INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	**PROBABILITY AND STATISTICS**				
Course Code	AHSB12				
Program	B. Tech				
Semester, Branch	THREE				
Course Type	Foundation				
Regulation	IARE – R20				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	-	-
Course Coordinator	Mr. Ch Chaitanya, Assistant Professor				
Course Faculty	Dr. P Srilatha, Ms. B Praveena				

I. COURSE OVERVIEW:

Probability theory is the branch of mathematics that deals with modelling uncertainty. Inferential Statistics and regression analysis together with random variate distributions are playing an exceptional role in designing data driven technology which is familiarly known as data centric engineering. They also have wide variety applications in telecommunications and other engineering disciplines. The course covers advanced topics of probability and statistics with applications. The course includes: random variables, probability distributions, hypothesis testing, confidence intervals, and linear regression. There is an emphasis placed on real-world applications to engineering problems.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
10+2	AHSB12	III	Fundamentals of Statistics

II. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Aircraft Stability and Control	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 expected percentage of cognitive level of the questions is broadly based on the criteria given in Table: 1.

Table 1: The expected percentage of cognitive level of questions in SEE.

Percentage of Cognitive Level	Blooms Taxonomy Level
10 %	Remember
50 %	Understand
25 %	Apply
15 %	Analyze
0 %	Evaluate
0 %	Create

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 2), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (Table 3).

Table 2: 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 center. 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. The AAT chosen for this course is given in table 3**.**

Table 3: Assessment pattern for AAT

5 Minutes Video	Assignment	Tech-talk	Seminar	Open Ended Experiment
20%	30%	30%	10%	10%

VI. COURSE OBJECTIVES:

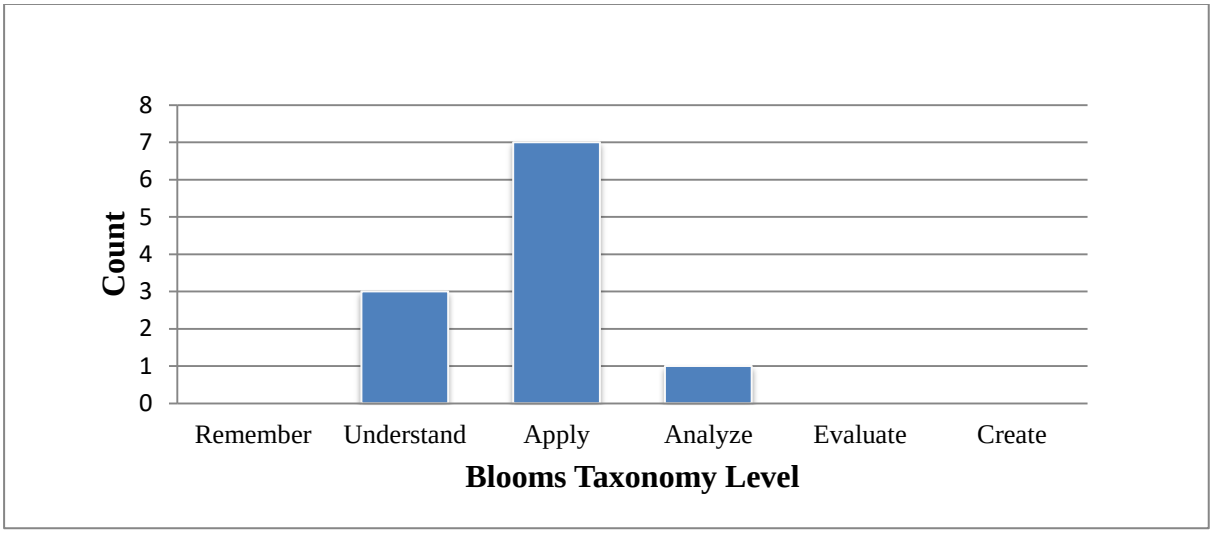
The students will try to learn:	
I	The Principles of probability, the theory of random variables, basic random variate distributions and their applications.
II	The Methods and techniques for quantifying the degree of closeness among two or more variables and linear regression analysis.
III	The Estimation statistics and Hypothesis testing which play a vital role in the assessment of the quality of the materials, products and ensuring the standards of the engineering process.
IV	The statistical tools which are essential for translating an engineering problem into probability model.

