

COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_IC464	SEMESTER OF STUDIES	8 th
COURSE TITLE	INTRODUCTION TO INTERVAL ANALYSIS		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>	TEACHING HOURS PER WEEK	ECTS CREDITS	
Lectures and Tutorials	4	6	
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialised general knowledge, skills development</i>	Free Elective course		
PREREQUISITE COURSES:	<u>Recommended prerequisite knowledge:</u> CALCULUS I, INTRODUCTION TO NUMERICAL ANALYSIS		
TEACHING AND ASSESSMENT LANGUAGE:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH918/		

2. LEARNING OUTCOMES

Learning outcomes

Περιγράφονται τα μαθησιακά αποτελέσματα του μαθήματος οι συγκεκριμένες γνώσεις, δεξιότητες και ικανότητες καταλλήλου επιπέδου που θα αποκτήσουν οι φοιτητές μετά την επιτυχή ολοκλήρωση του μαθήματος.

Συμβουλευτείτε το Παράρτημα Α

- Περιγραφή του Επιπέδου των Μαθησιακών Αποτελεσμάτων για κάθε ένα κύκλο σπουδών σύμφωνα με Πλαίσιο Προσόντων του Ευρωπαϊκού Χώρου Ανώτατης Εκπαίδευσης
- Περιγραφικοί Δείκτες Επιπέδων 6, 7 & 8 του Ευρωπαϊκού Πλαισίου Προσόντων Διά Βίου Μάθησης και Παράρτημα Β
- Περιληπτικός Οδηγός συγγραφής Μαθησιακών Αποτελεσμάτων

With this course, students are expected to be able to use Interval Analysis methods (in contrast to basic numerical methods) for the solution of mathematical problems. At the end of this course the student will have further developed the following skills:

- Understanding of interval arithmetic.
- Understanding of the basic interval methods.
- Ability to apply these methods in problem solving.
- Ability to distinguish the differences between basic numerical methods and interval methods of Interval Analysis.
- Ability to use a library for solving basic subjects of Interval Analysis.

After successfully attending the course, the student will be able to provide approximate solutions to mathematical problems using an appropriate numerical method.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

Others...

- Search, analysis and synthesis, as well as a critical understanding of data and information using appropriate technologies.
- Decision making.
- Autonomous Work.
- Teamwork.
- Working in an interdisciplinary environment.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

A brief history. Arithmetic of computers. Extensions of floating-point arithmetic. Interval numbers and Interval arithmetic. Advantages and disadvantages of Interval arithmetic. Functions of intervals. Interval vectors and matrices. The Fundamental Theorem of Interval Analysis. Solving nonlinear equations using interval methods. Solving linear and nonlinear systems of equations using interval methods. Global optimization using interval methods.

Applications: Usage of appropriate Matlab/Octave library.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

<p>TEACHING METHOD <i>Face-to-face, Distance learning, etc.</i></p>	Lectures (face to face)	
<p>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<ul style="list-style-type: none"> ✓ Slides ✓ Support Learning through the eClass platform. 	
<p>TEACHING ORGANIZATION <i>The manner and methods of teaching are described in detail.</i></p> <p><i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i></p>	Activity	Semester workload
	Lectures	26
	Tutorials	26
	Personal study by the student	50
	Solving suggested exercises	45
	Final examination	3
	Total number of hours for the Course (25 hours of work-load per ECTS credit)	150
<p>STUDENT ASSESMENT <i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students</i></p>	<p>Assessment Language: Greek Assessment Language for Erasmus students: English</p> <p>Assessment methods:</p> <ul style="list-style-type: none"> ✓ Written Course Examination and Exercises <p>Minimum passing grade: 5 Maximum passing grade: 10</p>	

5. RECOMMENDED LITERATURE

<p><i>(in Greek)</i></p> <ul style="list-style-type: none"> • Γράψα Θεοδούλα. <i>Εισαγωγή στην Ανάλυση Διαστημάτων -Interval Analysis-</i>. Εκδόσεις Τζιόλα, 2012. <p><i>(in English)</i></p> <ul style="list-style-type: none"> • Moore Ramon E. <i>Methods and Applications of Interval Analysis</i>. SIAM, 1979. • Hansen Eldon and Walster William G. <i>Global Optimization Using Interval Analysis: Revised And Expanded</i>. 2nd ed., Marcel Dekker 2004.
--