NUMERICAL ANALYSIS

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40401	**SEMESTER**	4th
COURSE TITLE	NUMERICAL ANALYSIS		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory exercises	3 (lectures), 1 (laboratory exercises)	4
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	There are no prerequisite courses.However, students must have sufficient knowledge of Mathematics and Computer Programming.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uop.gr/courses/CIVIL115/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course is the basic course in Numerical Analysis. It aims to present the basic methods of numerical solution of algebraic and differential equations, differentiation and integration of functions and data processing and analysis. The knowledge covered is necessary to solve various problems of the Civil Engineer. In the laboratory part of the course, the various numerical methods are implemented by using an appropriate programming language and/or a suitable computing environment.

Upon successful completion of the course, students will be able to:

- Solve various problems using numerical methods.
- Choose the most appropriate numerical method to solve a problem.
- Use appropriate programming language and/or computing environment.

General Competences

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

- Working idependently
- Team work
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Production of free, creative and inductive thinking

3. SYLLABUS

1. Basic concepts, discretisation, error theory.
2. Algebraic equations: Bisection, regula falsi, fixed-point iteration, Newton's method.
3. Linear systems: Gauss, LU, Jacobi, Gauss-SeidelandSOR methods.
4. Numerical calculation of eigenvalues and eigenvectors.
5. Interpolation, approximation, data fitting: Lagrange's and Newton's polynomials, splines, linear regression, least squares.
6. Numerical differentiation: Forward, backward and central differences.
7. Numerical Integration: Rectangle, trapezoidal and Simpson's rules.
8. Numerical solution of ordinary differential equations: (1) Initial value problems: Euler's, Runge-Kutta, multistep and predictor-corrector methods. (2)Boundary value problems:Shootingand finite differences methods.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use of appropriate software. Support of the learning process through the e-class platform.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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,*	1. Written examination that includes problem solving. 2. Laboratory examination that includes solving exercises on the computer. The final grade is 70% of the written examination grade and 30% of the laboratory examination grade.

Activity	***Semester workload***
Lectures	39
Laboratory practice	12
Final exams	3
Personal study	46
Course total	***100***

other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	

5. ATTACHED BIBLIOGRAPHY

1. Ι. Σαρρής, Θ. Καρακασίδης, «Αριθμητικές Μέθοδοι και Εφαρμογές για Μηχανικούς». Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. (2017).
2. Α. Ράπτης, «Εφαρμοσμένη Αριθμητική Ανάλυση». Εκδόσεις: Open Line/Μασκλαβάνος Θεόδωρος (2017).
3. Π. Γιαννοπούλου, Α. Δημητριάδης, Σ. Δουκάκης, Χ. Κοίλιας, Ν. Ματζάκος, «Εφαρμοσμένη Αριθμητική Ανάλυση». Εκδόσεις Νέων Τεχνολογιών (2016).
4. S. Chapra, R. Canale, «Αριθμητικές Μέθοδοι για Μηχανικούς». Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. (2018).

STEEL STRUCTURES

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40402	**SEMESTER**	4th
COURSE TITLE	STEEL STRUCTURES		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge
PREREQUISITE COURSES:	There are no prerequisite courses. Students must have at least knowledge of Statics and Strength materials.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After the end of the course, the students will be able to:

- understand the basic principles of design and analysis of steel structures
- classify the steel cross sections
- calculate the load-bearing capacity of steel cross sections
- calculate the strength of members against buckling
- design simple connections of members
- design simple structures based on Eurocode 3.

General Competences

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…

…….

- Autonomous work.
- Decision making.
- Production of free, creative and inductive thinking.

3. SYLLABUS

- Introduction to the design of steel structures according to Eurocode 3.
- Limit states of steel design.
- Classification of steel sections.
- Steel structural forms.

- Moment and shear resistance of steel members.
- Design of steel beams.
- Design of steel members subjected to combined bending and axial force.
- Stability of steel members. Design of steel members under compression. Lateral buckling.
- Steel connections (Welded -Bolted connections).
- Lateral-torsional buckling of structural elements.
- Design of members subjected to combined biaxial bending and compression force.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Part of the teaching material is presented using PowerPoint. • Supporting learning process using e-class on line platform and email
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The students will be evaluated as follows: • final exam (including problem solving and answering questions) • individual practice tasks. The degree of the final exam will be multiplied by a factor greater than or equal to one depending on the student's performance in the exercises. This maximum value of the factor will be 1.20 for students who will get an A in the exercises.

