# MS8945: STOCHASTIC OPERATIONS RESEARCH

**Effective Term**
Semester B 2024/25

## Part I Course Overview

**Course Title**
Stochastic Operations Research

**Subject Code**
MS - Decision Analytics and Operations
**Course Number**
8945

**Academic Unit**
Decision Analytics and Operations (DAOS)

**College/School**
College of Business (CB)

**Course Duration**
One Semester

**Credit Units**
3

**Level**
R8 - Research Degree

**Medium of Instruction**
English

**Medium of Assessment**
English

**Prerequisites**
MS8944 Introduction to Probability Models

**Precursors**
Nil

**Equivalent Courses**
Nil

**Exclusive Courses**
Nil

## Part II Course Details

**Abstract**
This advanced PhD course focuses on equipping doctoral students with a robust understanding of stochastic models and their applications in operational decision-making. The curriculum delves into the complexities of decision-making under

uncertainty, introducing students to sophisticated techniques such as dynamic programming for sequential decision processes. Key areas of application include inventory control, pricing strategies, and financial management, with a particular emphasis on bridging the gap between high-level financial objectives and operational guidelines. The course explores the profound impact of uncertainty on operational decisions, providing students with the analytical tools to navigate complex business environments. Through a combination of theoretical foundations and practical problem-solving, students will develop proficiency in fundamental models and technical solution methods essential for Operations Research and Operations Management research. This course serves as a cornerstone for PhD candidates, preparing them for advanced research in stochastic modeling and its real-world applications in management science.

**Course Intended Learning Outcomes (CILOs)**

| | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | Demonstrate a comprehensive understanding of the basic concepts of stochastic processes | | x | x | |
| 2 | Demonstrate a comprehensive understanding of the modelling issues in operations research | | x | x | |
| 3 | Apply the knowledge of stochastic processes to model and analyze problems in the management science field | | | x | x |

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

**Learning and Teaching Activities (LTAs)**

| | LTAs | Brief Description | CILO No. | Hours/week (if applicable) |
|---|---|---|---|---|
| 1 | Interactive lectures | Students will actively participate in interactive lectures and small-group discussions to develop a comprehensive understanding of the fundamental concepts, analytical techniques, and practical applications of stochastic processes. | 1, 2, 3 | 3 hours/week |

| | | | | |
|---|---|---|---|---|
| 2 | Individual Assignments | Students will complete assigned individual assignments to reinforce the theoretical knowledge, and apply the theory to real-world problems in management science. | 1, 2, 3 | 3 hours/week |

**Assessment Tasks / Activities (ATs)**

| | ATs | CILO No. | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|---|---|---|---|---|
| 1 | Assignments | 1, 2, 3 | 40 | |

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

3

**Minimum Continuous Assessment Passing Requirement (%)**

0

**Minimum Examination Passing Requirement (%)**

0

**Assessment Rubrics (AR)**

**Assessment Task**

Homework Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Ability to apply the methodology and techniques to solve problems in management science

**Excellent**

(A+, A, A-) High

**Good**

(B+, B, B-) Significant

**Fair**

(C+, C, C-) Moderate

**Marginal**

(D) Notevenreaching marginal levels.

**Failure**

(F) Ability to apply the methodology and techniques to solve problems in management science

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**Assessment Task**

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**
Evidenceof knowledge of subject matters and capability to prove fundamental resultsin stochastic processes

**Excellent**
(A+, A, A-) High

**Good**
(B+, B, B-) Significant

**Fair**
(C+, C, C-) Moderate

**Marginal**
(D) Notevenreaching marginal levels.

**Failure**
(F) Evidence of knowledge of subject matters and capability to prove fundamental results in stochastic processes

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**Assessment Task**
Homework Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**
Ability to apply the methodology and techniques to solve problems in management science

**Excellent**
(A+, A, A-) High

**Good**
(B+, B) Significant

**Marginal**
(B-, C+, C) Moderate

**Failure**
(F) Notevenreaching marginal levels.

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**Assessment Task**
Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**
Evidence of knowledge of subject matters and capability to prove fundamental results in stochastic processes

**Excellent**
(A+, A, A-) High

**Good**
(B+, B) Significant

**Marginal**
(B-, C+, C) Moderate

**Failure**

(F) Notevenreaching marginal levels.

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# Part III Other Information

**Keyword Syllabus**

Review of Probability Theory, Renewal Theory, Martingales, Random Walks, Brownian Motions, Optimal Stopping Problems and Dynamic Programming

**Reading List**

**Compulsory Readings**

| | Title |
|---|---|
| 1 | Sheldon M. Ross. 1996. Stochastic Processes, Second Edition, John Wiley & Sons |

**Additional Readings**

| | Title |
|---|---|
| 1 | Nil. |