VII. COURSE OUTCOMES:

After successful completion of the course, students will be able to:		
Course Outcomes		Knowledge Level (Bloom's Taxonomy)
CO 1	Determine the conditional probability of interdependent events by using Bayes theorem.	Apply
CO 2	Explain simulation of random events by using the concept of random variables	Understand
CO 3	Calculate the expected values, variances of the discrete and continuous random variables for making decisions under randomized probabilistic conditions.	Apply

CO 4	Interpret the Probability distributions such as Binomial, Poisson and Normal distribution by using their probability functions and parameters.	Understand
CO 5	Apply the concepts of discrete and continuous probability distribution and CLT for solving real time problems under probabilistic conditions.	Apply
CO 6	Interpret the results of Bivariate and Multivariate Regression as well as Correlation Analysis for statistical forecasting.	Understand
CO 7	Identify the role of types of statistical hypotheses, types of errors, sampling distributions of means and confidence intervals in hypothesis testing	Apply
CO 8	Apply tests of hypotheses for both large and small samples in making decisions over statistical claims.	Apply
CO 9	Test for the assessment of goodness of fit of the given probability distribution model by using Chi-square distribution.	Analyze
CO 10	Make Use of R software package in computing confidence intervals, Regression analysis and hypothesis testing.	Apply
CO 11	Select appropriate statistical methods for solving real-time engineering problems governed by laws of probability.	Apply

KNOWLEDGE COMPETENCY LEVELS:



VIII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Strength	Proficiency Assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.	3	CIE/Quiz/AAT
PO 2	**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	CIE/Quiz/AAT
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.	1	Seminar/ Conferences/ Research Papers

Program Outcomes		Strength	Proficiency Assessed by
PO 5	**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.	3	Assignments/ Discussion

3 = High; 2 = Medium; 1 = Low

IX. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Strength	Proficiency assessed by
PSO 1	Synthesize and analyze aircraft structures, propulsion, production technologies and computer aided engineering in aeronautical systems including air traffic controls standards.	-	-
PSO 2	Focus on broad knowledge of aeronautical engineering in innovative, dynamic and challenging environment for design and development of new products.	-	-
PSO 3	Make use of design, computational and experimental tools for research and innovation in aerospace technologies and allied streams, to become successful professional, entrepreneurs and desire higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

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

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	√	-	-	√	-	-	-	-	-	-	-	-	-	-	-
CO 2	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	√	-	-	√	-	-	-	-	-	-	-	-	-	-	-
CO 4	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	√	√	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 6	√	-	-	√	-	-	-	-	-	-	-	-	-	-	-
CO 7	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 8	√	√	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 9	√	-	-	√	-	-	-	-	-	-	-	-	-	-	-
CO 10	√	-	-	√	√	-	-	-	-	-	-	-	-	-	-
CO 11	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-