Activity	***Semester workload***
Lectures	52
Application of methods solving practical problems in class	16
Independent study	82
Course Load (25 hours of workload per credit unit)	150

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Steel Structures'. C.K Baniotopoulos, Th. N. Nikolaidis. Publisher: Ziti Pelagia & SIA I.K.E. (in Greek)
- Design of Stell Structures with Applications according to Eurocode 3'. I. Vayas, I. Ermopoulos, G. Ioannidis. Publisher: Kleidarithmos Ltd. (in Greek)
- Steel Structures'. A. Giannopoulos. Publisher: Gotsis Konstantinos & Co. (in Greek)
- Steel Structures'. C.K Baniotopoulos. Publisher: Ziti Pelagia & SIA I.K.E. (in Greek)
- Steel Structures-Analysis and Dimensioning'. I. Vayas. Publisher: Kleidarithmos Ltd. (in Greek)

COMPUTER PROGRAMMING AND COMPUTATIONAL APPLICATIONS IN CIVIL ENGINEERING II

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40403	**SEMESTER**	4th
COURSE TITLE	COMPUTER PROGRAMMING AND COMPUTATIONAL APPLICATIONS IN CIVIL ENGINEERING II		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS (ECTS)**
LecturesandLaboratoryExercises	5 hours/week *(LECTURES 3 hours&LABORATORY EXERCISES 2 hours)*	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized General Knowledge / Scientific area course
PREREQUISITE COURSES:	There are no prerequisite courses, however, the students should already have attended the previous semesters' courses and especially the course "COMPUTER PROGRAMMING AND COMPUTATIONAL APPLICATIONS IN CIVIL ENGINEERING I" and must also attend the current semester courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (In English)
COURSE WEBSITE (URL)	YES in the Open eClass platform (Asychronous eLearning platform) : https://eclass.uop.gr/modules/auth/opencourses.php?fc=82 https://eclass.uop.gr/courses/CIVIL105/ (For students with entrance before 2019 :

	https://eclass.pat.teiwest.gr/eclass/modules/auth/opencourses.php?fc=86 https://eclass.pat.teiwest.gr/eclass/courses/768116/)

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of this course, the students should be able to:

- Realize the importance of computer programming in the computational needs of the Civil Engineer.
- Compile and run computer programs in Fortran programming language.
- Compile and run computer programs in Fortran language for problems of the Civil Engineering specialty.
- Apply the numerical methods by programming in Fortran to solve Civil Engineering problems.
- Get to know the applications of the Fortran language in problems of the Civil Engineering specialty.
- Benefit from the enormous amount of programming work done in Fortranlanguage.
- Take advantage of the huge number of computer programs in Fortran language that have been written for problems of the Civil Engineering specialty.
- Use the numerous available scientific/educational computer programs in the Civil Engineering specialty, written in Fortran language, with the source code available.
- Know the principles of using ready-made computer programs (software).
- Know the legislation for the use of ready-made computer programs (software).
- Know the free software and the open source software for problems of the Civil Engineering specialty.
- Know the computer programming techniques in the computational structural analysis methods.
- Perform computational applications in subjects of the Civil Engineering specialty.

General Competences

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others… …….*

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Working independently.
- Team work.
- Working in an interdisciplinary environment.
- Production of new research ideas.
- Production of free, creative and inductive thinking.

3. SYLLABUS

The importance of computer programming in the computational needs of the Civil Engineer. The FORTRAN programming language.Creating and executing computer programs in FORTRAN for Civil Engineering problems.Numerical methods and FORTRAN programming for the solution of Civil Engineering problems.Applications of the FORTRAN programming language in problemsof the Civil Engineering specialty.Using and taking advantage of existing programs for Civil Engineering problems.Free software and open source software for problems of the Civil Engineering specialty.Computer programming techniques in the computational methods of structural analysis. Computational applications in subjects of the Civil Engineering specialty.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face. Lectures. Exemplary solving of exercises. Practice exercises and exercises using a computer. Laboratory exercises using a computer. Use of Information and Communication Technologies in Teaching. Classroom and Computer Center B4. Office hours for additional student support. A Textbook is provided (with a choice among 7 books) through the "Evdoxos" Electronic Service. Additional printed educational material is provided in the classroom. Additional educational electronic material is provided during teaching and / or through the Open eClass eLearning Platform. Laboratory exercises are distributed, and their solutions are commented in detail in class. The additional educational material (printed and electronic) is updated and enriched (if required) on an annual basis. The laboratory exercises are enriched (if required) on an annual basis. The students are trained in the research process through weekly exercises and additional optional projects.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Use of ICT in teaching, laboratory education, communication with students

Use of the Information and Communication Technologies (ICT) in Teaching.

