

**Indian Institute of Technology Kanpur**  
**New Course Proposal**

1. **Course Number:** MBAxxx
2. **Course Title:** Monte Carlo Methods in Finance
3. **Credits:** 3-0-0-0 [5]  
**Duration of Course:** Modular
4. **Proposing Department:** Department of Management Sciences  
**Other Department/IDPs which may be interested in the proposed course:**  
**Other faculty members interested in teaching the proposed course:**
5. **Proposing Instructor(s):** Sourav Majumdar
6. **Course Description:** This course focuses on the implementation of Monte Carlo algorithms to solve a variety of problems in finance and insurance. It begins with a brief introduction to no-arbitrage pricing and the dynamics of asset prices. The course also covers statistical inference for asset price models using real-world data. Students will study the pricing of standard and exotic financial derivatives across asset classes, along with model calibration and sensitivity analysis. Additionally, the course explores various loss-reserving techniques in life and non-life insurance.

A) **Contents:**

S. No.	Broad Title	Topics	No. of Lectures
1.	Introduction to Monte Carlo methods	Review of Probability, Introduction to simulation	2
2.	Financial Derivatives	Review of financial derivatives, No-arbitrage pricing, Asset price dynamics: simulation and inference	3
3.	Monte carlo methods for derivative pricing	Pricing European options, pricing path independent and path dependent exotic options, sensitivity, calibration, variance reduction techniques, output analysis	6
4.	Monte carlo methods in Insurance	Coherent risk measure, premium principle, mortality models in life insurance, ruin probabilities in non-life insurance	3

C) **Pre-requisites, if any:** MBA651, MBA772

**7. References:**

1. Glasserman, P. (2003). *Monte Carlo Methods in Financial Engineering*. Springer.
2. Korn, R., Korn E., and Kroisandt, G. (2010). *Monte Carlo Methods and Models in Finance and Insurance*. Routledge.
3. Hirs, A. (2024). *Computational Methods in Finance*. CRC press.
4. Oosterless, C.W. and Grzelak, L.A. (2019). *Mathematical Modeling and Computation in Finance*. World Scientific.

**Dated:** 20 January 2025    **Proposer:** Sourav Majumdar

**Dated:** \_\_\_\_\_ **DUGC/DPGC Convener:** \_\_\_\_\_

**The course is approved / not approved**

**Chairman, SUGC/SPGC**

**Dated:** \_\_\_\_\_