XI. JUSTIFICATIONS FOR CO – PO MAPPING:

Course Outcomes	POs / PSOs	Justification for mapping (Students will be able to)	No. of key competencies
CO1	**PO 1**	**Determine** the conditional probability of interdependent events (knowledge, understanding and application) which occur in **the complex engineering problems involving uncertainty** by using ratios, set theory (**principles of mathematics)**.	**2**
	PO4	The conditional probabilities of interdependent events will be **quantitatively measured** by using Bayes law.	**1**
CO2	**PO 1**	**Explain** (understanding) the role of random variables and simulation of random events (Apply) in solving **complex engineering problems involving random events and uncertainty** by using Mathematical functions (**principles of mathematics).**	**2**
CO3	**PO 1**	**Calculate** the expected values, variances (Application) of the discrete and continuous random variables (knowledge) for making decisions in **complex engineering problems under randomized probabilistic conditions** by using **principles of mathematics**.	**2**
	PO 4	The expected values, variances for the given discrete random variables will be **quantitatively measured** by using **statistical computer software** (R-software, SPSS-software).	**1**
CO4	**PO 1**	**Interpret** the Probability distributions such as Binomial, Poisson and Normal distribution (Understanding**)** with the support of evaluation of integrals (**principles of mathematics)** and appreciate their importance and applicability (Apply) in solving **complex engineering problems involving uncertainty**.	**2**
CO5	**PO 1**	**Apply** the concepts of discrete and continuous probability distributions which involves the role of Arithmetic mean, median, mode and variance, mathematical functions **(principles of mathematics)** for **solving complex engineering problems under probabilistic conditions**	**2**
	PO 2	Understand the **statement and formulation** of a complex engineering problem which involves the events of uncertainty, **Model** it with suitable probability distribution and **Apply** the concepts of discrete or continuous distributions along with basic principles of mathematics to **develop the solution** and reaching substantiated conclusions by the **interpretation of results**	**5**
CO6	**PO 1**	**Interpret** (Understand) the results of Bivariate and Multivariate Regression and Correlation Analysis by using ratios, square roots, straight lines and planes (**principles of mathematics)** for statistical forecasting (Apply) **in complex engineering problems involving bivariate or multivariate data.**	**2**
	PO 4	**Interpret** the results of Bivariate and Multivariate Regression and **quantifying** the degree of closeness between two or more variables by using **statistical computer software** (R-software, SPSS-software).	**1**
CO7	**PO 1**	**Identify** the role of types of statistical hypotheses, types of errors, sampling distributions of means and confidence intervals with the aid of statements and sets, percentages (**principles of mathematics)** in hypothesis testing of **complex engineering problems which requires sampling inspections**.	**2**
CO8	**PO 1**	**Apply** tests of hypotheses which involves the role of mathematical tools like statements, sets, ratios and percentages	**2**

		(**principles of mathematics)** for both large samples and small samples (knowledge) in making decisions over statistical claims that arise **in complex engineering problems which requires sampling inspections**.	
	PO 2	Understand the **statement and formulation** of a complex engineering problem which needs verification of truth values of numerical or statistical hypothesis, collect **the necessary information and data** through sampling techniques, **apply** tests of hypotheses (both large and small samples) along with basic principles of mathematics to **develop the solution** and reaching substantiated conclusions by the **interpretation of results**	**5**
CO9	**PO 1**	**Test for** the assessment of goodness of fit of the given probability distribution model (knowledge) which is fit to analyze the **complex engineering problem governed by laws of probability** with the support of **principles of mathematics** and Chi-square distribution	**2**
	PO 4	**Test for** the assessment of goodness of fit of the given probability distribution model by using **statistical quantitative methods and statistical computer software** (R-software, SPSS-software).	**1**
CO10	**PO 1**	**Make Use of** R software package (Apply) in computing confidence intervals, statistical averages and hypothesis testing(understand) while handling **complex engineering problems which requires sampling inspections** with the knowledge of statements and sets, percentages and intervals (**principles of mathematics)**.	**2**
	PO 5	**Make Use of R software package** a in modelling complex Engineering activities which involves computation of confidence intervals, statistical averages and regression analysis, hypothesis testing.	**1**
	PO 4	**Make Use of R software** package in computing confidence intervals, statistical averages and hypothesis testing**. (Computer software relevance)**	**1**
CO11	**PO 1**	**Select** appropriate statistical methods(understand) for solving some real-time **complex engineering problems governed by laws of probability** with the knowledge of **fundamental principles of mathematics.**	**2**

XII. NUMBER OF KEY COMPETENCIES FOR CO – PO MAPPING:

Course Outcomes	**Program Outcomes / No. of key competencies**												**Program Specific Outcomes / No. of key competencies**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
	3	**10**	**10**	**11**	**1**	**5**	**3**	**3**	**12**	**5**	**12**	**12**	**1**	**2**	**2**
CO 1	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-

