

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	PROB	ABII	LITY AND STA	FISTICS		
Course Code	AHS01	AHS010				
Programme	B.Tech	B.Tech				
	Π	CSE	E IT			
Semester	III	ME	CE			
Course Type	Founda	Foundation				
Regulation	IARE - R16					
			Theory		Practical	
Course Structure	Lectu	ires	Tutorials	Credits	Laboratory	Credits
	3		1	4	-	-
Chief Coordinator	Mr. J S	uresh	Goud, Assistant	Professor		
Course Faculty	Ms. P S Ms. B I	Srilatl Prave	na, Assistant Prof ena, Assistant Pr	essor ofessor		

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes probability, random variables, probability distributions, correlation, regression, sampling distribution, testing of hypothesis and analysis of variance. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	
-			Basic principles of statistics	

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Probability and Statistics	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

~	Chalk & Talk	>	Quiz	~	Assignments	×	MOOCs
~	LCD / PPT	~	Seminars	×	Mini Project	~	Videos
×	Open Ended Experim	ments					

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 units and each unit 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 unit. 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 25 marks for Continuous Internal Examination (CIE), 05 marks for Quiz/ Alternative Assessment Tool (AAT).

Component	Theory		Total Marka	
Type of Assessment	CIE Exam	Quiz / AAT	i otar wiarks	
CIA Marks	25	05	30	

Table 1: Assessment pattern for CIA

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 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five 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 / Alternative Assessment Tool (AAT):

Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Marks shall be awarded considering the average of two quizzes for every course. The AAT may include seminars, assignments, term paper, open ended experiments, five minutes video and MOOCs.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)	Strength	Proficiency assessed by
Engineering knowledge: Apply the knowledge of	3	Presentation on
mathematics, science, engineering fundamentals, and an		real-world
engineering specialization to the solution of complex		problems
engineering problems.		
Problem analysis: Identify, formulate, review research	2	Seminar
literature, and analyze complex engineering problems reaching		
substantiated conclusions using first principles of mathematics,		
natural sciences, and engineering sciences		
Conduct investigations of complex problems: Use research-	1	Term Paper
based knowledge and research methods including design of		
experiments, analysis and interpretation of data, and synthesis		
of the information to provide valid conclusions.		
	Program Outcomes (POs)Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.Problem analysis: Identify, formulate, review research 	Program Outcomes (POs)StrengthEngineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.3Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences2Conduct 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

3 = High; **2** = Medium; **1** = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

	Program Specific Outcomes (PSOs)	Strength	Proficiency assessed by
PSO 1	Professional Skills: The ability to understand, analyze and	1	Seminar
	develop computer programs in the areas related to algorithms,		
	system software, multimedia, web design, big data analytics,		
	and networking for efficient analysis and design of computer -		
	based systems of varying complexity.		
PSO 2	Software Engineering Practices: The ability to apply standard	-	-
	practices and strategies in software service management using		
	open-ended programming environments with agility to deliver		
	a quality service for business success.		
PSO 3	Successful Career and Entrepreneurship: The ability to	-	-
	employ modern computer languages, environments, and		
	platforms in creating innovative career paths to be an		
	entrepreneur, and a zest for higher studies.		

3 = **High; 2** = **Medium; 1** = **Low**

VIII. COURSE OBJECTIVES (COs):

The course s	hould enable the students to:
т	Enrich the knowledge of probability on single random variables and probability
1	distributions.
II	Apply the concept of correlation and regression to find covariance.
III	Analyze the given data for appropriate test of hypothesis.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO	CLO's	At the end of the course, the student will	PO's	Strength of
Code		have the ability to:	Mapped	Mapping
AHS010.01	CLO 1	Understand the basic concepts of probability	PO 1	3
		and random variables.		
AHS010.02	CLO 2	Analyze the concepts of discrete and	PO 1	3
		continuous random variables, probability		
		distributions, expectation and variance.		
AHS010.03	CLO 3	Use the concept of random variables in real-	PO 1	3
		world problem like graph theory, machine		
		learning, Natural language processing.		
AHS010.04	CLO 4	Apply the binomial distribution and poisson	PO 2	2

