COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	FINANCIAL AND MANAGEMENT ENGINEERING		
LEVEL OF STUDIES	UNDERGRATUATE		
COURSE CODE	GE0129	SEMESTER	7
COURSE TITLE	MODELLING, ANALYSIS AND DESIGN OF STOCHASTIC SYSTEMS		

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	3	5
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, specialised general knowledge, skills development*	Special background/ Specialised general knowledge/Skills development
PREREQUISITE COURSES:	Prerequisite knowledge from Courses: Probabilities, Probability Models
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://www.fme.aegean.gr/en/c/modelling-analysis-and-design-stochastic-systems

(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*

The aim of the course is to provide the students the capability of modeling, analysis and design of systems the evolution of which is arbitrary. To this direction the course provides the appropriate background for understanding the behavior of a real-world system and modeling its evolution using stochastic processes such as Markov processes. The course mainly focuses on queuing systems and their application is production and service systems.

A successful student should be able to:

- comprehend the concept of a stochastic process
- use Markov processes in system modeling and be familiar with the performance and dependability measures computation
- identify and characterize a queuing model
- compute the basic performance measures of a queuing model
- apply queuing theory in production, manufacturing and client-server systems

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
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Working in an international environment
- Working in an interdisciplinary environment
- Production of new research ideas
- Project planning and management
- Respect for difference and multiculturalism
- Production of free, creative and inductive thinking

(3) SYLLABUS

REVIEW FRO PROBABILITY MODELS

- Probability Models Review,
- Introduction to Stochastic Process
- Discrete and Continuous Time Markov Chains QUEUING SYSTEMS
- Characteristics of queuing systems, PASTA, Little's Law
- The M/M/1 model- Exercises
- The M/M/k model - Exercises
- The M/M/1/k model - Exercises
- The M/M/s/k and M/M/inf models - Exercises
- The M/M/1/k/k and M/M/s/k/k models – Exercises
- Total Expected cost for queuing systems

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY
Face-to-face, Distance learning, etc.

Face-to-face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students

Use of ICT in teaching	YES	Electronic Lecture Notes, Exercises
Use of ICT in laboratory education	NO	-
Use of ICT in communication with students	YES	Announcements, Email

TEACHING METHODS
The manner and methods of teaching are described in detail.

Activity	*Semester workload*
Lectures	39
Study and analysis of bibliography	18

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 hours of non-directed study according to the principles of the ECTS*	<table><tr><td>Non-directed study</td><td>70</td></tr><tr><td>Final Exams</td><td>3</td></tr><tr><td>Course total</td><td>130</td></tr></table>
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.*	Midterm exam (optional) and final exams in Greek

(5) ATTACHED BIBLIOGRAPHY

A) Suggested Bibliography:

1. **Βιβλίο [143559683]: ΟΥΡΕΣ ΑΝΑΜΟΝΗΣ**, Φακίνος Δημήτρης, **Κωδικός Βιβλίου στον Εύδοξο: 143559683**, Έκδοση: 1η έκδ./ 2025, Συγγραφείς: Φακίνος Δημήτρης, ISBN: 9789600245677, Τύπος: Σύγγραμμα, Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α.ΠΑΠΑΖΗΣΗΣ ΜΟΝΟΠΡΟΣΩΠΗ ΙΔΙΩΤΙΚΗ ΚΕΦΑΛΑΙΟΥΧΙΚΗ ΕΤΑΙΡΕΙΑ **(in Greek)**
2. **Βιβλίο [133034619]: ΣΤΟΧΑΣΤΙΚΑ ΜΟΝΤΕΛΑ ΣΤΗΝ ΕΠΙΧΕΙΡΗΣΙΑΚΗ ΕΡΕΥΝΑ, Θεωρία και Ασκήσεις**, Φακίνος Δημήτρης, **Κωδικός Βιβλίου στον Εύδοξο: 133034619**, Έκδοση: 1η έκδ./ 2024, Συγγραφείς: Φακίνος Δημήτρης, ISBN: 9789600243789, Τύπος: Σύγγραμμα, Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α.ΠΑΠΑΖΗΣΗΣ ΜΟΝΟΠΡΟΣΩΠΗ ΙΔΙΩΤΙΚΗ ΚΕΦΑΛΑΙΟΥΧΙΚΗ ΕΤΑΙΡΕΙΑ **(in Greek)**
3. **Βιβλίο [121051698]: ΘΕΩΡΙΑ ΟΥΡΩΝ ΑΝΑΜΟΝΗΣ**, Οικονόμου Αντώνιος, , **Κωδικός Βιβλίου στον Εύδοξο: 121051698**, Έκδοση: 1η έκδ./2023, Συγγραφείς: Οικονόμου Αντώνιος, ISBN: 9786185726614, Τύπος: Ηλεκτρονικό Βιβλίο, Διαθέτης (Εκδότης): Κάλλιπος, Ανοικτές Ακαδημαϊκές Εκδόσεις **(in Greek)**
4. **Βιβλίο [11282]: ΣΤΟΧΑΣΤΙΚΕΣ ΜΕΘΟΔΟΙ ΣΤΙΣ ΕΠΙΧΕΙΡΗΣΙΑΚΕΣ ΕΡΕΥΝΕΣ**, Βασιλείου Παναγιώτης – Χρήστος, **Κωδικός Βιβλίου στον Εύδοξο: 11282**, Έκδοση: 1η έκδ./2000, Συγγραφείς: Βασιλείου Παναγιώτης – Χρήστος, ISBN: 960-431-583-8, Τύπος: Σύγγραμμα, Διαθέτης (Εκδότης): Ζήτη Πελαγία & Σια Ι.Κ.Ε. **(in Greek)**

B) Additional Material:

Θεωρία Ουρών Αναμονής, Οικονόμου Αντώνιος, Ηλεκτρονικό Βιβλίο, Διαθέτης (Εκδότης): ΚΑΛΛΙΠΟΣ Ανοικτές Ακαδημαϊκές Εκδόσεις, Εύδοξο: **121051698** (https://repository.kallipos.gr/handle/11419/9213) **(in Greek)**

C) Additional Bilbiography:

1. Στοχαστικές Ανελίξεις: Θεωρία και Εφαρμογές, 1η εκδ./2003, Τ.Ι. Δάρας, Π.Θ. Σύψας, Εκδόσεις ΖΗΤΗ, Κωδικός Βιβλίου στον Εύδοξο: 11281. **(in Greek)**
2. Στοχαστικά Μοντέλα στην Επιχειρησιακή Έρευνα, Θεωρία και Εφαρμογές, Φακίνος, Δ., Εκδόσεις Συμμετρία, 2007, Κωδικός Βιβλίου στον Εύδοξο: 45393 **(in Greek)**
3. Modeling, Analysis, Design, and Control of Stochastic Systems, Kulkarni, V.G., Sprienger, 1999
4. Introduction to Probability Models, G. Bolch, S. M. Ross, Academic Press, (10th ed.), 2009.
5. Probability and Statistics with Reliability, Queuing, and Computer Science Applications (2nd ed.), Trivedi K. S., John Wiley & Sons, 2001