CO 4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 6	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 7	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 8	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 9	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 10	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-
CO 11	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

XIII. PERCENTAGE OF KEY COMPETENCIES FOR CO – PO MAPPING:

Course Outcomes	**Program Outcomes / No. of key competencies**												**Program Specific Outcomes / No. of key competencies**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
	3	**10**	**10**	**11**	**1**	**5**	**3**	**3**	**12**	**5**	**12**	**12**	**1**	**3**	**2**
CO 1	66.7	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 2	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 3	66.7	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 4	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 5	66.7	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 6	66.7	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 7	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 8	66.7	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 9	66.7	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 10	66.7	0.0	0.0	9.0	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CO 11	66.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

XIV. COURSE ARTICULATION MATRIX (PO – PSO MAPPING)

COs and POs and COs and PSOs on the scale of 0 to 3, **0** being **no correlation**, **1** being the **low correlation**, **2** being **medium correlation** and **3** being **high correlation**.

0 – **0**≤ ***C***≤ 5% – No correlation
1 – 5 <***C***≤ 40% – Low/ Slight
2 – 40 % <***C***< 60% –Moderate
3 – 60% ≤ ***C***< 100% – Substantial /High

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 6	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 7	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 8	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 9	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO 10	3	-	-	1	3	-	-	-	-	-	-	-	-	-	-
CO 11	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 12	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-
TOTAL	33	4		5	3										
AVERAGE	**3**	**2**		**1**	**3**										

XV. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1,PO 2, PO 4,PO 5	SEE Exams	PO 1,PO 2, PO 4,PO 5	Assignments	-	Seminars	PO 1, PO 2, PO 4, PO 5
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	PO1, PO2, PO4, PO5						

XVI. ASSESSMENT METHODOLOGIES – INDIRECT

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

XVII. SYLLABUS

Module-I	PROBABILITY AND RANDOM VARIABLES
Probability, Conditional Probability, Baye's Theorem; Random variables: Basic definitions, discrete and continuous random variables; Probability distribution: Probability mass function and probability density functions; Mathematical expectation.	
Module-II	**PROBABILITY DISTRIBUTION**
Binomial distribution; Mean and variances of Binomial distribution, Recurrence formula for the Binomial distribution; Poisson distribution: Poisson distribution as a limiting case of Binomial distribution, mean and variance of Poisson distribution, Recurrence formula for the Poisson distribution; Normal distribution; Mean, Variance, Mode, Median, Characteristics of normal distribution.	
Module-III	**CORRELATION AND REGRESSION**
Correlation: Karl Pearson's Coefficient of correlation, Computation of correlation coefficient, Rank correlation, Repeated Ranks; Properties of correlation. Regression: Lines of regression, Regression coefficient, Properties of Regression coefficient, Angle between two lines of regression; Multiple correlation and Regression.	
Module-IV	**TEST OF HYPOTHESIS - I**
Sampling: Definitions of population, Sampling, Parameter of statistics, standard error; Test of significance: Null hypothesis, alternate hypothesis, type I and type II errors, critical region, confidence interval, level of significance. One sided test, two-sided test. Large sample test: Test of significance for single mean, Test of significance for difference between two sample means, Tests of significance single proportion and Test of difference between proportions.	
Module-V	**TEST OF HYPOTHESIS - II**
Small sample tests: Student t-distribution, its properties: Test of significance difference between sample mean and population mean; difference between means of two small samples. Snedecor's F-distribution and its properties; Test of equality of two population variances Chi-square distribution and it's properties; Chi-square test of goodness of fit.	
Text Books:	
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014. 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2012.	
Reference Books:	
1. N. P. Bali, "Engineering Mathematics", Laxmi Publications, 9th Edition, 2016. 2. S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand & Co., 10th Edition, 2000. 3. Richard Arnold Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, 8th Edition, 2013.	

