COURSE OUTLINE

RISK AND VULNERABILITY ANALYSIS AND ASSESSMENT

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
DEPARTMENT	PREVENTION AND MANAGEMENT OF CRISIS AND DISASTERS: INNOVATIVE TECHNIQUES IN CIVIL PROTECTION		
LEVEL OF STUDIES	ISCED level 7 – Master's or equivalent level		
COURSE CODE	CP03	**SEMESTER**	1st Semester
COURSE TITLE	Risk and Vulnerability Analysis and Assessment		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3.0	6.0
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	NO
TEACHING & EXAMINATION LANGUAGE:	Greek, English
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.duth.gr/courses/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

At the end of the course the student will be able to:

- Identify and categorize types of hazards and vulnerabilities.
- Apply risk and vulnerability assessment methodologies to various systems.
- Design risk mitigation strategies and resilience enhancement plans.
- Use tools and techniques for hazard simulation and modeling

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Adaptation to new situations
Decision making
Working in an interdisciplinary environment
Project design and management
Respect for the natural environment

Promoting free, creative and inductive reasoning

3. COURSE CONTENT

The course introduces the definitions of key concepts and types of hazards, methodologies for hazard analysis, and the definitions and methods for vulnerability assessment. The course also analyzes natural and human-made systems and the tools and techniques for hazard and vulnerability assessment. Historical disaster events are analyzed, and crisis scenarios are developed. The course also covers risk reduction policies and management strategies.

1. Basic concepts of risk, hazard, and vulnerability: definitions, general principles, natural and human-made systems.
2. Methodologies for hazard and vulnerability analysis: qualitative, quantitative, and hybrid analysis, as well as uncertainty assessment tools.
3. Presentation of systems: properties of natural systems, properties of human-made systems, and systems with interactions.
4. Seismic hazard and vulnerability: earthquakes, faults, seismic hazard, vulnerability of buildings and infrastructures.
5. Floods and hydrological hazards: flood models, vulnerability of areas and infrastructures.
6. Climate change and environmental hazards: wildfires, droughts, erosion, heatwaves, hurricanes and cyclones, snowstorms, frosts, volcanic eruptions. Multi-hazard analysis.
7. Complex natural events: natural disaster cascade and their interactions, the resilience of natural ecosystems.
8. Transport, energy, water, and telecommunications infrastructures: hazard analysis in networks and critical infrastructures. Study of cascading failures and development of resilience enhancement strategies.
9. Risk assessment methodologies for human-made systems: accident models, hazard analyses, accident scenarios, and safety specifications.
10. Hazard analysis tools and assessment techniques: introduction to FTA (Fault Tree Analysis), FMEA (Failure Modes and Effects Analysis), and STPA (System-Theoretic Process Analysis).
11. Information systems and cybersecurity: cyber and telecommunications hazards. Vulnerability analysis of digital systems.
12. Man-made disasters and industrial hazards: major industrial accidents and risks in large technical projects.
13. Risk response plans: policies for vulnerability reduction in natural and human-made systems, and analysis of real-world case studies.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to face Distance learning
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning,*	

Activity	*Workload/semester*
Lectures	39
Essay	50
Study	60
Examination	1
Total	**150**

Study visits, Study / creation, project, creation, project. Etc. *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Student evaluation languages Greek English Method (Formative or Concluding) Concluding Essay: Assessed based on the quality of research, critical thinking, ability to analyze and synthesize information, and the application of appropriate solutions. Essay presentation of Assignment: Evaluated on the ability to present complex topics in an understandable manner, communication skills, and adaptability to questions and feedback. In-class participation: Assessed based on engagement and the ability to apply learned concepts to practical applications.

5. SUGGESTED BIBLIOGRAPHY

1. Aven, T. (2011). "Risk Analysis: Assessing Uncertainties Beyond Expected Values and Probabilities."
2. Blaikie, P., et al. (1994). At Risk: Natural Hazards, People's Vulnerability, and Disasters.
3. Füssel, H.-M. (2007). "Adaptation planning for climate change: concepts, assessment approaches, and key lessons." Sustainability Science.
4. Kappes, M. S., et al. (2012). "Assessing natural hazards and vulnerability in the context of climate change: A review of methods and case studies." Environmental Science & Policy.
5. Mayer, A. L., et al. (2011). "Understanding risk and vulnerability: insights for decision-making in climate change adaptation." Risk Analysis.
6. Pelling, M. (2003). The Vulnerability of Cities: Natural Disasters and Social Resilience.
7. UNDRR (United Nations Office for Disaster Risk Reduction). Sendai Framework for Disaster Risk Reduction (2015).