COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Mechanical Engineering		
LEVEL OF STUDIES	Undergraduate (towards 5-year Diploma Degree)		
COURSE CODE	ΟΠ0600	**SEMESTER**	5th
COURSE TITLE	Stochastic Models in Operations Research		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Practice Exercises	5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://www.mie.uth.gr/?page_id=17879&lang=en

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

During the course, students become familiarized with the development and analysis of models for performance evaluation and decision making in dynamic systems that are subject to uncertainty.

After successfully completing the course, students will be able to:

- Appreciate the strength of stochastic models and the scope of their applications.
- Use basic stochastic modeling tools including Markov chains and queueing theory.
- Formulate and solve problems that require the building of stochastic models.
- Combine and apply their knowledge to characterize, analyze, and solve a wide range of problems.
- Understand the relationship between the purpose of a model and the appropriate level of complexity and accuracy.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis, and synthesis of data and information, with the use of the necessary technology
- Working independently
- Decision-making
- Project planning and management
- Criticism and self-criticism
- Promotion of free, creative, and inductive thinking

(3) SYLLABUS

MARKOV CHAINS

Introduction and analysis: Prototype examples. Chapman-Kolmogorov equations. State classification. First passage times.

Long-run properties of Markov chains: Steady-state (limiting) probabilities. Expected average cost per unit time. Absorption states.

Continuous-time Markov chains: Formulation. Transition rates. Steady-state (limiting) probabilities.

QUEUEING THEORY

Models with exponential distributions: Prototype example. Basic structure of queueing models. Examples of real queueing systems. The role of the exponential distribution. The birth-and-death process. Queueing models based on the birth-and-death process.

Other models: Queueing models with nonexponential distributions. Priority-discipline queueing models. Queuing networks.

Applications of queueing theory: Examples. Decision making process. Formulation of waiting-cost functions. Decision models.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Face-to-face teaching in a classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of ICT in teaching (web-based learning process support), research activities (searching bibliographic sources on the internet), and communication with students (option of electronic homework submission).

TEACHING METHODS

The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the

Activity	*Semester workload*
Lectures	70
Homework	30
Independent study	50
Course total	*150*

hours of non- directed study according to the principles of the ECTS		
STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written exams (midterm + final) (80%): II. Homework (20%) The evaluation criteria are made known to the students at the beginning of the semester and are posted in the course's webpage.	

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Taha, H.A. (2011) Εισαγωγή στην Επιχειρησιακή Έρευνα. Επιστημονική Επιμέλεια Σ. Κατσαβούνης. Εκδόσεις Τζιόλα, ISBN 978-960-418-327-2.
- Hillier F.S., Lieberman, G.J. 1985. Εισαγωγή στην Επιχειρησιακή Έρευνα, Τόμος Α, Τεύχη Α-Γ, Μετάφραση - Επιμέλεια Γ. Οικονόμου. Εκδόσεις Παπαζήση, ISBN 978-960-020-230-4.
- Hillier, F.S., Lieberman G.J. (2017) Εισαγωγή στην Επιχειρησιακή Έρευνα. Επιστημονική Επιμέλεια Διαμαντίδης Α. Εκδόσεις Τζιόλα, ISBN 978-960-418-604-4.
- Φακίνος, Δ. Στοχαστικά Μοντέλα στην Επιχειρησιακή Έρευνα. Αυτοέκδοση, Σ. Αθανασόπουλος-Σ. Παπαδάμης & ΣΙΑ (εκτύπωση), Αθήνα, 2003.

Related academic journals:

- Annals of Operations Research, Springer
- Discrete Event Dynamic Systems Theory and Applications, Springer
- European Journal of Operations Research, Elsevier
- Management Science, INFORMS
- Operations Research, INFORMS
- Probability in the Engineering and Informational Sciences, Cambridge University Press
- Queueing Systems, Springer