SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University of Cluj-Napoca**
1.2 Faculty	**Faculty of Environmental Science and Engineering**
1.3 Department	**Department of Environmental Analysis and Engineering**
1.4 Field of study	**Environmental Engineering**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**Sustainable Development and Environmental Management**

2. Information regarding the discipline

2.1 Name of the discipline	**Integrated Management of Natural and Technological Risks**						
2.2 Course coordinator	**CS III Dr. Lucrina Ştefănescu, Lect. Dr. Eng. Zoltán Török**						
2.3 Seminar coordinator	**CS III Dr. Lucrina Ştefănescu, Lect. Dr. Eng. Zoltán Török**						
2.4. Year of study	**1**	2.5 Semester	**2**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Compulsory**

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					28
Additional documentation (in libraries, on electronic platforms, field documentation)					14
Preparation for seminars/labs, homework, papers, portfolios and essays					7
Tutorship					0
Evaluations					4
Other activities:					-

3.7 Total individual study hours	53
3.8 Total hours per semester	95
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1. curriculum	Basics of environmental science and engineering: natural hazards, risk management process, technological hazards, risk assessment procedure
4.2. competencies	Practical: implementation and use of the risk management process Technical: use of computer software

5. Conditions (if necessary)

5.1. for the course	Necessity of digital projector and computer (laptop)

5.2. for the seminar /lab activities	Laboratory with computers and specific software

6. Specific competencies acquired

Professional competencies	• Understanding the concepts of natural and technological hazards and risks • Knowledge of specific integrated activities, measures and tasks, legally organized and realized, with the aim of prevention and mitigation of natural and technological disasters • Knowledge of institutional structures and actors in the domain of emergency situations generated by natural and technological hazards. • Learning of specific measures to be taken in case of natural and technological risks • Learning to implement and use the risk management process • Learning to use specific risk analysis methods • Learning to develop specific environmental studies: hazard identification, risk analysis.
Transversal competencies	• ability to conduct literature research in all the existing formats; • knowledge of using specific computer software in the field of environmental studies; • acquiring knowledge of developing a research project; • teamwork.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• presentation of the natural risk management methodology and emergency situation caused by these risks, the legal framework for the specific measures and activities in the management procedure, institutional structures and specific measure for the mitigation of the risks • knowledge of developing an environmental risk study
7.2 Specific objective of the discipline	• coverage of the risk management terminology • knowledge of methods and techniques used in the risk management • presentation of the stages in the risk management and the specific actions • knowledge of developing an environmental risk or impact study • study and knowledge of techniques and procedures for hazard identification, qualitative and quantitative environmental risk analysis

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction: motivation, methodology, terminology	Presentation Interactive discussions	Introductory course to present the conceptual framework approach
2. Risk management: steps in the overall risk assessment: processes, methods, advantages. Distribution of the management process in function of risk types generating emergency situations.	Presentation Interactive discussions	Presentation of risk management methodology
3. Emergency situations management	Presentation Interactive discussions	Disaster management stages
4. Institutional structures involved in risk and	Presentation	Presentation of the

emergency situations management	Interactive discussions	National System for Emergency Situations Management and other national and international actors in the risk management
5. Legal framework related to risk and emergency situations management. Risk management strategies	Presentation Interactive discussions	Presentation of the legal framework specific for Romania
6. Typology of risks and their specific treatment measures: endogenous risks	Presentation Interactive discussions	Presentation of specific risk reduction measures with specificity to Romanian territory
7. Typology of risks and their specific treatment measures: exogenous risks	Presentation Interactive discussions	Presentation of specific risk reduction measures with specificity to Romanian territory
8. Seveso Directives – history and actual framework	Presentation Interactive discussions	Introduction to the Seveso Directives
9. Major Industrial Accident Prevention Politics and Safety Reports from the perspective of European Union and Romanian methodologies	Presentation Interactive discussions	Requirements and content of these documents. Examples.
10. Technological risk management. General steps, terminology and European legislation.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	Introduction. Techniques used in the Change management.
11. NATECH risks. Triggering events and possible scenarios.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	Presentation of the methodology. Case studies.
12. Qualitative hazard identification and risk analysis methods: Preliminary Hazard Assessment (PHA) and Hazard and Operability Study (HAZOP)	• Interactive exposure • Explanation • Conversation • Didactical demonstration	Risk communication in the Seveso III Directive;
13. Quantitative risk analysis: Fault trees and event trees.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	Quantitative risk analysis. Case studies.
14. Quantitative risk analysis: Basics of effects and consequence analysis. Individual and social risk results.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	Quantitative risk analysis. Case studies

Bibliography

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2. A. Randall: Risk and Precaution, Cambridge, UK, 2011.
3. European Environmental Agency: Environmental Risk Assessment: Approaches, Experiences and