		distribution to find mean and variance.		
AHS010.05	CLO 5	Understand binomial distribution to the	PO 2	2
		phenomena of real-world problem like sick		
		versus healthy.		
AHS010.06	CLO 6	Use poission distribution in real-world	PO 2	2
1112010100	0200	problem to predict soccer scores.	102	_
AHS010.07	CLO 7	Apply the inferential methods relating to the	PO 4	1
/1115010.07		means of normal distributions	101	1
AHS010.08	CLO8	Understand the mapping of normal	PO 4	1
7115010.00	CLO 0	distribution in real-world problem to analyze	104	1
		the stock market		
AH\$010.09	CLO9	Explain multiple random variables and the	PO 2	2
Alisolo.07	CLO)	covariance of two random variables	102	2
AUS010 10	CLO 10	Understand the concept of multiple random	PO 2	2
A115010.10		variables in real world problems aspects of	102	2
		variables in real-world problems aspects of		
	CLO 11	Calculate the correlation system.	DO 1	2
AH5010.11	CLUII	calculate the correlation coefficient to the	FUT	5
AU\$010.12	CLO 12		DO 1	2
AHS010.12	CLO 12	Understand the correlation and regression to	POI	3
		the real-world such as stock price and interest		
AUG010.10	OT 0 12	rates.	DO 1	2
AHS010.13	CLO 13	Calculate the regression to the given data.	POI	3
AHS010.14	CLO 14	Understand the concept of sampling	PO I,	3
		distribution of statistics and in particular	PO 2	
	<u> </u>	describe the behavior of the sample mean.	DO 0	
AHS010.15	CLO 15	Understand the concept of estimation for	PO 2	2
		classical inference involving confidence		
		interval.		
AHS010.16	CLO 16	Understand the concept of estimation in real-	PO 2	2
		world problems of signal processing.		
AHS010.17	CLO 17	Understand the foundation for hypothesis	PO 1,	3
		testing.	PO 2	
AHS010.18	CLO 18	Understand the concept of hypothesis testing	PO 1,	3
		in real-world problem to selecting the best	PO 2	
		means to stop smoking.		
AHS010.19	CLO 19	Apply testing of hypothesis to predict the	PO 1,	3
		significance difference in the sample means.	PU 2	
AHS010.20	CLO 20	Apply testing of hypothesis to predict the	PO 1,	3
		significance difference in the sample	PO 2	
		proportions.		
AHS010.21	CLO 21	Apply Student t-test to predict the difference	PO 1	3
		in sample means.		
AHS010.22	CLO 22	Apply F-test to predict the difference in	PO 1	3
		sample variances.		
AHS010.23	CLO 23	Understand the characteristics between the	PO 1	3
		samples using Chi-square test.		
AHS010.24	CLO 24	Understand the assumptions involved in the	PO 4	1
		use of ANOVA technique.		
AHS010.25	CLO 25	Understand the concept ANOVA to the real-	PO 4	1
		world problems to measure the atmospheric		
		tides.		

CLOs	Program Outcomes (POs)									Program Specific Outcomes (PSOs)					
CLOS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3												1		
CLO 2	3												1		
CLO 3	3												1		
CLO 4		2													
CLO 5		2													
CLO 6		2													
CLO 7				2											
CLO 8				1											
CLO 9		3											1		
CLO 10		2											1		
CLO 11	3														
CLO 12	3														
CLO 13	3														
CLO 14	3	2											1		
CLO 15		2													
CLO 16		2													
CLO 17	3	2											1		
CLO 18	3	2											1		
CLO 19	2	2											1		
CLO 20	3	1											1		
CLO 21	3														
CLO 22	3														
CLO 23	2														
CLO 24				2											
CLO 25				1											
CLO 26															

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

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

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

XII. ASSESSMENT METHODOLOGIES - INDIRECT

~	Early Semester Feedback	>	End Semester OBE Feedback
×	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

Unit-I	SINGLE RANDOM VARIABLES AND PROBABILITY DISTRIBUTION				
Random varia Probability r distribution, I	ables: Basic definitions, discrete and continuous random variables; Probability distribution: nass function and probability density functions; Mathematical expectation; Binomial Poisson distribution and normal distribution.				
Unit-II	MULTIPLE RANDOM VARIABLES				
Joint probable density funct coefficient, th	lity distributions, joint probability mass, density function, marginal probability mass, ions; Correlation: Coefficient of correlation, the rank correlation; Regression: Regression e lines of regression, multiple correlation and regression.				
Unit-III	SAMPLING DISTRIBUTION AND TESTING OF HYPOTHESIS				
Sampling: De of sample me sampling dist	finitions of population, sampling, statistic, parameter; Types of sampling, expected values an and variance, sampling distribution, standard error, sampling distribution of means and ribution of variance.				
Estimation: I hypothesis, ty test, two side	Point estimation, interval estimations; Testing of hypothesis: Null hypothesis, alternate ppe I and type II errors, critical region, confidence interval, level of significance. One sided d test.				
Unit-IV	LARGE SAMPLE TESTS				
Test of hypo	thesis for single mean and significance difference between two sample means, Tests of				
significance of	difference between sample proportion and population proportion and difference between				
two sample p	roportions.				
Unit-V	SMALL SAMPLE TESTS AND ANOVA				
Small sample mean and pop and its prop properties; T square test of classification	tests: Student t-distribution, its properties: Test of significance difference between sample pulation mean; difference between means of two small samples. Snedecor's F-distribution erties; Test of equality of two population variances Chi-square distribution and it's est of equality of two population variances Chi-square distribution, it's properties, Chi- of goodness of fit; ANOVA: Analysis of variance, one way classification, two way				
Text Books:					
1. Erwin Kre 2014.	eyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9 th Edition,				
2. B. S. Grew	ai, righer Engineering Mathematics, Khanna Publishers, 45 Edition, 2012.				
1 TKV Ivenger B Krishne Gendhi "Probability and Statistics" S Chand & Co. 6 th Edition 2014					
 G.C.Beri, "Business Statistics", Tata McGraw-Hill Publications, 2nd Edition, 2005. 					

