INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad -500 043

CIVIL ENGINEERING

COURSE DESCRIPTOR

Course Title	**PROGRAMMING FOR PROBLEM SOLVING THROUGH PYTHON**
Course Code	ACSB38
Programme	B.Tech
Semester	II CIVIL
Course Type	Foundation
Regulation	IARE - R18

Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3		3	-	-

Chief Coordinator	Dr. P Govardhan, Associate Professor
Course Faculty	Dr. P Govardhan, Associate Professor

I. COURSE OVERVIEW:

This course explains the fundamental ideas behind the object oriented approach to programming. Knowledge of python helps to create the latest innovations in programming. Like the successful computer languages that came before, python is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves OOP concepts, python basics, inheritance, polymorphism, interfaces, packages, Exception handling. This course is presented to students by power point projections, course handouts, lecture notes, assignments, objective and subjective tests.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	ACSB01	II	Programming for problem solving	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Object Oriented Programming Through Python	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✘	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE modules and each module carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory			Total Marks
Type of Assessment	CIE Exam	Quiz	AAT	
CIA Marks	20	05	05	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination

Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis,

evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT)

This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

	Program Outcomes (POs)	Strength	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Assignments
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	2	Assignments
PO3	**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.	3	Guest Lectures
PO 4	**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.	2	5 minutes Video/ Seminars
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	3	Seminars / Term Paper / 5 minutes video

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

	Program Specific Outcomes (PSOs)	Strength	Proficiency assessed by
PSO 1	**ENGINEERING KNOWLEDGE:** Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication	2	Seminar/SEE

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 2	**BROADNESS AND DIVERSITY:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	2	Quiz/AAT
PSO 3	**SELF-LEARNING AND SERVICE:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.**.**	2	Guest Lectures

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES :

The course should enable the students to:	
I	Understand the fundamentals of Python programming concepts and its applications.
II	Improve problem solving skills using control structures and lists.
III	Understand the basics of object-oriented concepts using Python.
IV	Apply string handling to solve real-time problems.
V	Design and implement programs using functions.

IX. COURSE OUTCOMES (COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Understand and comprehend the basics of python programming.	CLO 1	Describe the Features of python, Data types.
		CLO 2	Summarize the concept of various ooperators.
		CLO 3	Describe the usage of different input and output functions.
		CLO 4	Understand importance of membership and identity operators.
CO 2	Express different conditional and decision making statements used to develop python applications.	CLO 5	Describe the various control structures.
		CLO 6	Determine different conditional blocks of if statements.
		CLO 7	Describe the usage of while loop.
		CLO 8	Describe the usage of while loop.
CO 3	Learn and implement various data structures provided by python library including string, list, dictionary and its operations etc	CLO 9	Summarize the concept of list creation and manipulations.
		CLO 10	Describe the usage of tuple data type and its methods.
		CLO 11	Determine the usage of dictionaries.
		CLO 12	Understand importance of arrays in python.

COs	Course Outcome	CLOs	Course Learning Outcome
CO 4	Define and demonstrate the use of the built-in functions and better usage of string methods in the development of python programming.	CLO 13	Understand Creating strings and basic operations on strings.
		CLO 14	Analyze the concept of String testing methods, Defining a function.
		CLO 15	Illustrate Calling a function, Returning multiple values from a function.
		CLO 16	Contrast the Usage of Functions are first class objects, Formal and actual arguments,
CO 5	Develop real-world applications by using various object oriented programming concepts.	CLO 17	Define Positional arguments, Recursive functions.
		CLO 18	Identify the features of Object Oriented Programming System (OOPS).
		CLO 19	Use the concept of Classes and Objects, Encapsulation, Abstraction, Inheritance, and Polymorphism.
		CLO 20	Describe types of variables and methods.

X. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AITB01.01	CLO 1	Describe the Features of python, Data types.	PO1	3
AITB01.02	CLO 2	Summarize the concept of various ooperators.	PO2	2
AITB01.03	CLO 3	Describe the usage of different input and output functions.	PO1	3
AITB01.04	CLO 4	Understand importance of membership and identity operators.	PO2	2
AITB01.05	CLO 5	Describe the various control structures.	PO1	3
AITB01.06	CLO 6	Determine different conditional blocks of if statements.	PO2	2
AITB01.07	CLO 7	Describe the usage of for and while loop.	PO2, PO3	3
AITB01.08	CLO 8	Understand break, continue and return statements.	PO2	2
AITB01.09	CLO 9	Summarize the concept of list creation and manipulations.	PO3	3
AITB01.10	CLO 10	Describe the usage of tuple data type and its methods.	PO2, PO3	3
AITB01.11	CLO 11	Determine the usage of dictionaries.	PO2	2
AITB01.12	CLO 12	Understand importance of arrays in python.	PO4	2
AITB01.13	CLO 13	Understand Creating strings and basic operations on strings.	PO2, PO4	2
AITB01.14	CLO 14	Analyze the concept of String testing methods, Defining a function.	PO2	2
AITB01.15	CLO 15	Illustrate Calling a function, Returning multiple values from a function.	PO2, PO4	2
AITB01.16	CLO 16	Contrast the Usage of Functions are first class objects, Formal and actual arguments,	PO1, PO2	3
AITB01.17	CLO 17	Define Positional arguments, Recursive functions.	PO1, PO2	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AITB01.18	CLO 18	Identify the features of Object Oriented Programming System (OOPS).	PO2	2
AITB01.19	CLO 19	Use the concept of Classes and Objects, Encapsulation, Abstraction, Inheritance, and Polymorphism.	PO2	2
AITB01.20	CLO 20	Describe types of variables and methods.	PO1, PO2	3

3= High; 2 = Medium; 1 = Low

XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

Course Outcomes (COs)	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3
CO1	2	2			2		
CO2		2	3			2	
CO3		2		2		2	
CO4	3	2				2	
CO5	3			2			2

3= High; 2 = Medium; 1 = Low

XII. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												2		
CLO 2		2													
CLO 3	3												2		
CLO 4		2											2		
CLO 5	3														
CLO 6		2													
CLO 7		2	3											3	
CLO 8		2													
CLO 9			3											3	
CLO 10		2	3												
CLO 11		2												3	
CLO 12				2											

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 13		2		2										3	
CLO 14		2												3	
CLO 15		2		2											
CLO 16	3	2												3	
CLO 17	3	2												3	
CLO 18		2													
CLO 19		2												3	
CLO 20	3	2													

3 = High; 2 = Medium; 1 = Low

XIII. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO2,PO3, PO4,PO5, PSO1,PSO 2,PSO3	SEE Exams	PO1, PO2,PO3, PO4,PO5, PSO1,PSO2, PSO3	Assignments	PO1, PO2,PSO2	Seminars	PO4, PO5, PSO1
Laboratory Practices	-	Student Viva	-		-		-
Term Paper							

XIV. ASSESSMENT METHODOLOGIES – INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XV. SYLLABUS

MODULE-I	INTRODUCTION TO PYTHON
Introduction to Python: Python Identifiers, Keywords, Datatypes in python: buitin datatypes, bool datatype, sequences, sets. Input and Output statements, Operators: arithmetic operators, assignment operators, comparison operators, logical operators, identity operators, membership operators, bitwise operators.	
MODULE-II	CONTROL STRUCTURES
Conditional Control structures: Conditional blocks using if statement, if-else statement, if- elif statement,Range function. Loops: for loops, Nested for loop, while loop, pass, continue, break statements.	

