Probability and Statistics	Code & No:	STAT 102
	Credits:	3(3,0,1)
	Pre-requisite:	MATH 112
	Co-requisite:	None
	Level:	4

Course Description:

Upon successful completion of this course, students will be familiar with basic rules of probability and will be able to use them in modeling uncertainty in obtaining and recording data. They will be able to utilize graphical and numerical summaries of data in understanding data generating processes. They will understand the logic of statistical inference and will be able to apply common inferential procedures. Students will be exposed to the computational aspects of statistics through the use of calculators, spreadsheet programs or special purpose data analysis packages.

This course includes the following topics:

Introduction to Sample space, Random events, Probability rules, Conditional probability, Baye's rule, Random variables, Definitions of Discrete and Continuous distributions, Moment Generating Function, mean and variance of a random variable, and mean and variance of a linear combination of independent random variables. Probability Density Function, Discrete distributions (Binomial Poisson) and continuous distributions (Uniform, Exponential, Normal), Applications of the Normal Distribution, Sampling distributions of sample: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, The concept of estimation methods: Point estimation and Confidence interval estimation, Estimating the Mean Standard Error of a Point Estimate, Concepts of Testing Hypotheses: Hypotheses testing of a single Population parameter (mean, proportion, difference) , Concepts of simple linear correlation, The Simple Linear Regression Model, Least Squares and the Fitted Model.

Course Aims:

1) Understanding and applying probability rules, independent random events.
2) Understanding and applying random variables and their probability distribution.
3) Understanding and applying common discrete probability distributions and their relationships.
4) Understanding and applying common continuous probability distributions and their applications.
5) Understanding and applying sampling distribution of some sample statistics.
6) Understanding and applying principles of estimation, estimation of some population parameters.

7) Understanding and applying the principles of estimation of simple linear regressions.

Student Outcomes (SOs):

☒(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

☒(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

☐(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

☐(d) An ability to function effectively on teams to accomplish a common goal

☐(e) An understanding of professional, ethical, legal, security and social issues and responsibilities

☐(f) An ability to communicate effectively with a range of audiences

☒(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society

☐(h) Recognition of the need for and an ability to engage in continuing professional development

☒(i) An ability to use current techniques, skills, and tools necessary for computing practice.

☐(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. [CS]

☐(k) An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

☐(j) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]

☐(k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems. [IT]

☐(l) An ability to effectively integrate IT-based solutions into the user environment. [IT]

☐(m) An understanding of best practices and standards and their application. [IT]

☐(n) An ability to assist in the creation of an effective project plan. [IT]

Course Learning Outcomes (CLOs):

The student is expected to be able to:

1. Apply probability rules and independent random events.
2. Use random variables and their probability distribution.
3. Use discrete probability distributions and their relationships.
4. Use continuous probability distributions and their applications.
5. Apply sampling distribution of sample statistics.
6. Understand the principles of estimation and estimation of population parameters.
7. Understand the principles of estimation of simple linear regressions.

SOs and CLOs Mapping:

CLO/SO	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CLO1	√	√					√		√					
CLO2	√	√					√		√					
CLO3	√	√					√		√					
CLO4	√	√					√		√					
CLO5	√	√					√		√					
CLO6	√	√					√		√					
CLO7	√	√					√		√					

No.	Topics	Weeks	Teaching hours
1	Introduction to Sample space, Random events, Probability rules, Conditional probability, Baye's rule	2	6
2	Random variables, Definitions of Discrete and Continuous distributions, Moment Generating Function, mean and variance of a random variable, and mean	2	6
3	variance of a linear combination of independent random variables. Probability Density Function	1	3
4	Discrete distributions (Binomial Poisson) continuous distributions (Uniform, Exponential, Normal), Applications of the Normal Distribution)	2	6
5	Sampling distributions of sample: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions	2	6

6	The concept of estimation methods: Point estimation and Confidence interval estimation, Estimating the Mean Standard Error of a Point Estimate	2	6
7	Concepts of Testing Hypotheses: Hypotheses testing of a single Population parameter (mean, proportion, difference)	2	6
8	Concepts of simple linear correlation, The Simple Linear Regression Model, Least Squares and the Fitted Model.	1	3
	Total	**14**	**42**

Textbook:

- Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson; 9 edition (January 6, 2011).
- Douglas C. Montgomery and, George C. "Applied Statistics and Probability for Engineers", Wiley; 6th edition (2013).

Essential references:

- Michael Baron, "Probability and statistics for computer engineers", CRC press, 2nd edition (2013)