Indian Institute of Technology Kanpur

New Course Proposal

1. **Course Number:** DMSxxx 613
2. **Course Title:** Introduction to Mathematical Finance
3. **Credits:** 3-0-0-0 [9]
   Duration of Course: Full Semester
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 introductory course on Mathematical finance focuses on the principle of pricing contingent claims under absence of arbitrage. The course will build a working knowledge of topics in Stochastic calculus with respect to Brownian motion and convex analysis, and use them to rigorously build the theory of no-arbitrage pricing. Special emphasis will be on the characterization of no-arbitrage, in terms of its existence and relation to pricing. The course will apply the theory to hedging and pricing financial derivatives. The course will also discuss topics relevant in contemporary research and practice, including pricing-hedging duality and pricing in incomplete markets.

   A) **Contents:**

S. No.	Broad Title	Topics	No. of Lectures
1.	Probability preliminaries	Probability as a measure: Sigma algebra, Random variable, Independence, Expectation, Conditional expectation, Martingales	5
2.	Stochastic Integration	Brownian Motion, Itô's integral, Itô's formula, Itô's isometry, Stochastic differential equations	5
3.	No-Arbitrage pricing in Complete Markets	No-arbitrage and related notions, Equivalent Martingale measure, Fundamental theorems of asset pricing, Girsanov's theorem, Delta-Hedging approach to Black-Scholes-Merton formula (BSM), Martingale approach to BSM	6
4.	Pricing and Hedging duality	Convex sets, Convex programming, Lagrange multiplier, Fenchel conjugate, Convex Duality. Applications to: Super-hedging and Sub-hedging bounds, Delta hedging and duality, Determining the hedging process, Hedging with contingent claims	6
5.	Pricing in Incomplete Markets	Examples of incomplete markets, Minimal entropy martingale measure approach, Good deal bounds	4

C) **Pre-requisites, if any**: Probability (DMS602/HSO201/MSO201 or equivalent), Familiarity with linear programming is recommended but not necessary (DMS605 or equivalent)

7. **References**:

1. Shreve, S. E. (2004). *Stochastic calculus for finance II: Continuous-time models*. Springer.
2. Kallianpur, G. and Karandikar, R. L. (2000). *Introduction to Option Pricing Theory*. Birkhauser.
3. Dineen, S. (2013). *Probability theory in finance: a mathematical guide to the Black-Scholes formula*. American Mathematical Society.
4. Carr, P. and Zhu Q. J. (2018). *Convex Duality and Financial Mathematics*. Springer.
5. Björk, T. (2020). *Arbitrage Theory in Continuous Time*. Oxford University Press.
6. Bingham, N.H. and Kiesel, R. (2004). *Risk-Neutral Valuation: Pricing and Hedging of Financial Derivatives*. Springer.
7. Danna, R. and Jeanblanc, M. (2007). *Financial Markets in Continuous Time*. Springer.

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

Dated:_____ **DUGC/DPGC Convener**:_____

The course is approved / not approved

Chairman, SUGC/SPGC Sudha

Dated: 29/05/25

INDIAN INSTITUTE OF TECHNOLOGY KANPUR
POSTGRADUATE OFFICE

No. A(P)/IITK/course approval/
March 25, 2025

The Convener, DPGC
Departments of **DOMS/MTH/SEE**
IIT Kanpur

I am directed to communicate the concurrence of the SPGC (2024-25) in its 6th meeting held on 27/02/2025 for the approval of new/modification PG course proposal. After detailed discussion the following courses were approved.

