Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BMA501 – Probability and Statistics For Civil Engineers

Fifth Semester, 2017-18 (Odd Semester)

Course (catalog) description

To develop a thorough understanding of the methods of probability and statistics which are used to model engineering problems.

Compulsory/Elective course : Compulsory for Civil students

Credit /Contact hours : 4 credits / 75 hours

Course Coordinator : Dr.Ramya,

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr.Ramya,	Third year Civil	Civil Block			9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites : Numerical method

Assumed knowledge : To develop a thorough understanding of the methods of probability and statistics which are used to model engineering problems.

Following courses : NIL

Syllabus Contents

UNIT I PROBABILITY AND RANDOM VARIABLES 9

Sample space, Random experiments and random variables, Concept of probability, Conditional probability, Addition and multiplication laws, Baye's theorem - One dimensional Random VariablesExpectation, Variance, Covariance, and Moments.

UNIT II THEORETICAL DISTRIBUTIONS DISCRETE: 9

Binomial, Poisson, Geometric, Negative Binomial; Continuous: Exponential and Normal Distributions, their properties and applications to industrial problems.

UNIT III TESTING OF HYPOTHESIS 9

Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportion, Small sample tests based on t, distributions- Test for single mean, difference between means, standard deviation, difference between standard deviation. Chisquare test for goodness of fit, independence of attributes.

UNIT IV CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE 9

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression-Concepts – Regression lines – Multiple correlation and regression. Analysis of Variance- One-way classification and two way classification.

UNIT V STATISTICAL QUALITY CONTROL 9

Introduction – Process control – control charts for variables - X and R, X and S charts control charts for attributes: p chart, np chart, c chart and their applications in process control.

TEXT BOOKS:

1. 1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 9th extensively revised edition, Sultan Chand & Sons, 1999
2. 2. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.

REFERENCE:

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics", McGraw-Hill, New Delhi, 1998.
3. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill,1st Reprint 2004.

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	100%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%

Broad area: Methods of probability and statistics

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

H: high correlation, M: medium correlation, L: low correlation

To develop a thorough understanding of the methods of probability and statistics which are used to model engineering problems.	Correlates to program outcome		
	H	**M**	**L**
1. To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution	a,e,	b,d	
2. Plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse using various conventional instruments	b	e	
3. To learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.	a,e		
4. To understand how regression analysis can be used to develop an equation that estimates how two variables are related and how the analysis of variance procedure can be used to	a	d	

determine if means of more than two populations are equal.			
5. To understand the fundamentals of quality control and the methods used to control systems and processes.		e	

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**PROBABILITY AND RANDOM VARIABLES**		
1.	Sample space, Random	Yes	[T1, R2]
2.	experiments and random variables	Yes	
3.	Concept of probability	Yes	
4.	Conditional probability	Yes	
5.	Addition and multiplication laws	Yes	
6.	Baye's theorem	Yes	
7.	One dimensional Random Variables, Expectation	Yes	
8.	Variance	Yes	
9.	Covariance, and Moments	Yes	
UNIT II	**THEORETICAL DISTRIBUTIONS DISCRETE:**		
10.	Binomial	Yes	[T1, T2 & R3]
11.	Poisson	Yes	
12.	Geometric	Yes	
13.	Negative Binomial	Yes	
14.	Continuous Distributions	Yes	
15.	Exponential Distributions	Yes	
16.	Normal Distributions	Yes	
17.	Properties of Continuous, Exponential and Normal distribution	Yes	
18.	Applications to industrial problems	Yes	
UNIT III	**TESTING OF HYPOTHESIS**		
19.	Introduction– Large sample tests based on normal distribution	Yes	[T1, T2 & R3]
20.	Test for single mean	Yes	
21.	Difference between means, proportion	Yes	
22.	Difference between proportion	Yes	
23.	Small sample tests based on t, distributions	Yes	
24.	Test for single mean, difference between means, standard deviation	Yes	
25.	difference between standard deviation	Yes	
26.	Chi square test for goodness of fit	Yes	
27.	Independence of attributes	Yes	
UNIT IV	**CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE**		
28.	Pearson's Correlation coefficient	Yes	[T1, T2 & R3]
29.	Spearman's Rank correlation coefficient	Yes	
30.	Regression-Concepts	Yes	
31.	Regression lines	Yes	
32.	Multiple correlation	Yes	
33.	Regression.	Yes	

34.	Analysis of Variance	Yes	
35.	-One-way classification	Yes	
36.	Two way classification	Yes	
UNIT V	**STATISTICAL QUALITY CONTROL**		
37.	Introduction	Yes	
38.	Process control	Yes	
39.	Control charts for variables - X and R chart	Yes	
40.	Control charts for variables - X and S chart	Yes	
41.	Control charts for attributes: p chart	Yes	[T1, T2 & R3]
42.	Control charts for attributes: np chart	Yes	
43.	Control charts for attributes: c chart	Yes	
44.	Applications in process control – p,np chart	Yes	
45.	Applications in process control - c chart	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

Prepared by: Dr.Ramya, Professor , Department of Maths **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / Civil / program by the time that they graduate:

a. An ability to apply knowledge of mathematics, science, and engineering
b. An ability to design and conduct experiments, as well as to analyze and interpret data
c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. An ability to function on multidisciplinary teams
e. An ability to identify, formulate, and solve engineering problems
f. An understanding of professional and ethical responsibility
g. An ability to communicate effectively
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. A recognition of the need for, and an ability to engage in life-long learning
j. A knowledge of contemporary issues
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

Course Teacher	Signature
Dr.Ramya,	

Course Coordinator **HOD/CIVIL**