B.Sc. Degree Program

Faculty of Applied Sciences

University of Sri Jayewardenepura

Course Title	**Computational Statistics**
Course Code	**AMT 377 2.0**
Credit Value	02
Status	Core
Year / Level	Year 3
Semester	2
Theory: Practical: Independent Learning	28: 20: 52
Other: Pre-requisite Course/s	AMT 112 2.0 / AMT 212 2.0

Aim of the Course:

To emphasize the need of statistical computing as efficient and effective methods in problem solving and expose the students with theoretical and computational aspects of statistical computing.

Intended Learning Outcomes:

On the successful completion of this course, the student should be able to:

1) Use programing with R to analyze data and solve problems
2) formulate computational methods with statistical approaches;
3) apply computational methods to solve problems;
4) analyze and compare the appropriateness of computational methods

Course Content:

Introduction to R; Objects, their modes and attributes (Vectors, Matrices, Lists, Data Frames, Factors), Data Input/Output, descriptive methods, R graphs/ Tables, Pattern data, arbitrary data, data from probability distributions, IF, ELSE, Logical operations, FOR and WHILE loops
Working with different R packages that are used to different tests and operations
Parametric and non-parametric tests for hypothesis testing on mean and median, Confidence intervals, linear models, extracting data from outputs, empirical power of tests
Functions and arguments, provide a function as a solution for a problem
Simulation studies

Scope and Schedule of Teaching - Learning Activities:

Session No.	Topic / Sub Topic	No. of Hrs.			Teaching Method	Assessment Criteria	ILO Alignment
		T	P	IL			
1	**1 Introduction to R** 1.1 Objects and their modes and attributes	2	1	3	Lecture / Handout 1		1,2
2	1.2 Pattern data 1.3 Arbitrary data 1.4 Random data	2	1	3	Lecture / Handout 1		1,2
3	**2 Preliminary data analysis using R** 2.1 Data Input/Output 2.2 Descriptive statistics	2	1	4	Lecture / Handout 1		1,2
4	2.3 R graphs 2.4 Tables	2	1	3	Lecture / Handout 1		1,2,3
5	**3 Control structures** 3.1 IF, ELSE 3.2 Logical operations	2	1	3	Lecture / Handout 2		1,2
6	3.4 FOR and While loops	2	2	4	Lecture / Handout 2		1,2
7	**4 Data analysis and computations** 4.1 Using packages	2	1	4	Lecture / Handout 3		1,2,3,4
9	**Mid-Semester Examination**	0	0	0	FA 1: Mid-Sem. Examination	20% of Final Marks	
8	4.2 Construct and compare of tests of hypotheses using simulations 4.2.1 Parametric test	2	2	4	Lecture / Handout 3		1,2,3,4
10	4.2.2 Non-Parametric test	2	1	4	Lecture / Handout 4		1,2,3,4
11	4.2.3 Data modeling	2	1	4	Lecture / Handout 4		1,2,3,4
12	4.2.4 Empirical distributions	2	2	4	Lecture / Handout 5		1,3,4
13	**5 Write R program to solve a given problem** 5.1 Functions and arguments	2	2	4	Lecture / Handout 5		1,3
14	4.2 Provide a function as a solution for a problem	2	2	4	Lecture / Handout 6		1,2,3,4
	Total	*28*	*20*	*52*			

Linking Program Outcomes with ILOs:

Programme Learning Outcomes:

1. Demonstrate competency in theoretical knowledge and practical and/or technical skills in respective subject areas.
2. Communicate efficiently and effectively in the respective subject areas using written, oral, visual and/or electronic forms.
3. Facilitate, and participate as an empathetic and emotionally intelligent team player with leadership qualities, in a group, diverse team or organization.
4. Apply subject based knowledge and skills creatively in making appropriate judgments in changing situations.
5. Integrate creativity and innovation to achieve entrepreneurial competencies.
6. Implement solutions in keeping with ethical, societal and environmental norms and need for sustainable development.
7. Secure life goals through lifelong learning with the aim of strengthening professional skills, and ensuring the betterment of the community.

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
ILO 1	***	**		*			**
ILO 2	***	**		**	*		**
ILO 3	***	**		**	*	*	**
ILO 4	***	**		**	*	*	***

*** - *Strongly Linked;* ** - *Medium linked;* * *Weakly linked*

Mode of Assessment:

Formative Assessment (FA): FA1 20% + FA2: Computer Practicals 10% = 30% of Total Marks

Summative Assessment (SA): End Semester Examination: 70% of Total Marks
2-hour paper covering Essay-type questions need coding in R

References

- The R book, Mitchael J. Crawley, John Willey & Sons
- Software for Data Analysis: Programing with R
- Maria L. Rizzo statistical computing with R, Chapman & Hall