University of Engineering and Management

Institute of Engineering & Management, Salt Lake Campus
Institute of Engineering & Management, New Town Campus
University of Engineering & Management, Jaipur

Syllabus for B. Tech Admission Batch 2023

Subject Name: Mathematics - III   **Credit: 3**

Subject Code: BSM301   **Lecture Hours: 42**

Pre-Requisites: Permutation & Combination, Concept of Basic Probability, Evaluation of definite, improper and infinite integrals, Concept of β & Γ functions.

Relevant Links:

Coursera: Probability & Statistics   https://www.coursera.org/learn/machine-learning-probability-and-statistics
NPTEL   Advanced Engineering Mathematics   https://onlinecourses.nptel.ac.in/noc24_ma03/preview

Study Material Link (BL 4, 5,6)

https://drive.google.com/drive/folders/19umqy3stib1-wuHy0h-p0arM0NkIzdxC?usp=sharing

COURSE OBJECTIVES:

1. The syllabus will prepare the learners for Engineering Exit Examinations, ESE and campus placements.

2. Students will apply concepts of various probability distributions to find probabilities.

3. Students will make estimations for a mean, variance, standard deviation and proportions for big data.

4. Students will be eligible to work in the Data domain which is the emerging technology of the future

and create more opportunities for creative work.

5. Students will be able to describe and quantify the uncertainty inherent in predictions made by machine learning models.

COURSE OUTCOMES:

CO	Course Outcomes
CO 1	Illustrate the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment that will make a bridge between elementary statistical tools and probability theory.
CO 2	Find the inter-relation between two or more phenomena with the help of curve fitting.
CO 3	Understand the basic components of sampling and have the knowledge on exact sampling distributions which are essential for estimating and testing hypothetical statements. Know the various sampling methodologies and their efficiencies in theoretical and practical aspects.
CO 4	Estimate and test the parameters associated with the relevant areas for forecasting and verification of economic theory
CO 5	Apply the statistical tools in business, economical and commercial areas for analyzing problems and to make better decisions for future in their fields.

Detailed Syllabus:

Module No.	Topic	Sub-topics	Mapping with Chapters of the Text Book	Mapping with Industry & International Academia	Lecture hour	Corresponding Lab Assignment
1	**Random Variables and Probability Distributions**	*Discrete Random Variable:* Discrete Probability Distribution, Expectation and Variance of random variables; Binomial and Poisson Distributions; Mean, Variance and Moment Generating Functions of Binomial and Poisson Variates; Convergence of Binomial to Poisson Variate. *Continuous Random Variable;* Continuous Probability Distributions, Expectation and Variance of random variables, Exponential, Normal Distributions; Mean, Variance and Moment Generating Functions of the corresponding variates.	Chapters 2 and 3/Text Book 1 Chapter 12 /Text Book 2	https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/	**12**	"R" software for statistical computing
2	**Method of Least Squares and Curve Fitting**	Principle of Least Squares, Curve fitting by the method of Least Squares - fitting of straight lines, second degree parabolas and exponential curves.	Chapter 9/Text Book 1 Chapter 8 /Text Book 2	https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/	**4**	"stata": statistical software for data science

3	**Sampling and Sampling Distributions**	Population and Sample, Sampling With and Without Replacement (SRSWR and SRSWOR); Random Samples, Population Parameters, Sample Statistics, Sampling Distributions, Standard Error and Probable Error; Sample Mean, Sampling Distribution of Means; Sample Proportion, Sampling Distribution of Proportions, Sample Variances, Sampling Distribution of Variances; Case where Population Variance is unknown; Central Limit Theorem (Statement only); Degrees of freedom, Chi-square distribution, Mean & Variance of Chi-square variate.	Chapter 11 /Text Book 1 Chapter 13/Text Book 2	https://www.cl.cam.ac.uk/teaching/2021/IntroProb/materials.html	8	"stata": statistical software for data science
4	**Estimation of Parameters**	Point and Interval estimations, Biased and Unbiased estimators, Minimum Variance Unbiased Estimator (MVUE), Consistent Estimator, Maximum Likelihood Estimation of Parameters, Applications in populations following theoretical distributions (Binomial, Poisson and Normal), Calculation of confidence limits for population mean and population proportions.	Chapter 12 /Text Book 1 Chapters 14/ Text Book 2	https://ocw.mit.edu/courses/1-010-uncertainty-in-engineering-fall-2008/	6	"R" software for statistical computing
5	**Testing of Hypothesis**	*Large Sample Test*: Statistical Hypotheses, Test Statistic, Best Critical Region, Test for single mean, difference of means, single proportion, difference of proportions, and difference of standard deviations.	Chapter 13/ Text Book 1 Chapter 14?Text Book 2	https://ocw.mit.edu/courses/6-041-probabilistic-systems-analysis-and-	12	"R" software for statistical computing

		Small Sample Test: Test for single mean, difference of means and correlation coefficients, Test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.		applied-probability-fall-2010/	

TEXT BOOK:

1. Saktipada Nanda and Sibashis Nanda , "A Course on Probability & Statistics", 2nd Edition (2024), Mindprobooks Academic Series [Available in flipkart.com/amazon.in]

2. N.G.Das, "Statistical Methods", Combined Edition Vol. 1 &2 (2017) McGraw Hill Education

REFERENCE BOOKS:

1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 6th Edition (2020), Academic

2. Douglas C, Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 7th edition (2018), John Wiley & Sons.

3. Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, "Schaum's Outline of Probability & Statistics" , 4th Edition (2012), McGraw Hill Education.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	1	1	2	1
CO2	3	3	3	3	2	1	1	1	1	1	2	1
CO3	3	3	3	3	2	1	1	1	1	1	2	1
CO4	3	3	3	3	2	1	1	1	1	1	2	1
CO5	3	3	3	2	2	2	1	2	2	2	3	2

3: Strong correlation
2: Medium correlation
1: Weak correlation

PSO	PSO Description
PSO1	**Technical knowledge and analysis:** Apprehend and analyze specific engineering problems of communication, networking, electrical & electronics circuits, signal processing, computer programming, embedded systems, VLSI design and semiconductor technology by applying the knowledge of basic sciences, engineering mathematics and engineering fundamentals.
PSO2	**Design and Implementation:** Ability to design and implement the acquired technical knowledge with proficiency in logical programming for applications in electronics & communication engineering.
PSO3	**Development of professional skill and professional ethics:** Ability to communicate effectively with excellent professional proficiency, interpersonal skills and demonstrate the practice of professional ethics for societal benefit.