • RCCB • ELCB • Relay Videos/Presentations/Discussion on different protective devices. 2.Inspection of their installation in the college building/public building.	3	1,4	3	0:0:2
9	Identification and selection of different tools. Handson use of the tools for appropriate applications. Combination plier, Cutting Plier, Nose plier, screw driver set, line tester, Poker, Hand Drill, Power Drill, Concrete Drill, Megger, Earth tester, Continuity tester, crimping tool, wire cutter, Wire splicer, wire stripper standard wire gauge, soldering iron, wooden mallet, ball pin hammer, testing board	3	1,4	3	0:0:2
10	1.Identification and selection of different tools. Handson use of the tools for appropriate applications. Surface conduit • concealed conduit • PVC casing capping 2.Wire up and test PVC Conduit wiring and practice control of 2 sockets and 2 lamps.	3	1,4	3	0:0:2
11	Wire up and test PVC Conduit wiring to control one lamp from two different places.	3	1,4	3	0:0:2
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 three pin sockets.	3	1,4	3	0:0:2
13	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	4	1,4	4	0:0:2
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/star-delta starter.	4	1,4	4	0:0:2
15	Troubleshoot the DOL/Star-delta starter and induction motor	4	1,4	4	0:0:2
16	Testing Condition of a Lead-acid battery	4	1,4	4	0:0:2
17	Estimate the UPS rating for a computer lab with 50 computers/domestic.	4	1,4	4	0:0:2
18	1.Identification of types and values of resistors-color codes. 2.Determine the value of resistance by color code and compare it with multimeter readings	5	1,4	5	0:0:2
19	Identify the terminals of a Diode and test the diode for	5	1,4	5	0:0:2
	its condition.				
20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	5	1,4	5	0:0:2
21	Identification of transistor terminals and test. Construct and test the transistor as an electronic switch.	5	1,4	5	0:0:2
22	Connect and test anIR proximity sensor to a Digital circuit.	5	1,4	5	0:0:2
23	Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	5	1,4	5	0:0:2

24	Test an IC. Verify the truth-table AND, OR, NOT logic gates.	5	1,4	5	0:0:2
25	Verify the truth-table NAND, NOR, EX-OR, EX-NOR logic gates.	5	1,4	5	0:0:2
26	1.Identify MCS-51 variants 2.Identify commercially available PLC and their specifications.	5	1,4	5	0:0:2
Total					**0:0:52 =52Hrs**

Python Programming

Week	CO	PO	Lecture (Knowledge Criteria)	Tutorial (Activity Criteria)	Practice (Performance Criteria)
			3 hours/week	1 hour/week	4 hours/week (2 hours/batch twice in a week)
1	1,2	1,4	**Fundamental Concepts:** brief history; features; applications of python; python distributions; versions; python IDEs; Python interpreter; Execution of python programs, debugging python code; Indentation, Comments; best practices for python programming; Character set; tokens; keywords, variables, naming rules for variables, Assignment,	**Refer Table 1**	1. Setup python environment 2. Executing python: explore different ways to run python program 3. debug python code
2	2,4	1,2,4	**Basics I/O operations** Input- input (), raw_input() ; output – print (), formatting output. **Datatypes**		1. Code, execute and debug programs that a) Use i/o statements

			Scalar type: Numeric (int, long, float, complex), Boolean, bytes, None; Type casting **Operators** Arithmetic, Comparison/Relational, Logical/Boolean, Bitwise; string operators; Expressions and operator precedence		b) Evaluate expressions and displays formatted output c) Evaluate expressions to examine the operator precedence 2. Identify and resolve syntactic and semantic issues in the given code snippet
3	2,4	1,2,4	**Control Flow: Conditional blocks** If statement: general format; Multiway branching; Sufficient examples;		1. Identify and Code, execute and debug programs using conditional statements. 2. Identify and resolve syntactic and semantic issues in the given code snippet
4	2,4	1,2,4	**Control Flow: Loops** While loop: general format; examples For loop: general format, examples. Range();nesting loops and conditional statements; Controlling loop execution: Break, continue, pass statements;		1. Code, execute and debug programs using loops. 2. Code, execute and debug programs using loops and conditional statements 3. Identify and resolve syntactic and semantic issues in the given code snippet
5	2,4	1,2,4	**Data Collections** Concept of mutability Set – features, declaration, initialization, operations, comprehension; Tuple-features; declaration, initialization, basic operations; indexing; slicing; built in functions; Nested tuples;		1. Code, execute and debug programs to perform following ▪ set operations ▪ set comprehension 2. Code, execute and debug programs to perform following ▪ basic operations on tuples ▪ tuple indexing and slicing 3. Identify and resolve syntactic and semantic issues in the given code snippet
6	2,4	1,2,4	**List** features; declaration, initialization, basic operations; indexing; List iterations; Slicing; built in functions; Nested Lists; Comprehensions; Applications		1. Write code snippet to perform following on List ▪ basic operations on List ▪ indexing and slicing ▪ comprehension

