



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER APPLICATIONS

COURSE PLAN – PART I			
Name of the programme and specialization	Master of Computer applications		
Course Title	Python and R programming		
Course Code	CA723	No. of Credits	3
Course Code of Pre-requisite subject(s)	CA716,CA719		
Session	July 2019	Section	A & B
Name of Faculty	Dr. S. Sangeetha	Department	Computer Applications
Official Email	sangeetha@nitt.edu	Telephone No.	0431-2503743
Name of Course Coordinator(s)	Dr.B.janet		
Official E-mail	janet@nitt.edu	Telephone No.	0431-2503741
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
<p>INTRODUCTION TO PYTHON PROGRAMMING: Python interpreter and interactive mode; values and types variables, expressions, statements, tuple assignment, Order of operations, comments, debugging; modules and functions: function Calls, adding new functions, Definitions and Uses, flow of execution, parameters and arguments, Fruitful functions. Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, range, break, continue, pass; recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.</p> <p>LISTS, TUPLES, DICTIONARIES: Lists: Traversing a List, list operations, list slices, list methods, Map, Filter and Reduce, list loop, mutability, aliasing, cloning lists, list parameters; Dictionaries: operations and methods; advanced list processing -list comprehension; Tuples: tuple assignment, tuple as return value.</p> <p>FILES, MODULES, PACKAGES: Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages: PANDAS, NUMPY, SCIKIT-LEARN;</p> <p>INTRODUCTION TO R PROGRAMMING: Introduction and Preliminaries, numbers and vectors, Objects, their modes and attributes, Ordered and unordered factors, Arrays and matrices, Lists and data frames, Grouping, loops and conditional execution, functions.</p> <p>STATISTICAL MODELS, GRAPHICAL PROCEDURES, PACKAGES: Statistical models : Defining statistical models; formulae, Linear models, Generic functions for extracting model information, Analysis of variance and model comparison, Updating fitted models, Generalized linear models, Nonlinear least squares and maximum likelihood models; Graphical procedures:</p>			

High-level and low-level plotting commands, graphics parameters and list, Dynamic graphics. Packages: Standard packages, Contributed packages and CRAN, Namespaces.

REFERENCES:

1. Allen B. Downey, Think Python: How to Think like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python –Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. William N. Venables, David M. Smith, An Introduction to R: A Programming Environment for Data Analysis and Graphics, 2nd edition, Network Theory Ltd, 2009.
4. John V Guttag, —Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, —Exploring PythonII, Mc-Graw Hill Education (India) Private Ltd.2015.
7. Kun Ren, Learning R Programming, Packt Publishing Ltd, 2016.
8. Colin Gillespie, Robin Lovelace, and Efficient R Programming: A Practical Guide to Smarter Programming, "O'Reilly Media, Inc.", 2016

COURSE OBJECTIVES

- To acquire knowledge in Python and R programming
- To develop Python programs with conditionals and loops and data structures
- To learn how to design and program Python applications
- To learn how to build and package Python modules for reusability
- To learn statistical models using R

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. Problem solving and programming capability	1,2,3
2. Construct and execute basic programs in Python	1,2,3,5
3. Use external libraries and packages with Python	4,5
4. Construct and execute basic programs in R using elementary programming techniques	1,2,3
5. Use external R-packages in statistics and graphics	4,5

COURSE PLAN – PART II

COURSE OVERVIEW

This course introduces the concepts of problem solving to the students using python. It begins with the various data structures such as lists, dictionary and tuples along with the methods and comprehension. It introduces functions, especially lambda functions to solve real world problems. It also introduces problem solving using object orientation in python. The course provides clear description of handling files and creation of packages and modules. It introduces third party libraries such Numpy, Pandas, and Scikit learn that support recent computing technologies like data analytics and data mining. It also provides basic programming using R and R for statistical operation and graphics.

COURSE TEACHING AND LEARNING ACTIVITIES

Week	Contact Hours	Topic	Mode of Delivery
1	1	Introduction to python programming, Features of Python, Python interpreter and interactive mode	Chalk and Talk
	2	Values and types variables, expressions, statements, Order of operations, comments, debugging	-do

	3	Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else)	--do-
2	1	Iteration: state, while, for, range, break, continue, pass	--do-
	2	Functions: function Calls, adding new functions, Definitions and Uses and flow of execution	-do
	3	Parameters and arguments, Fruitful functions, recursion	-do
	4	Problem solving session	Problem Solving
3	1	Strings: string slices, immutability, string functions and methods Lists as arrays	Chalk and Talk
	2	Lists: Traversing a List, list operations, list slices, list methods	--do-
	3	List mutability, aliasing, cloning lists, list parameters;	-do
	4	Problem solving session	Problem Solving
4	1	Dictionaries: operations and methods; Tuples: tuple assignment, tuple as return value	Chalk and Talk
	2	Advanced list processing : list comprehension; Dictionary and Set comprehensions	-do-
	3	Map, Filter and Reduce	-do-
	4	Problem solving session	Problem Solving
5	1	Object oriented programming- classes ,objects	--do-
	2	Constructors and Destructors	-do
	3	Problem solving session	Problem Solving
6	1	Files : text files, reading and writing files	Chalk and Talk
	2	Format operator, command line arguments	-do
	3	Errors and exceptions	-do
7	1	Handling exceptions	Chalk and Talk
	2	Modules and packages	--do-
	3	Creating Modules and packages	Demo
8	1	NUMPY	Demo
	2	PANDAS	Demo
	3	SCIKIT-LEARN	Demo
9	1	SCIKIT-LEARN	Demo
	2	Problem solving session	Problem Solving
	3	Introduction to R programming, numbers and vectors, objects, their modes and attributes, ordered and unordered factors.	Presentation
	4	Arrays and matrices, Lists and data frames, Grouping, loops and conditional execution	Presentation
10	1	Functions	Presentation
	2	Statistical models: Defining statistical models; formulae, Linear models, Generic functions for extracting model information.	Presentation
	3	Analysis of variance and model comparison, Updating fitted models.	Presentation
	4	Generalized linear models, Nonlinear least squares and maximum likelihood models.	Presentation
11	1	High-level and low-level plotting commands, graphics parameters and list, Dynamic graphics.	
	2	Packages: Standard packages, Contributed packages and CRAN, Namespaces.	Presentation

3	Packages: Standard packages, packages and CRAN, Namespaces.	Contributed	Demo
4	Problem solving session		Problem Solving

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Test 1	Week 4	1 Hr	15
2	Test 1	Week 8	1 Hr	15
3	Programming Assignment	Week 6	3 Weeks	30
CPA	Compensation Assessment*	At the end of the course	1 Hr	15
4	Final Assessment *	At the end of the course	3 Hrs	40

COURSE EXIT SURVEY

- The students through the class representative may give their feedback at any time to the course faculty which will be duly addressed.
- The students may also give their feedback during Class Committee meeting.

COURSE POLICY (including compensation assessment to be specified)

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.
- The students are expected to come out with their original solution for problems given as assignment, and tests/examinations.

ADDITIONAL INFORMATION, IF ANY

The Course Coordinator is available for consultation office from 4 pm to 5 pm on Tuesday every week.

FOR APPROVAL

Course Faculty 

CC- Chairperson 

HOD 