Use of open source software.

Support of the learning process through the electronic e-class platform.

The Laboratory education takes place at the Computer Center B4.

The open source software Force 2.0 FORTRAN COMPILER AND EDITOR (Free distribution software), etc.

Additional educational electronic material is provided during the teaching and through the Open eClass eLearning Platform (Electronic presentations/powerpoint, electronic multiple-choice exercises, exercises, etc.)

All weekly laboratory exercises are performed by the students using a computer.

TEACHING METHODS

The manner and methods of teaching are described in detail.

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.

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

Activity	***Semester workload***
Attendance of Lectures (3 hours x 13 weeks)	39
Participation in optional practice exercises that are given in the classroom and focus on Civil Engineering applications	13
Preparation for the laboratory exercises	13
Laboratory exercises using computer on computational applications in Civil Engineering (2 hours x 13 weeks)	26
IndependentStudy	56
Final examination (3 hours)	3
Course total	***150***
(25 hours workload per credit)	***(6 ECTS x25) = 150***

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of

Written Final Examination at the end of the semester. Delivery of weekly laboratory exercises in the computer center B4 and final laboratory examination in the computer center B4: all together will contribute "positively" the grade "**E**" in a total percentage of 10% in the final grade.

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 *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Active systematic attendance of the Lectures of the course by the students and their successful participation in optional practice exercises can contribute "positively" the additional grade "**A**" at a rate of 5% in the final grade. The final grade of the course is calculated as follows: **Final Course Degree** = min **[(FE** + 0.1**E** + 0.05**A)**, 10**]** where "**FE**" is the grade of the Written **F**inal **E**xamination which is not allowed to be less than 4 in order the grades "E" and "A" to be activated. The above applies to the academic year in which the students declare the course for the first time. In case of failure or non-attendance at the Written Final Examination (in June and September), in each subsequent academic year the students are graded only on the basis of the written final examination of the course.

5. ATTACHED BIBLIOGRAPHY

- D.-P. N. Kontoni, "Computer Programming and Computational Applications in Civil Engineering II:Solved Problems and Applications", T.E.I. of Patras, T.E.I. of Western Greece, University of the Peloponnese, Patras, 1998-2019.
- A. S. Karakos, "FORTRAN 77/90/95 & FORTRAN 2003", 2nd edition (contains CD), Kleidarithmos Publications, Athens, 2008. (Book Code in Eudoxus: 13536). [In Greek].
- V. Ch. Mousas, "Programming for Engineers with FORTRAN 95/2003", Ion Publications, Athens, 2006. (Book Code in Eudoxus: 14694). [In Greek].
- S. K. Klimopoulos& A. G. Tsouroplis, "From FORTRAN '77 to FORTRAN '90", 3rd edition, New Technologies Publications, Athens, 2001. (Book Code in Eudoxus: 2154). [In Greek].
- C. Pozrikidis, "Numerical Computation in Science and Engineering", A. Tziolas& Sons SA Publications, Thessaloniki, 2006. (Book Code in Eudoxus: 18548823). [Translation in Greek]. The original English 1st and 2nd edition by Oxford University Press, 1998, 2008.
- T. R. Chandrupatla& A. D. Belegundu, "Introduction to Finite Elements in Engineering" 3rd edition (includes CD-ROM with computer programs), Kleidarithmos Publications, Athens, 2006. (Book Code in "Eudoxos" 13671). [Translation in Greek]. The original English 3rd edition by Prentice Hall, 2002 & the new 4th edition by Pearson, 2012.
- I. Th. Katsikadelis, "Boundary Elements. Theory and Applications" (contains CD-ROM with computer programs), SYMMETRIA Publications - S. Athanasopoulos& Co. P.C., Athens, 2012. (Book Code in "Eudoxos" 22768988). [In Greek]. Available also in English: J. T. Katsikadelis, "The Boundary Element Method for Engineers and Scientists. Theory and Applications", 2nd ed., Academic Press, Elsevier, U.K.(2016).
- Ch. G. Provatidis, "Structural Optimization and Software for Computational Mechanics: Finite Elements, IsogeometricElements, Boundary Elements", A. Tziolas& Sons SA Publications, Athens, 2015. (Book Code in "Eudoxos" 50659719). [In Greek].