					2. Identify and resolve syntactic and semantic issues in the given code snippet
7	2,4	1,2,4	**Dictionary** features; declaration, initialization, basic operations; indexing; adding and removing keys, iterating through dictionaries; built in functions; Comprehensions; Applications		1. Code, execute and debug programs to perform basic operations on Dictionary 2. Code, execute and debug programs to perform Dictionary indexing Iterating comprehension 3. Identify and resolve syntactic and semantic issues in the given code snippet
8	2,4	1,2,4	**Arrays and Strings** Arrays: features; create, initialize, indexing, traversal, manipulation; Strings: create, assign, indexing, built in functions;		1. Code, execute and debug programs to perform string manipulation 2. Code, execute and debug programs to perform array manipulation 3. Identify and resolve syntactic and semantic issues in the given code snippet
9	2,3,4	1,2,4	**Functions** Need of function; types; define function, calling function, function arguments; return and yield; None keyword; Scope of variables; Recursion; anonymous functions; sufficient examples;		1. Code, execute and debug programs to solve the given problem using built in functions 2. Code, execute and debug programs to solve the given problem by defining a function 3. Code, execute and debug programs to solve the given problem using recursion 4. Define anonymous function and code to solve the given problem 5. Identify and resolve syntactic and semantic issues in the given code snippet
10	2,3,4	1,2,4	**Modules and Packages**		1. Create Modules and Packages

			Why modules? Module creation; Importing modules; Module Namespace; Packages: basics; path setting; Package_init_.py Files; Commonly used modules: Math, random; Emoji;		2. Code, execute and debug programs using built in modules
11	2,3,4	1,2,4	**NumPy** Brief about NumPy module; NumPy arithmetic functions; NumPy array manipulation functions; NumPy statistical functions; **Pandas** Introduction, series, data frame; Create dataframes; formatting data; fundamental data frame operations;		1. Code, execute and debug programs using NumPy module. 2. Code, execute and debug programs using series. 3. Code, execute and debug programs using dataframes. 4. Identify and resolve syntactic and semantic issues in the given code snippet
12	2,3,4	1,2,4	**Files** Concept; features; file operations; Opening Files; Closing Files; Writing to Files; Reading to Files; File methods; Working with files using data frame.		1. write code snippet to perform following operations on different types of files ▪ read file ▪ write to file. 2. Write code to perform file operations using dataframes on different file types. 3. Identify and resolve syntactic and semantic issues in the given code snippet
13	2,3,4	1,2,4	**Error and Exception Handling:** Python errors; exceptions: built in, user defined. How to catch exceptions? Raising exceptions;		1. Integrate exception handling into above code 2. Write code snippet to raise exceptions 3. Identify and resolve syntactic and semantic issues in the given code snippet
Total in hours			**39**	**13**	**52**

Environmental Sustainability

Unit No & Name	Detailed Course Content	CO	PO	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	CO1	1,5,7	1
	Global warming - Causes, effects.	CO1	1,5,7	2
	Green House Effect, Ozone depletion - Causes, effects	CO1	1,5,7	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	CO2	1,5,7	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	CO2	1,5,7	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	CO2	1,5,7	6
3. Noise pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	CO3	1,5,7	7
	Effects and Control of Noise pollution. Noise pollution (Regulation and Control) Rules, 2000	CO3	1,5,7	8
4. Water and Soil	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	CO4	1,5,7	9
Pollution:	Control measures of water pollution.	CO4	1,5,7	10
	Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control of pollution) act 1974.	CO4	1,5,7	11
	Water conservation – Importance of Rain Water Harvesting	CO4	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	CO4	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	CO4	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy. Solar collectors and advantages of Advanced solar collectors.	CO5	1,5,7	15
	Solar water heater, Solar stills and their uses.	CO5	1,5,7	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.			17
	Wind energy: Current status and future prospects of wind energy. Wind energy in India.	CO5	1,5,7	18
	Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy	CO5	1,5,7	19

	Environmental benefits of New Energy Sources- Ocean energy resources	CO5	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	CO5	1,5,7	21
6. Solid Waste Management And Environmental Acts	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016	CO6	1,5,7	22
	E- Waste generation Sources and characteristics, E waste management rules 2016	CO6	1,5,7	23
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics	CO6	1,5,7	24
	Recycled plastic rules 2016,Importance of Environment (protection) act 1986,	CO6	1,5,7	25
	Occupational health and safety measures.	CO6	1,5,7	26
			Total	**26**