SCHOOL OF TECHNOLOGY
WOXSEN UNIVERSITY
Kamkole, Sadasivpet, Hyderabad, Telangana

COURSE PLAN

Programme : B. Tech – CSE, DSAI, A&R

Course : Computational Thinking and Problem Solving with Python

Course Code : 23CSE101

No. of credits : 4

Semester : I

Session : ODD

Batch : 2023-2027

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COURSE PLAN

A. PREREQUISITE:

a. Basic Understanding of algebra (Class 10th Level)

B. PROGRAM OUTCOMES (POs) and PROGRAM SPECIFIC OUTCOMES (PSOs) for

B1. PROGRAM OUTCOMES (POs): Engineering Graduates will be able to:

PLO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PLO2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PLO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PLO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PLO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PLO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PLO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PLO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PLO9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PLO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PLO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PLO12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B2. Program Specific Outcomes (PSOs): Graduates will be able to:

PSO1. Analyze and develop computer programs in the core areas through modern programming languages
PSO2. Demonstrate their skills in the field of machine learning, cloud computing, web applications to address the need of the industry.
PSO3. Apply their knowledge for providing novel solutions to the existing real-world problems.

C. COURSE OUTCOMES (CO)

At the end of this course students should be able to:

CLO1. Develop algorithmic solutions to simple computational problems, read, write, execute, and structure simple Python programs for solving problems.
CLO2. Decompose a Python program into functions and represent compound data using Python lists, tuples, and dictionaries.
CLO3. Read and write data to/from files in Python Programs.
CLO4. Able to understand and solve Competitive Coding Problems.

Table: Correlation of PLOs and PSOs v/s CLOs

PLO/ CLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	3	2										1			
CLO2	3	3			1			1				1			
CLO3	3	3			1			1				1			
CLO4	2	2	2	2								2	3	3	3
Avg															

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

D. PEDAGOGY

- **Lecture (L) / Discussion (D) / Deliberation (De)**
- **Coursera Courses, NPTEL videos**
- **CodeChef Problem Practice**

E. COURSE COMPLETION PLAN

Total Classroom sessions	35
Total Virtual sessions	00
Total Tests	02
Total Assignments	02
Coursera	01

One Classroom Session = 60 minutes

F. EVALUATION & GRADING

Students will be evaluated based on the following:

S. No.	Assessment	Weightage	Schedule
1	Internal Assessment (IA)	60%	Detailed Below
2	End-semester Examination (ESE)	40%	Academic Calendar

F1. INTERNAL ASSESSMENT: WEIGHTAGE = 60%

Internal Assessment shall be done based on the following:

S. No.	Description	Weightage out of 60 Marks
1	Assignment - 1	10
2	Quiz – 1	10
3	Assessment - 2	15
4	Quiz – 2	10
5	Coursera (Certification)	15

F2. ***Internal Assessment Record Sheet*** *will be displayed online at the end of the semester i.e. last week of regular classroom teaching.*

F3. QUIZZES & ASSESSMENTS: Two assignments will be given at end of Unit-2 and Unit-5. There will be 2 Class Tests based on descriptive type theoretical & numerical questions based on objective type questions will be held. All assessment will be finished before the End Term Examination.

- Those who do not appear in Viva-Voce and quiz examinations shall lose their marks.
- The marks obtained by the students will be displayed on LMS after complete the each Test, and displayed all marks on LMS before End Term Examinations respectively.

F4. ASSIGNMENTS: There will be home assignments based on theory and numerical problems. Those who fail to submit the assignments by the due date shall lose their marks.

F5. MOOC COURSES: There will be MOOC /Coursera courses suggested by the course instructor. They are meant to be completed by the students before finalizing the internal assessment record sheet. Those who fail to complete the suggested MOOC /Coursera courses shall lose their marks.

F5. GENERAL DISCIPLINE: Based on students' regularity, punctuality, sincerity, and participation in the interactions.

The marks obtained by the students will be displayed on LMS at the end of the semester.

