हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
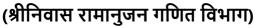# Central University of Himachal Pradesh
(Accredited by NAAC with 'A+' Grade with CGPA of 3.42)
(श्रीनिवास रामानुजन गणित विभाग)
(Srinivasa Ramanujan Department of Mathematics)

Course Name: Probability Theory
Course Code: MTH 413
Credits: 02
Course Instructor: Dr. Pankaj Kumar S/O Late Sh. Maniram
Credits Equivalent:
(One credit is equivalent to 10 hours of lectures / organized classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Attendance Requirements:
Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:
1.	Mid Term Examination:20%
2.	End Term Examination:60%
3.	Continuous Internal Assessment: 20%. i.e. 20 marks out of100

Course Outcomes
After completing the course satisfactorily, a student will be able:
•	To calculate probabilities by applying probability laws and theoretical results.
•	To understand the axiomatic formulation of modern Probability Theory.
•	To understand the Conditional Probability including the concept of Bayes' Theorem.
•	To characterize probability models and function of random variables based on single & multiples random variables.

Learning Outcomes
The deliverables Learning Outcomes of this paper with students are following:
•	Ability to distinguish between random and non-random experiments.
•	To calculate probabilities by applying probability laws and theoretical results.
•	Gain knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach.
•	Can explain the conditional probability including the concept of Bayes' Theorem,
•	Will possess the knowledge related to discrete and continuous random variable and its probability distribution including expectations.

Unit I
Classical Approach to Probability: Random Experiment an Events, Exhaustive Events, Favourable Events, Mutually Exclusive Events, Equally Likely Events, Classical Theory of Probability, Theorem of Total Probability, Compound Events, Theorem of Compound Events.   **(10 HRS)**
Practicum
- Solving the Exercises of the selected Chapters
- Implementation on the selected real world problems
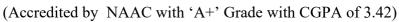- Performing simulations for the pattern of solutions

Unit II
Classical Approach to Probability: Set Theoretic Concepts, Function, Algebra and Sigma- Algebra, Sample Space, Events, Events Space, Probability Function, Probability Space, Conditional Probability, Independent Events, Bayes Theorem, Multiple Rule. Distribution function and Expectation. **(10 HRS)**
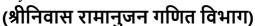**Practicum**
- Solving the Exercises of the selected Chapters
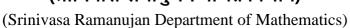- Implementation on the selected real world problems

- Performing simulations for the pattern of solutions

General Practicum:

i. Class Room Presentation
ii. Model/Chart/PowerPoint based presentations
iii. Assignment/ Write Up/Creative work
iv. Books/Journals Readings
v. Tutorials/PBL

Reference Books:

1. Miller, I. and Miller, Marylees. John E. Freund's :Mathematical Statistics with Application, 7th Ed, New Jersey: Prentice Hall, 2010.

2. S. C. Gupta , V. K. Kapoor, : Fundamentals of Mathematical Statistics, 12th Edition, Sultan Chand and Sons, 2020.