



Kot Bhalwal, Jammu

Model Institute of Engineering  
& Technology (Autonomous)  
Course Handout

## COURSE HANDOUT

Introduction to Probability and Statistics (BSC-301)

CSE (AI/ML) – 3<sup>rd</sup> SEMESTER

ACADEMIC YEAR (2024-25)

**Dr. Pallavi Sharma**

Assistant Professor

Department of Applied Sciences and Humanities



Department of Computer Science & Engineering

Model Institute of Engineering & Technology (Autonomous)

Kot Bhalwal, Jammu - 181122

[www.mietjmu.in](http://www.mietjmu.in)



Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
BSC – 301	Introduction to Probability and Statistics	Core	3	2	1	0	50	100	150

### COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Understand the concept of number theory
CO2	Evaluate linear programming problems using graphical, simplex, and duality methods.
CO3	Understanding and analyzing queuing models and their characteristics in single and multi-server systems.
CO4	Apply non-parametric tests for statistical analysis and inference, and their advantages over parametric tests.
CO5	Assimilate the knowledge of Stochastic Process

#### Unit-I

Greatest Common Divisors and Prime Factorization: Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers  
Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

(8 Hours)

#### Unit-II

Linear Programming: Elementary theory of convex set, definition of general LPP, Formulation problem of LPP. Example of LPP, problem occurring in various fields, graphical and simplex method of solving an LPP, artificial variable, duality of LPP.

(8 Hours)

#### Unit-III

Queuing Theory: Introduction, elements of a Queuing model, Queuing process, Fundamental Structure of a Queueing System, Probability distributions in Queuing system, Classification of Queuing models (Single server and multi-server), Queueing Model Arrival-Departure Equations for M/M/1 Queueing Model Operating Characteristics for the M/M/1 Queueing Model.

(8 Hours)

#### Unit-IV

Concept of non-parametric tests, advantages of non-parametric tests over parametric tests. Sign test for single sample and two sample problems (for paired and independent samples), Wilcoxon-signed rank test, Mann-Whitney U-test, Run test, Median test and test for independence based on Spearman's rank correlation

(8 Hours)

#### Unit-V

Stochastic Processes and Markov Chains: Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n step transition probabilities, Markov chain, Steady state condition, Markov analysis.

(8 Hours)



**Textbooks**

S. No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub. Yr.)
1	Linear Programming methods and applications	Gass S. I	McGraw Hill.	1975
2	Probability, Statistics and Random Processes	P. Kousalya	Pearson Publishing house	2013
3	Probability & Statistics for Engineers & Scientists	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye	Pearson Publishers	9 <sup>th</sup> Edition

**Reference Books**

S. No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub. Yr.)
1	A First Course in Probability	S. Ross	Pearson	1 <sup>st</sup> (2013)
2	Introduction to Probability and Statistics for Engineers	Milan Holicky	Springer	5 <sup>th</sup> (2013)
3	Linear Programming: Methods & Applications	Gass S. I	New York: Dover Publications	2003

**COURSE PLAN**

Unit-I Greatest Common Divisors and Prime Factorization		
S. No	Topics	Recommended Books
1	Greatest Common Divisors	Book 3, Ch.2
2	The Euclidean Algorithm	Book 3, Ch.2
3	The Fundamental theorem of Arithmetic	Book 3, Ch.2
4	Factorization of Integers and the Fermat's Numbers	Book 3, Ch.2
5	Introduction to Congruences: Linear Congruences	Book 3, Ch.2
6	The Chinese Remainder Theorem	Book 3, Ch.2
7	Systems of Congruences	Book 3, Ch.2
Unit-II Linear Programming		
8	Elementary theory of convex set	Book 1, Ch.8
9	Definition of general LPP, Formulation problem of LPP and its examples.	Book 1, Ch.8
10	Problem occurring in various fields	Book 1, Ch.8
11	Graphical method of solving an LPP	Book 1, Ch.8
12	Simplex method of solving an LPP, artificial variable & duality of LPP.	Book 1, Ch.8
Unit-III Queuing Theory		
13	Introduction to Queuing theory & elements of a Queuing model	Book 2, Ch.13
14	Queuing process, Fundamental Structure of a Queuing System	Book 2, Ch.13



15	Probability distributions in Queuing system	Book 2, Ch.13
16	Classification of Queuing models (Single server and multi-server)	Book 2, Ch.13
17	Queuing Model Arrival-Departure Equations for M/M/1	Book 2, Ch.13
18	Operating Characteristics for the M/M/1 Queuing Model	Book 2, Ch.13
<b>Unit-IV Non-parametric tests</b>		
19	Concept of non-parametric tests & its advantages over parametric tests	Book 2, Ch.3
20	Sign test for single sample and two sample problems (for paired and independent samples)	Book 2, Ch.9
21	Wilcoxon-signed rank test	Book 2, Ch.9
22	Mann-Whitney U-test	Book 2, Ch.9
23	Run Test	
24	Median test and test for independence based on Spearman's rank correlation	Book 2, Ch.9
<b>Unit-V Stochastic Processes and Markov Chains</b>		
25	Introduction to Stochastic Processes- Markov Process	Book 1, Ch.9
26	Transition Probability Matrix	Book 1, Ch.9
27	First Order and Higher order Markov Process	Book 1, Ch.9
28	N step transition probabilities	Book 1, Ch.9
29	Markov Chain: Steady State Condition	Book 1, Ch.9
30	Markov Analysis	Book 1, Ch.8

#### ADDITIONAL WEB RESOURCES

1.	<b>NPTEL LINK:</b> <a href="https://archive.nptel.ac.in/courses/111/102/111102098/#">https://archive.nptel.ac.in/courses/111/102/111102098/#</a> This site contains video lectures on <b>Stochastic Processes</b> .
2.	<a href="https://nptel.ac.in/courses/112106134/">https://nptel.ac.in/courses/112106134/</a> This site contains video lectures on <b>Linear Programming</b>
3.	<a href="https://archive.nptel.ac.in/courses/111/103/111103159/">https://archive.nptel.ac.in/courses/111/103/111103159/</a> This site contains video lectures on <b>Queuing theory</b>
4.	<a href="https://www.youtube.com/watch?v=IcLSKko2tsg">https://www.youtube.com/watch?v=IcLSKko2tsg</a> This site contains video lectures on various topics of <b>non-parametric tests</b> .

#### GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 20 marks
- **Attendance:** 10 marks
- **Final Examination:** 100 marks

#### COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.



### FACULTY INFORMATION

- **Office Hours**  
Tuesday (12:55 PM - 1:45 PM)  
Wednesday (12:55 PM - 1:45 PM)
- **Contact Information**  
[pallavi.ash@mietjammu.in](mailto:pallavi.ash@mietjammu.in)