MODULE-III	LIST, TUPLES ,DICTIONARY AND ARRAYS

Creating List, List manipulation – index(), append(), insert(), copy(), extend(), count(), remove(), pop(), reverse(), sort(),len(),nested list. Creating a tuple, accessing a tuple element, basic operations on tuples, tuples manipulations – len(),min(), max(), count(),index(), sorted().Creation of dictionary, operations on dictionaries, dictionaries methods

Array: creating an array, importing array module, indexing and slicing. processing the arrays, arrays using numpy, array creation using numpy, transpose, addition and multiplication of matrices..

MODULE-IV	STRINGS AND FUNCTIONS

Creating a string, methods – length(), indexing(), slicing(), repeating(), concatenation(), comparing(), remove(), removing spaces, finding substring, inserting a sub string in to a string, finding number of characters and words.

Functions: Defining a function, Calling a function, returning multiple values from a function, functions are first class objects, formal and actual arguments, positional arguments, recursive functions, Powerful Lamda function in python

MODULE-V	INTRODUCTION TO OOPS

Introduction to Object Oriented Concepts: Features of Object oriented programming system (OOPS) – Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism.

Classes and Objects: Concept of class, object and instances, Creating a class, The Self variable, constructor, Types of Variables, Types of Methods.

Text Books:

1. R Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2017.
2. Dusty Philips, "Python 3 Object Oriented Programming", PACKT Publishing, 2nd Edition, 2015.

Reference Books:

1. Michael H.Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.

XVI. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Describe the Features of Python, Data types.	CLO 1	T1:1.2
2-3	Summarize the concept of Operators, Input and output,	CLO 2	T1:4,5,6
4-5	Use the control structure with if statements	CLO 6	T12.3
6-7	Summarize the concept of for and while loop, break, continue and return	CLO 8	T1:12.4,12.5
8-9	Understanding the importance of pass statement	CLO 7	T1:12.6-12.8
10-11	Understanding creation of list and list manipulations	CLO 9	T1:13.1,13.2
12-13	Illustrate creation of tuple and tuple manipulations	CLO 10	T1:13.4,13.5
14-15	Summarize the concept dictionaries and its methods	CLO11	T1:13.6,14
16-18	Understand the usage of arrays and array package	CLO 12	T1:14.1,14.3

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
19-20	Analyze the concept transpose, addition and multiplication of matrices.	CLO 12	T1:14.4,14.6
21-22	Illustrate the usage of numpy for array manipulation	CLO 12	T1:8.1
23	Understand Creating strings and basic operations on strings.	CLO 13	T1:8.17
24-25	Analyze the concept of String testing methods,	CLO 14	T1:9.2
26-27	Defining a function.	CLO 14	T1:9.3
28	Illustrate Calling a function.	CLO 15	T1:9.5
29	Illustrate Returning multiple values from a function.	CLO 14	T1:9.6
30	Contrast the Usage of Functions is first class objects.	CLO 14	T1:9.8
31	Contrast the Usage of Formal and actual arguments.	CLO 15	T1:9.9,9.16
32-34	Define Positional arguments and keyword arguments.	CLO 16	T1:16.1
35	Understand the usage of recursive functions	CLO 18	T1:16.2,16.3
36	Analyze the concept of powerful lamda function	CLO 17	T1:16.4
37	Identify the features of Object Oriented Programming System (OOPS),	CLO 19	T1:16.5,16.6
38	Use the concept of Classes and Objects, Encapsulation.	CLO 18	T1:16.7
39	Describe Abstraction, Inheritance, and Polymorphism.	CLO 19	T1:22.2,22.3
40-41	Determine Creating a class, The Self variable.	CLO 20	T1:22.4,22.5
42	Determine types of, Inheritance and Polymorphism.	CLO 23	T1:22.7
43	Understand types of variable .	CLO 24	T1:22.11
44-45	Contrast the Usage of methods	CLO 25	T1:22.8

XVII. GAPS IN THE SYLLABUS-TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Seminars	PO1	PSO1
2	Implementation of Exception Handling	Seminars / NPTEL	PO4	PSO2
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 2	PSO1

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