COURSE DESCRIPTION

Name of the Course:	**Numerical Analysis**							
Specialization Code:	**U02.07.ICV.IZ.M24.**			**Course Code:**	**1.DF.OB01**			
Year of study:	**1**	**Semester:**	**1**	**Examination form:** (**E-**Exam; **Co-** Colloquy; **P-**Project**; P/F-**Passed/Failed)	**Co**	**ECTS credits granted (CR):**	**E (Co)**	**4**
							P (P/F)	
Course Category: (**DF**- Fundamental; **DD**- General engineering; **DS**-Specialty engineering; **DC**-Complementary; **PR**-Practical stage)								**DF**
Course Type: (**OB**-Compulsory**; OP**-Elective**; FC**-Facultative)								**OB**
Number of hours per semester: Total of hours per week (TH) x Number of weeks per semester								
TOTAL :	70	**Individual study** (IS)**:**		28	**Contact hours (C + S;L;P):**			42
Academic staff member in charge: (Full name, Academic position and Department)	*Ion Mierluş-Mazilu, Associate Professor*							

Faculty	**Engineering in foreign languages Master study programme**		**Number of contact hours per semester**				
			Total	Course	Seminar	Laboratory	Project
Field	**Civil Engineering**						
Specialization	**Structural Engineering**		42	28		14	

Course objectives - Description of the main competences: The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. Topics in function approximation, main methods for solving systems of linear and nonlinear equations, numerical methods for determining eigenvalues and eigenvectors, numerical integration and derivation, numerical solution of differential equations and partial differential equations. The discussion of approximate arithmetic and error propagation will also arise in a natural way. Applications using specific software packages (MathCAD, MATLAB).

Content description:

1. COURSE	1. Errors. Sources and types of errors. Propagation of errors in numerical calculations. (2 hours). 2. Systems of linear equations. Exact methods: Gauss, Choleski. Iterative methods: Jacobi, Relaxation methods, Method of least squares. (4 hours). 3. Systems of linear equations. Method of successive approximations. Newton-Raphson method. (2 hours). 4. Numerical methods for determining eigenvalues and eigenvectors: Jacobi method, using symmetric tridiagonal matrices. (3 hours). 5. Interpolation functions. Lagrange polynomial interpolation. Aitken method. Cubic spline functions. (4 hours). 6. Numeric integration and differentiation: differentiation by interpolation, Newton-Cotes formulas or quadrature formulas, Gauss-Legendre quadrature formulas. (4 hours). 7. Numerical solutions of ordinary differential equations. Direct methods: Taylor, Euler, Runge-Kutta. (3 hours). 8. Numerical solution of partial differential equations of second order. Network method. (2 hours). 9. Finite element method for the numerical solution of elliptic partial differential equations of second order. (4 hours).
2. Seminar / Laboratory / Project / Practical stage	Laboratory consists in solving in Mathcad or Matlab, to concrete problems, using methods presented in the course.

3. Bibliography	1. K. Atkinson (1989) An Introduction to Numerical Analysis, 2nd ed., Wiley Pub 2. K. Atkinson, W. Han (2003) Elementary Numerical Analysis, 3rd ed., Wiley Pub 3. W. Cheney, D. Kincaid (2007) Numerical Mathematics and Computing, 6th ed., Brooks/Cole 4. G. Dahlquist, A. Bjorck (2008) Numerical Methods in Scientific Computing, SIAM 7. C. Moler (2004) Numerical Computing with MATLAB, SIAM 9. A. Quarteroni, R. Sacco, F. Saleri (2004) Numerical Mathematics, 2nd ed, Springer 10. E. Suli, D. Mayers (2003) An Introduction to Numerical Analysis, Cambridge 11. J. Stoer, R. Bulirsch (1993) Introduction to Numerical Analysis, Springer 12. Introduction to numerical analysis. University of Manchester course. http://www.maths.manchester.ac.uk/~cp/frontpage157.htm 13. Introduction to numerical analysis for engineers - lecture notes. MIT open courseware. http://ocw.mit.edu/courses/mechanical-engineering/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/index.htm

Criteria to be considered for the final mark	**Weight of each criterion in the final mark (%)**
1. Exam defence (final examination)	40%
2. Appreciation during the entirely semester	
2.1 Seminar activity	
2.1 Laboratory activity	
2.2 Project activity (the project has not a distinct final mark)	60%
3. Periodical examinations	
3.1 Written / oral examination	
3.2 Home works, reports, essays etc.	
4. Other criteria (to be specified)	
Short description of the final evaluation procedure: project presentation using algorithms and their practical applications and solving problems presented in numerical analysis course also using appropriate software	

Estimation of the total number of hours per semester requested for the individual study (IS)				
Type of individual activity	No. of hours		Type of individual activity	No. of hours
1. Study of the course notes	9		8. Preparation of the final examination	6
2. Study of the compulsory bibliography	9		9. Advisory class participation	
3. Study of the supplementary bibliography	9		10. Practical documentation on site	
4. Preparation of specific activities			11. Additional documentation on library	
5. Preparation of home works	9		12. Internet network documentation	
6. Preparation of periodical written examinations			13. Others (to be specified)	
7. Preparation of periodical oral examinations			**TOTAL number of hours**	42

Date:
15.03.2013

Signature of the Academic Staff member in charge:
Assoc. Prof. PhD. Ion MIERLUŞ MAZILU