3. Richard Arnold Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, 8th Edition, 2013.

XIV. COURSE PLAN:

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

Lecture No	Topics to be covered	Course Learning Outcomes	Reference
1	Describe the concept of Pandom variables and	(CLOS)	T1.22.5
1	Contrast discrete Random variables and calculate the mean and	CLUI	P1.22.3
	variance of discrete Random variables		K1.2.5
2	Recall the continuous probability function	CLO 2	T1:22.5
			R1:2.4
3	Identify mathematical mean	CLO 2	R1:22.6
4-5	Recall characteristics of the Binomial Distribution and find mean,	CLO 4	T1:22.7
67	Valiance Decognize coses where Deisson Distribution could be enpropriete		K1:4.4
0-7	model to find mean and variance	CLO 4	11.22.7 R1.4.10
8-9	Apply Normal Distributions find the probability over a set of		T1.22.8
0-7	values mean and variance	CLO /	R1·4 15
			T1:22.9
10	Apply probability distribution	CLO 9	R1:5.4
11	Apply marginal probability density function	CLO 9	T1:22.9
11			R1:5.8
12-13	Recognize the limitation of correlation as a summary of bivariate	CLO 11	T1:23.10 R1:68
14	Interpret the correlation between the bivariate data by allotting	CLO 11	T1·23 10
	ranks.	02011	R1:6.13
15.16		GL 0, 12	T1:23.9
15-16	Define the concept of least squares estimation in linear regression	CL0 13	R1:7.5
17	Estimate the linear model to a bivariate data	CLO 11	T1:23.10
		02011	R1:7.5
18	Recognize the multiple correlation of bivariate data	CLO 9	T1:23.10 R1:8.1
19	Recall the sampling distribution of the sample mean in general	CLO 14	T1:23.1
	situation		R1:9.2
20	Distinguish between a population and a sample and between	CLO 14	T1:23.1
	parameters & statistics		R1:9.4
21	Recall the sampling distribution and define standard error	CLO 14	T1:23.1
22.22	Decell the compliant distribution of the complement in compared		RI:9.9
22-23	situation	CLO 14	P1:25.1
24.25	Interpret the confidence interval and confidence level	CL O 14	T2.27.5
24-23	interpret the confidence interval and confidence level	CLO 14	R1.10.2
26	Understand the foundation for classical inference involving	CLO 17	T2:27.7
	hypothesis testing and two types of errors possible	02017	R1:11.3
27		CL O 17	T2:27.8
27	Explain level of significance confidence interval	CLO 17	R1:11.6
28-30	Identify the confidence interval with single mean	CLO 19	T2:27.12
			R1:11.7
31-32	Identify the confidence interval with difference between the mean	CLO 19	T2:27.12
22.24			KI:11.8
55-34	Identify the confidence interval with difference between the	CLO 20	12:27.12 D1.110
35 26	Identify the confidence interval with difference between the	CLO 20	T2.27 12
35-50	proportions		R1:11.10

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
37-38	Recall the definition of a t-statistics in terms of statistics of sample from a normal distribution	CLO 21	T2:27.14 R1:12.3
39	State and apply the definition of F-distribution	CLO 22	T2:27.1 R1:12.7
40-41	State and apply the definition of χ^2 –Distribution	CLO 23	T2:27.17 R1:12.15
42	Apply Chi-square distribution	CLO 23	T2:27.18 R1:12.19
43-44	Apply One way classification	CLO 24	T2:27.19 R2:14.4
45	Apply Two way classification	CLO 24	T2:27.19 R2:14.5

XV. 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	PO 1	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 4	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 2	PSO 1

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HOD, FRESHMAN ENGINEERING