Table S2.6.4. Form for the preparation of the course information sheets

Name of the subject: *Risk management in civil engineering*

Code of the subject	Status of the subject	Semester	Number of ECTS credits	Class load
	Optional	I	10	2+0+2

Study programme for which it is organised:
Doctoral studies in sustainable development, MARDS

Dependency by other subjects: None

Objectives of studying this subject: The goal of this course is that PhD students: understand categories and terms in domain of risk management in civil engineering projects realisation; understand risk analysis and assessment procedures; use gained knowledge in the scientific research and in engineering practice.

Contents of the subject (teaching units, forms of students' individual work, forms of testing) presented per working weeks in the academic calendar:

Preparatory week	Consultation with supervisor, courses selection.
I week	Risk definition, causes of high risk, importance of assessment, decision making.
II week	Planning in risk conditions – analysis of managing decisions.
III week	Planning in risk conditions – risk identification.
IV week	Planning in risk conditions – project risk evaluation.
V week	Planning in risk conditions – risk assessment and analysis of alternatives; responsibility and insurance of planned actions.
VI week	Planning in risk conditions – measures for risk reduction.
VII week	Implementation of project risk management plan, conflicts solving, analysis of plan realisation consequences.
VIII week	Data bases application in risk management.
IX week	Fuzzy logic in risk management.
X week	Neural networks in risk management.
XI week	Genetic algorithms in risk management.
XII week	Project task. Seminar paper. (individual work)
XIII week	Project task. Seminar paper. (individual work)
XIV week	Project task. Seminar paper. (consultation and review)
XV week	Project task. Seminar paper. (discussion and defence)

Methods of education: teaching (lectures and exercises), in combination with supervised work; consultations; project based teaching/learning; practical work; obtained knowledge and skills presentation

Student's load

Weekly	In semester

10 credits x 40/30 = **13.33 hours**
 	
Structure:
   2 hours of lectures
   2 hours of exercises
   9.33 hours of individual work
	Lectures and final exam: (13.33 hours) x 16 = **213.33 hours**
	Necessary preparation before the start of the semester (administration, enrolment, verification):
	                    (13.33 hours) x 2 = **26.66 hours**
	
	Total workload for the course: **10 x 30 = 300 hours**
	
	Additional work for preparing correction of the final exam, including taking the exam:
	0 - 60 hours (remaining time from the first and the second item to the total workload for the course of 300 hours)
	
	Structure of the workload:
	213.33 hours (lectures and final exam) + 26.66 hours (preparation) + 60 hours (additional work)

Students' obligations during the teaching:
-   regular attending lectures and other classes or adequate activity in supervised work
-   conscientious and individual elaboration of homework and project tasks, as well as realisation of practical work through seminar paper, with systematisation of material and adequately

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applied scientific research methodology
- individual elaboration of written exam, accompanied by oral discussion
- presenting obtained knowledge during the semester and at the final exam

Literature:
- Anthony M. "Neural Network Learning: Theoretical Foundations", Cambridge University Press, 2002, ISBN-13: 978-0521573535
- Barnes M. "How to Allocate Risks in Construction Contracts" – Project Management, Vol 1, pp 24-57, 1993
- Bowers J.A. "Data for Project Risk Analysis" - International Journal of Project Management, Vol 12, No 1, pp 9-16, 1994
- Bowman E.H. "A Risk-return Paradox for Strategic Management", Sloan Management Review, 23(4), 1980
- Dembo R, Freeman A. "The rules of risk", John Wiley and Sons, Inc, 1998
- Haykin S.O, "Neural Networks and Learning Machines", Prentice Hall, Englewood Cliffs, New Jersey, 2008, ISBN-13: 978-0131471399
- Raftery J. "Risk Analysis in Project Management", E&FN Spon, 1994
- Smith N. J. Managing risk in Construction Project, Blackwell Science Ltd, 1999
- current literature (scientific papers from international conferences and journals)

Learning outcomes (complied with the outcomes for the study programme):

Knowledge and understanding:

On completion of this course the student will be able to:
- explain basic categories and terms in domain of risk management in civil engineering,
- understand matter of planning and plan implementation in risk conditions in civil engineering projects,
- apply data bases, fuzzy logic, neural networks and genetic algorithms in domain of risk management in civil engineering,
- apply adequate skills in recognition of risks, their influence and mutual dependence,
- make categorisation of risks and recognise their weight criteria in multi-criteria analysis,
- make risk assessment for certain situation.

Transferable / Key skills and other attributes:
- Communication skills: oral defence of seminar paper, manner of expression in seminar paper and at written examination.
- Use of information technology: use of risk management software tools.
- Calculation skills: performing calculation operations in risk management algorithms.
- Problem solving: risk assessment.

Forms of tests and evaluation:

Knowledge assessment is continuous during the semester, through pre-exam checks, and in the final exam. In total, student may collect max 100 points.
The following is assessed:
- seminar paper and other semester activities (homework etc.)   50%,
- final exam   50%.
The final exam consists of written and oral part. Written part may be realised through project task.
Grades (A, B, C, D, E, F) are adjoined to collected number of points, in line with the Law of Higher Education and study rules at the University of Montenegro.

Name and surname of teacher and associate:

Prof.Dr Miloš Knežević

Particularities needed to be emphasized for the subject:

Note (if needed):