Course No	Title	Credits	Instructor	SPGC Decision
DMS613	Introduction to Mathematical Finance	3-0-0-0-[9]	Dr. Sourav Majumdar	Approved
MBA644	Cyber Security and Privacy for Managers	3-0-0-1-[10]	Dr. Sourya Joyee De	Approved
MBA788M	Monte Carlo Methods in Finance	3-0-0-1-[5]	Dr. Sourav Majumdar	Approved
MBA789M	Management Sciences	3-0-0-1-[5]	Dr. Harshal Rajan Mulay	Approved
MBA790M	Private Equity, Venture Capital and other Alternative Assets	3-0-0-1-[5]	Dr. Harshal Rajan Mulay	Approved
MTH619	Representation theory of quivers	3-0-0-0-[9]	Dr. Amit Kuber	Approved
SEE627	Electric Mobility [Modification]	3-0-0-2-[11]	Dr. Amarendra Edpuganti	Approved

Joint/Assistant Registrar
Academic Affairs

CC: OARS (DOAA Office) For necessary action

MINUTES
FOR THE 6th MEETING OF THE SENATE POSTGRADUATE COMMITTEE (2024-25) HELD
ON February 27, 2025 (Thursday) AT 11:00 AM
CONFERENCE ROOM (208), ACADEMIC AFFAIRS BUILDING

Members Present: Prof(s): D. Chaitanya Kumar Rao on behalf P M Mohite (AE), Suresh Kumar (BSBE), Basker Sundararaju (CHM), Ark Verma (CGS), Gourabananda Pahar (CE), Soumik Das on behalf of Dipin S Pillai (CHE), J Ramkumar (DES), Sukumar Vellakkal (ECO), Imon Mondal (EE), Animesh Mandal (ES), Rajarshi Sengupta (HSS), Subhankar Mukherjee (DoMS), Anikesh Pal (ME), Sudhanshu S Singh (MSE), Pritam Chakraborty (MSP), Sudhanshu Shekhar (MATH), Sagar Chakrabarty (PHY), Kunal P Mooley (SPASE), Prabodh Bajpai (SEE)

Members Absent: Prof(s), Piyush Rai (CSE), Pankaj Wahi (NET), Sapam Ranjita Chanu (PSE)

Senate Nominee : Prof. Abheejeet Mohapatra

Student representatives: Saurabh Sona Lahamate (231250121

(A) Ratification of minutes of 5th SPGC meeting held on January 24, 2025

No comments were received. Minutes is confirmed

(B) Item requiring SPGC Approval

a) New course approval

Course No	Title	Credits	Instructor	SPGC Decision
DMS613	Introduction to Mathematical Finance	3-0-0-0-[9]	Dr. Sourav Majumdar	Approved
MBA644	Cyber Security and Privacy for Managers	3-0-0-1-[10]	Dr. Sourya Joyee De	Approved
MBA788M	Monte Carlo Methods in Finance	3-0-0-1-[5]	Dr. Sourav Majumdar	Approved
MBA789M	Management Sciences	3-0-0-1-[5]	Dr. Harshal Rajan Mulay	Approved
MBA790M	Private Equity, Venture Capital and other Alternative Assets	3-0-0-1-[5]	Dr. Harshal Rajan Mulay	Approved
MTH619	Representation theory of quivers	3-0-0-0-[9]	Dr. Amit Kuber	Approved
SEE627	Electric Mobility [Modification]	3-0-0-2-[11]	Dr. Amarendra Edpuganti	Approved

b) Termination under 5.7

S. No	Roll No	Name	Dept.	Prog.	Supervisor & DPGC Recommendation	SPGC Decision
1.	241250026	Jatin Chaudhary	DOMS	MBA	Recommended	Approved to be reported to Senate
2.	241010003	Adhikari Thakur Prasad Das	AE	MTech	Recommended	Approved to be reported to Senate

c) Full Time to Part-Time

S. No	Roll No	Name	Dept	Prog	Supervisor and DPGC Recommendation	Remark	SPGC Decision
1.	231040115	Swati Gupta	EE	MTech	Recommended	CU=78 TU=54 CPI=9.38 NOC - attached	Approved
2.	231040036	Bingi Poojari Venkatesh	EE	MTech	Recommended	CU=78 TU=54 CPI=9.38 NOC - attached	Approved

Sudha