Course title : Environmental modeling principles

Course Basic Information	
Academic Unit:	Faculty of Civil Engineering
Course title:	Environmental modeling principles
Level:	Bsc
Course Status:	Elective
Year of Study:	Year 2/ Semester 4
Number of Classes per Week:	2+0
ECTS Credits:	3
Time /Location:	According to timetable
Teacher:	Prof. Ass. Lavdim Osmanaj
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Course Description:	The course deals with environmental problems arising from a complex interaction of chemical, physical and biological processes, involving soil, water, air and energy resources that significantly affect human activities and attitudes. The complex and multidisciplinary nature of environmental problems requires that they be addressed objectively and in an integrated manner. Quantitative tools provide the necessary objectivity in environmental decision-making. These tools help to investigate, understand, represent the current state and predict the future state of the environment. These are essential for any integrated environmental assessment and management strategy.
Course Goals:	Course objectives are: 1. Understand the idea, methodology and basic tools of environmental modeling. 2. Understand the different modeling approaches, their scope, and limitations. 3. Understand the transport of contaminants. 4. Be aware of a wide range of modeling applications in environmental management.
Expected Learning Outcomes:	After completing this course, the student should: 1. Develop models based on the mass balance approach. 2. Predict the impact of external waste loading on various environmental matrices.

	3. Predict and generate future conditions under different loading scenarios or management action alternatives.

Student Workload (should be in compliance with student's Learnign Outcomes)			
Activity	**Hours**	**Day/ Week**	**Total**
Lectures	2	15	30
Theory/ Lab Work/Exercises	1	15	15
Practical Work	0	0	0
Preparation for midterm test	1	5	5
Consultations with the teaher	2	2	4
Field Work	0	0	0
Test, seminar paper	1	5	5
Homework	1	3	3
Self-study (library or home)	5	1	5
Assessment time (test, quiz, final exam)	2	2	4
Projects, presentations, etc.	2	2	4
Other activity wich is not in the table			
Total			**76**

Teaching Methods:	*Lectures, exercises during class using different materials, one project work in group of 2-3 students (independent work), individual homework*
Assessment Methods:	First evaluation 30 %, Second Evaluation 30%, Homework or elaborations 10%, Final exam 30% Total 100%
Primary Literature:	1. Chapra S.C. (1997) Surface Water-Quality Modelling, McGraw-Hill International Edition. 2. Nirmalkhandan N. (2001) Modeling Tools for Environmental Engineers and Scientists, CRC Press, Boca Raton, Florida. 3. Schnelle K.B. and Dey P.R. (1999) Atmospheric Dispersion Modelling Compliance Guide, McGraw-Hill. 4. Thomann R.V. and Mueller J.A. (1987) Principles of Surface Water Quality Modelling and Control, Harper &

	Row, New York.
Additional Literature:	1. Dunnivant F.M. and Anders E. (2006) A Basic Introduction to Pollutant Fate and Transport, John Wiley & Sons, Inc., New Jersey. 3. Ramaswami A., Milford J.B. and Small M.J. (2005) Integrated Environmental Modelling, John Wiley and Sons, Inc., New Jersey. 3. Schnoor J.L. (1996) Environmental Modeling, John Wiley & Sons, Inc., New York.

Designed teaching plan	
Week	**Title of the Lecture**
Week 1:	Environmental modelling, scope and problem definition
Week 2:	Goals and objectives, definition; modelling approaches– deterministic
***Week 3*:**	Applications of environmental models
Week 4:	*Model building process*
Week 5:	Elementary concepts, laws, theories and processes
***Week 6*:**	The building blocks: extensive and intensive properties, properties relevant to of environmental systems
Week 7:	*The material balance approach; the transport processes– advection, diffusion, dispersion, gravitational settling, transport in porous media; the transformation processes – the non-reactive processes, the reactive processes*
Week 8:	Imulation of transport and transformation processes– introduction, the completely stirred tank reactor, plug flow reactor, mixed flow reactor models
Week 9:	The general material balance models.
Week 10:	Environmental modelling - applications
***Week 11*:**	Water quality modelling surface water quality modelling – lakes
***Week 12*:**	Water quality modelling impoundments, rivers and streams, estuaries
***Week 13*:**	Water quality modelling ground water pollution modelling.
***Week 14*:**	Air quality modelling: the box model, the Gaussian plume model point sources, line sources, area sources;
***Week 15*:**	Special topics; Gaussian puff model

Academic Policies and Code of Conduct

We start and finish class on time.
Tools used during class must be cleaned and stored away at the end of class.
Mobile/smart phones, and other electronic devices (e.g. iPods) must be turned off (or on vibrate) and hidden from view during class time.
Laptop and tablet computers are allowed for quiet use only; other activities such as checking personal e-mail or browsing the Internet are prohibited.