XVIII. COURSE PLAN:

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

Lecture No	Topics to be covered	Course Outcomes	Reference
1	Define the concept of probability and its applications	CO 1,CO 11	T2:26.3
2-3	Describe the concept of conditional probability	CO 1,CO 11	R2:21.48
4-5	Describe the Concept of Baye's Theorem	CO 1,CO 11	T2:26.6 R2:21.50
6-7	Describe the concept of Random variables, contrast discrete Random variables and also calculate the mean and variance of discrete Random variables, probability distribution	CO 2,CO 11	T2:26.7 R2:21.51
8-9	Recall the continuous probability function	CO 2,CO 11	T2:26.8
10-11	Identify mathematical expectation	CO 3,CO 11	T2:26.10
12-13	Recall characteristics of the Binomial Distribution and find mean, variance	CO 4,CO 5, CO 11	T2:26.14 R2:21.55
14-15	Recognize cases where Poisson Distribution could be appropriate model to find mean and variance	CO 4,CO 5, CO 11	T2:26.15 R2:21.58
16-18	Apply Normal Distributions find the probability over a set of values, mean and variance	CO 4,CO 5, CO 11	T2:26.16 R2:21.61
19-20	Recognize the limitation of correlation as a summary of bivariate data.	CO 6, CO 10, CO 11	T2:25.12 R2:21.24
21-22	Interpret the correlation between the bivariate data by allotting ranks.	CO 6, CO 10, CO 11	T2:25.16 R2:21.29
23	Correlation properties	CO 6, CO 10, CO 11	T2:25.14 R2:21.31
24-25	Recognize the multiple correlation and regression of bivariate data	CO 6, CO 10, CO 11	T2:25.14 R2:21.33
26-27	Calculate the Karl Pearson's correlation coefficient for the given data	CO 6, CO 10, CO 11	R2:21.33
28	Calculate the Spearman's rank correlation coefficient for the given data.	CO 6, CO 10, CO 11	T2:27.2 R2:21.64
29	Understand Regression coefficients and their properties	CO 6, CO 10, CO 11	T2:27.2
30	Define the concept of least squares estimation in linear regression	CO 6, CO 10, CO 11	T2:27.2 R2:21.67
31-33	Estimate the linear model to a bivariate data to the line of regression	CO 6, CO 10, CO 11	T2:27.2
34	Understand the foundation for classical inference involving hypothesis testing and two types of errors possible	CO 7, CO 10, CO 11	T2:27.3 R2:21.71
35	Explain level of significance confidence interval	CO 7, CO 10, CO 11	T2:27.4 R2:21.68
36	Identify the confidence interval with single mean	CO 8, CO 10, CO 11	T2:27.7 R2:21.74
37	Identify the confidence interval with difference between the mean	CO 8, CO 10, CO 11	T2:27.12 R2:21.75
38	Identify the confidence interval with difference between the proportions	CO 8, CO 10, CO 11	T2:27.8 R2:21.72
39	Identify the confidence interval with difference between the proportions	CO 8, CO 10, CO 11	T2:27.8 R2:21.73

Lecture No	Topics to be covered	Course Outcomes	Reference
40-41	Recall the definition of a t-statistics in terms of statistics of sample from a normal distribution	CO 8, CO 10, CO 11	T2:27.14 R2:21.78
42	Apply the definition of F-distribution	CO 8, CO 10, CO 11	T2:27.19 R2:21.814
43	Apply the definition of χ^2 –Distribution	CO 9, CO 10, CO 11	T2:27.12 R2:21.82
44-45	Apply χ^2 - distribution of goodness of fit	CO 9, CO 10, CO 11	T2:27.18 R2:21.82

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

S No	Description	Proposed Actions	Relevance with POs
1	Introduction to R software	Seminars/NPTEL	PO 5
2	Statistical quality control charts	Seminars	PO 1

Prepared by
Mr. Ch Chaitanya, Assistant Professor

HOD, FE