COURSE OUTLINE

(1) GENERAL INFORMATION

FACULTY / SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	MARITIME STUDIES		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΝΑΑΓΓ26	**SEMESTER**	WINTER SEMESTER (OPTIONAL)
COURSE TITLE	SYSTEM DYNAMICS		
INSTRUCTOR'S NAME	DR. ELEFTHERIOS SDOUKOPOULOS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	6
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General knowledge, Skills development,*	Background knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INTRODUCTION:	English
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS:	Yes
COURSE WEBSITE (URL):	eclass.unipi.gr

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

The course introduces students to *systems thinking*, a holistic approach to analysis that focuses on how the constituent parts of a system interrelate and how systems work over time and within the context of larger systems. It then emphasizes on *system dynamics*, a computer-based mathematical modeling approach used for understanding and analysing dynamic systems. Students will acquire new background knowledge on system analysis, going beyond traditional approaches that study systems by breaking them down into their separate elements. Through free simulation software (VensimPLE), they will also learn to model and analyse maritime-related systems and interpret results for supporting decision-making in the maritime industry.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free , creative and inductive thinking
……..
(Other……citizenship, spiritual freedom, social awareness, altruism, etc.)
……..

Upon completion of the course, it is expected that students will be able to:

- Apply a holistic approach to system analysis
- Use system dynamics for modelling and analysing dynamic maritime-related systems
- Interpret results and understand how they can support decision-making in the maritime industry

(3) COURSE CONTENT

- Systems thinking
- System dynamics
- Causal Loop Diagrams
- Stock and Flow Diagram
- System dynamics model building
- Scenario evaluation in system dynamics models and interpretation of results for supporting decision-making in the maritime industry

(4) TEACHING METHODS – ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning, etc.*	Face-to-face (in-class lecturing)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with Students*	• Use of e-class • Use of VensimPLE (free software) for system dynamics model building
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity etc.* *The study hours for each learning activity as well as the hours of self-study are given following the principles of ECTS.*	
STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other….,etc.* *Specifically defined evaluation criteria are stated, as well as if and where they are accessible by the students*	Final exam (80%) System dynamic model building assignments – short report submission and assessment (20%)

Activity/Method	***Semester workload***
Lectures	52
System dynamics model building assignments	18
Non-guided study	80
Total	**150**

(5) SUGGESTED BIBLIOGRAPHY

- *Suggested bibliography :*

- Bala, B.K., Arshad, F.M. & Noh, K.M. (2017). *System Dynamics: Modelling and Simulation*. Springer
- Sterman, J.D. (2000). *Business dynamics: Systems Thinking and Modeling for a Complex World*. Irwin McGraw-Hill.
- VensimPLE User Guide (file:///Users/Shared/Vensim/Help/HTML/index.html#users_guide.html)

- *Other key references :*

- Shepherd, S.P. (2014). A review of system dynamics models applied in transportation. *Transportmetrica B: Transport Dynamics*, 2:2, 83-105. https://doi.org/10.1080/21680566.2014.916236
- Oztanriseven, F., Pérez-Lespier, L., Long, S. & Nachtmann, H. (2014). A review of system dynamics in maritime transportation. Proceedings of the 2014 Industrial and Systems Engineering Research Conference.
- Hou, L. & Geerlings, H. (2016). Dynamics in sustainable port and hinterland operations: A conceptual framework and simulation of sustainability measures and their effectiveness, based on an application to the port of Shanghai. *Journal of Cleaner Production*, 135, 449-456. https://doi.org/10.1016/j.jclepro.2016.06.134