F6. END TERM EXAMINATION: WEIGHTAGE – 40%

End Term Examination shall be Three Hours duration and shall be a combination of Short and Long theory/numerical Questions.

F7. GRADING:

The overall marks obtained at the end of the semester comprising all the above four mentioned shall be converted to a grade.

G. Slow and Advanced Learners

Identification of slow & advanced learners and supporting methodology.

H. COURSE DELIVERY PLAN

Class	TOPICS	Course Outcome	Assessment
	Unit 1:		
1	Computational Thinking, Problem Solving Techniques, Algorithm, Basic Logic Structure in Computer Programming, Building blocks of Algorithms, Algorithm Examples	CO1	
2	Notations of an Algorithm	CO1	
3	Algorithmic Problem Solving and Design Techniques	CO1	
4	Analysis of Algorithm - Time and Space Complexity	CO1	
5	Programming Language, Basic Programming Fundamentals (Syntax and Coding Environment, OOPS Concepts, and Efficient Code Building Practices))	CO1	
	Unit 2:		
6	Introduction to Python; Python Interpreter, Modes of Python Interpreter	CO2	
7	Values and data types; Variables; Keywords; Identifiers; Statements and Expressions	CO2	
8	Input and Output; Comments; Docstring; Lines and Indentation; Quotation in Python; Operators and Types, Operator Precedence	CO2	
9	Functions: Types and Definition, Flow of execution	CO2	
10	Function Prototype; Parameters and Arguments, Modules	CO2	
	Assignment - 1		**Assignment**
	Unit 3:		
11	Boolean values; Conditionals statements	CO2	
12	Iteration/Control Statement	CO2	
13	Fruitful Functions	CO2	
14	Strings	CO2	
15	Arrays	CO2	
16	**Test/Quiz 1**		**Test**
	Unit 4:		
17	Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list as parameters	CO2	
18	Tuples: tuple operations, tuple methods, tuple assignment, tuple as return value, tuple as an argument	CO2	
19	Dictionaries: operations and methods	CO2	
20	Difference between List, Tuple and Dictionaries	CO2	

21	Advanced List Processing: list comprehension, nested list	CO2	
22	**Assignment - 2**		**Assignment**
	Unit 5:		
23	Handling Files and its operations.	CO3	
24	Exceptions handling	CO3	
25	Modules; Packages; Exploring few Packages	CO3	
26	Importing Module from a Package	CO3	
27	**Test/Quiz - 2**		**Test**
28	Problem Solving/CodeChef - I	CO4	
29	Problem Solving/CodeChef - II	CO4	
30	Problem Solving/CodeChef -III	CO4	
31	Problem Solving/CodeChef -IV	CO4	
32	Problem Solving/CodeChef -V	CO4	
33	Problem Solving/CodeChef -VI	CO4	
34	Problem Solving/CodeChef -VII	CO4	
35	Problem Solving/CodeChef -VIII	CO4	
36	Problem Solving/CodeChef -IX	CO4	
37	Problem Solving/CodeChef -X	CO4	
38	**Completion of Coursera/MOOC Certification**		

I. Suggested Readings

Textbooks:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data‘‘, Third Edition, MIT Press 2021 GE3151 Syllabus PROBLEM SOLVING AND PYTHON PROGRAMMING

4. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.

5. https://www.python.org/

6. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

J. MOOC Courses

1. https://www.coursera.org/learn/python-crash-course
2. https://www.coursera.org/specializations/python
3. https://www.coursera.org/learn/python-data

GUIDELINES:

***Cell Phones and other Electronic Communication Devices*:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.

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Attendance: Students are required to have **minimum attendance of 75%** in each subject. Students with less than said percentage shall **NOT** be allowed to appear in the end semester examination.

Course learner outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement Capping.

Passing criterion:

- Minimum 75 % Attendance required to attend Internals.
- Minimum 50 % Marks required in Internal to attend End-Semester Examinations.
- Passing Criterion for B. Tech: Minimum 50% of the marks in the end semester.