Information Sources, EEA, 1998.
4. C. E. Haque (Ed.): Mitigation of Natural Hazards and Disasters, Springer, Canada, 2005.
5. Frank P. Lees: Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control, Second edition, United Kingdom, 1996.
6. Van den Bosch, C. J. H., Weterings R.A.P.M: „Yellow Book": Methods for the Calculation of Physical Effects, Third edition, Committee for the Prevention of Disasters, Netherlands, 1997.
7. P.A.M. Uijit de Haag, B.J.M. Ale: „Purple Book": Guidelines for Quantitative Risk Assessment, First edition, Committee for the Prevention of Disasters, Hague, 1999.
8. C. A. Ericson: *Hazard Analysis Techniques for System Safety*, Ed. Wiley-Interscience, New Jersey, 2005.
9. ***American Institute of Chemical Engineers (AIChE): *Guidelines for Chemical Process Quantitative Risk Analysis*, Second Edition, New York, 2000.
10. T. Kletz, *HAZOP &HAZAN. Notes on the Identification and Assessment of Hazards*, Institution of Chemical Engineers, Fourth Edition, UK, 1999.
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12. A. J. Jakeman, A.A. Voinov, A.E. Rizzoli, S.H. Chen (Eds.): Environmental Modelling, Software And Decision Support. State of the Art and new perspectives. Elsevier, 2008.
13. G.E. DeVaull, J.A. King, R. J. Lantzy, D. J. Fontaine (Eds.): Understanding Atmospheric Dispersion of Accidental Releases, AIChE, New York, 1995.
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15. Gheorghiu A.-D., Török Z., Ozunu A., Antonioni G., Cozzani V., 2014, Comparative Analysis of Technological and Natech Risk for two Petroleum Products Tanks Located in a Seismic Area, Environmental Engineering and Management Journal, Vol.13/8, pp. 1887-1892.
16. GHEORGHIU A.-D., TÖRÖK Z., OZUNU A., ANTONIONI G., COZZANI V., 2014, Natech Risk Analysis in the Context of Land Use Planning. Case Study: Petroleum Products Storage Tank Farm Next to a Residential Area., Chemical Engineering Transactions, Vol. 36, pp. 439-445.
17. Gheorghiu A.-D., Török Z., Ozunu A., 2013, How Can Existing Risk Assessment Methodologies Be Used in a Systematic Manner, in the Extractive Mining Industry?, Journal of Environmental Protection and Ecology, Vol.14/4, pp. 1597-1607.
18. Zoltán TÖRÖK, Nicolae AJTAI, Adrian T. TURCU, Alexandru OZUNU - Comparative consequence analysis of the BLEVE phenomena in the context on Land Use Planning; Case study: The Feyzin accident, Process Safety and Environmental Protection, 89 (2011) pp. 1-7.
19. TÖRÖK, Z., OZUNU, A., CORDOŞ E., Chemical risk analysis for land-use planning. I. storage and handling of flammable materials, Environmental Engineering and Management Journal, January 2011, Vol.10, No. 1, 81-88.

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http://ec.europa.eu/environment/seveso/index.htm
http://www.igsu.ro/
http://mahb.jrc.it/index.php?id=9

Access for the references: Central University Library (BCU), Library of the Faculty of Environmental Science and Engineering.

Electronic Library of the Research Centre for Disaster Management, Faculty of Environmental Science and Engineering.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Introduction. Related topics. Structure.		Presentation of the seminar structure and workplan.

2. Natural phenomena generating risks and disasters. Typology, affected areas	Presentation Teamwork Brainstorming	Presentation of specific phenomena
3. Methods for assessing risk perception. questionnaire	Presentation Teamwork Brainstorming	Discussion in items and development of a questionnaire for natural risk perception.
4. Example: Risk analysis for a given area	Presentation Teamwork Brainstorming	Application of the methodology.
5. Romania. Hazard, risk and seismic management	Presentation Teamwork Brainstorming	Seismic data, macro and micro-zoning maps, construction safety
6. Floods management and emergency situations in Romania	Presentation Teamwork Brainstorming	Case studies
7. Emergency situations management for extreme meteorological phenomena in Romania	Presentation Teamwork Brainstorming	Case studies
8. Synthesis on natural risk management	Presentation Brainstorming	Presentation
9. Dangerous properties of chemical substances.	• Lab assignment • Explanation • Conversation	Database analysis
10. Natech risk analysis example. Triggering event frequency analysis, consequence analysis.	• Lab assignment • Explanation • Conversation	
11. PHA and HAZOP exercises	• Lab assignment • Explanation • Conversation	Team work exercises
12. Fault tree and Event tree exercises	• Lab assignment • Explanation • Conversation	Team work exercises
13. Physical effects and consequence analysis exercises	• Lab assignment • Explanation • Conversation	Team work exercises
14. Seminar examination	Written project and presentation by each student	Seminar examination

1. B Wisner, P. Blaikie, T. Cannon, I. Davis; At Risk: Natural hazards, people's vulnerability and disasters, Routledge, London, 2004.
2. A. Randall: Risk and Precaution, Cambridge, UK, 2011.
3. European Environmental Agency: Environmental Risk Assessment: Approaches, Experiences and Information Sources, EEA, 1998.
4. C. E. Haque (Ed.): Mitigation of Natural Hazards and Disasters, Springer, Canada, 2005.
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Access for the references: Central University Library (BCU), Library of the Faculty of Environmental Science and Engineering.

Electronic Library of the Research Centre for Disaster Management, Faculty of Environmental Science and Engineering.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The knowledge acquired during the course can be used in the following domains: environment protection, process industries: chemical, pharmaceutical, petrochemical, food industry etc. and academic domains;
- The graduates of this course can contribute in the development of natural and technological risk studies, safety reports or major industrial accidents prevention policies and to work in consultancy in the field of risk assessment.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	• Problem solving • Correctness of the results and answers	Written exam (2 hours)	80 %
10.5 Seminar/lab activities	The activity of the student	Score	5 %
	The correctness of the project, accuracy of the presentation, correctness of the responses.	Project presentation (10 minutes/student)	15 %
10.6 Minimum performance standards			
• Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the studied domain, that (s)he is capable of stating these knowledge in a coherent form, that (s)he has the ability to establish certain connections and to use the knowledge in solving different problems. • Successful passing of the exam is conditioned by the final grade that has to be at least 5. • Minimum 80% presence at seminar/lab activities.			

Date	Signature of course coordinator	Signature of seminar coordinator
10.04.2017	CS III Dr. Lucrina Ştefănescu	CS III Dr. Lucrina Ştefănescu
	Lect. Dr. Eng. Zoltán Török	Lect. Dr. Eng. Zoltán Török

Date of approval

Signature of the head of department