

**FIRST COURSE HANDOUT,
PROBABILITY THEORY (MTH309A),
2018-19 EVEN SEMESTER**

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1. PRE-REQUISITES

Familiarity with Real Analysis and basic Probability distributions will be assumed (MSO201 or MTH431).

2. COURSE CONTENTS AND REFERENCES

- Limits of sequences of sets, σ -field of events.
- Probability measure, probability space. Random variables, induced probability space, probability distribution.
- Distribution function, decomposition theorem.
- Expectation and moments, inequalities.
- Convergence theorems for expectations of sequences of random variables (monotone convergence theorem, Fatou's lemma, dominated convergence theorem).
- Various modes of convergence of sequences of random variables (in probability, almost surely, in r th mean).
- Convergence of sequences of distribution functions, Helly-Bray theorems, convergence of moments.
- Characteristic function and its properties, inversion formulae.
- Independence of events and random variables, zero one laws.
- Convergence of series of independent random variables, Kolmogorov inequality, Kolmogorov three-series criterion.
- Khintchin's weak law of large numbers, Kolmogorov strong law of large numbers. Central limit theorems of Lindeberg-Levy, Liapounov and Lindeberg-Feller.

References:

- Probability & Measure Theory (2nd Edition), Robert B. Ash and Catherine A. Doléans-Dade. Elsevier.
- A Course in Probability Theory (3rd Edition), Kai Lai Chung. Academic Press (Elsevier).
- Probability and Measure (3rd Edition), Patrick Billingsley. Wiley.

Supplementary texts:

- Probability: Theory and Examples (4th Edition), Rick Durrett. CUP.
- Probability Essentials (2nd Edition), Jean Jacod and Philip Protter. Springer.
- Probability with Martingales, David Williams, CUP.
- Modern Probability Theory (3rd Edition), B. R. Bhat, New Age International.
- Probability Theory - I (4th Edition), M Loève, Springer.

3. LECTURE, TUTORIAL, LAB SCHEDULE & VENUE

Lectures: Mondays, Tuesdays & Fridays 14:00 - 14:50 hrs
Tutorials: Wednesdays 11:00 - 11:50 hrs

4. OFFICE HOURS

Mondays 10:00 - 11:00 hrs (make appointments through email)

5. WEIGHTAGES FOR DIFFERENT COMPONENTS OF EVALUATION (OUT OF 100)

Component Name	Weightage
Mid-semester Examination	35
End-semester Examination	40
Assignments	10
Quizzes	15

- Assignments: Each student will be assigned 2 problems, which they need to submit in due time.
- Quizzes ($3 \times 5 = 15$): 3 Quizzes (MCQ, 5 marks in each) will be held during specified tutorial hours (January 23 or 30, March 6 and April 10).

6. COURSE POLICIES: ATTENDANCE, HONESTY PRACTICES, WITHDRAWAL

- No extra weightage for attendance.
- Make-up option for exams would be given only if the student produces a medical certificate or a proof of sanctioned leave. There will be no make-up opportunity for the quizzes or assignments.
- Discussion/collaborations for solving the assignments is encouraged. However, students are expected to write down the solutions on their own.
- Any dishonest practice during examinations or quizzes will be reported to DOAA and appropriate action would be taken to penalize such action.
- Students are allowed to withdraw from the course as per guidelines set by DOAA.