- D.-P. N. Kontoni, "Scientific-Educational Computer Programs for the Civil Engineering Specialty", Patras, 1985-2019.
- Extensive relevant Bibliography in the English Language, majoring in Civil Engineering applications.

REINFORCED CONCRETE I

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40404	**SEMESTER**	4th
COURSE TITLE	REINFORCED CONCRETE I		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory exercises	4+2	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialised general knowledge
PREREQUISITE COURSES:	There are no prerequisite courses. Students must have at least knowledge of Statics and Strength materials.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*

- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After the end of the course, the students will be able to:

Theory

- understand the mechanical behavior of concrete and steel
- calculate design loads based on Eurocode 1
- calculate the dimensions and necessary reinforcement of linear elements of reinforced concrete according to Eurocode 2
- calculate the dimensions and necessary reinforcement of surface elements (one direction and two directions) of reinforced concrete according to Eurocode 2
- design the reinforcement detailing of floor plans.

Laboratory

After the end of the course, the students will:

- be able to proportionthe igredients required for concrete composition
- knowthe production process of concrete, its placement and curing
- know the control procedures and conformity criteria of the steel reinforcement in accordance to thesteel standards and codes
- be able to estimate the strength and grade of concrete with destructive and non-destructive methods.

General Competences

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Analysis and synthesis of data with the use of necessary technology.
- Working independently.
- Team work.
- Project planning and management.

3. SYLLABUS

Theory

- Introduction to the design of reinforced concrete structures based on Eurocode 2.
- Reinforced concrete technology. Mechanical properties of steel and concrete.
- Design of linear members in flexurewithaxial force based on the ultimate limit state.
- Detailing and sizing of linear reinforced concrete members.

- Design of members in shear based on the ultimate limit state.
- Design and detailing of one and two-way slabs.

Laboratory

- Studying concrete compostion.
- Steel technology regulations.
- Concrete production.
- Mix-batch compliance inspections.
- Assessment of concrete strength by destructive methods.
- Assessment of concrete strength by non-destructive methods.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Part of the teaching material is presented using PowerPoint. • Supporting learning process using e-class on line platform and email
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.* *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*	***Activity*** / ***Semester workload*** Lectures — 52 Individual practice tasks — 16 Project workimplementing the learning outcomes — 20 Laboratory exercises and writing laboratory reports — 20 Independent study — 42 Course Load (25 hours of workload per credit unit) — ***150***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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,*	The students will be evaluated as follows: • final exam (including problem solving and answering questions) • individual practice tasks • project work • lab exercises (technical report) • final lab exam. ✓ Final theory exam (80%). The grade of the final exam will be multiplied by a factor greater than or

other *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	equal to one depending on the student's performance in the exercises and the project. The maximum value of the factor will be 1. 36 for students who will get an A in the exercises and the project. The exercises and the project will have the same weight. ✓ Final laboratory exam (20%). The grade of the final exam will be multiplied by a factor greater than or equal to one depending on the student's performance in the exercises and the project. The maximum value of the factor will be 1. 4 for students who will get an A in thelab exercises.

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Elements for the calculation and configuration of structures'. Karavezyroglou-Weber. Publisher: Viola (in Greek)
- 'Reinforced Concrete'. Volumes A and B, Th. Georgopoulos, Self-publishing (in Greek)
- 'Reinforced of Reinforced Concrete Structures I'. A. Tsonos. Publisher: Sofia (in Greek)
- 'Reinforced Concrete Design'. Bill Mosley, John Bungey, Ray Hulse. Publisher: Kleidarithmos
- 'Reinforced Concrete Structures According to the new Regulations of R/C & Earthquake Structure'. G. Penelis, K. Stylianides, A. Kappos, C. Ignatiadis. Publications: Aivazis Publications (in Greek)
- 'Reinforced Concrete lessonsI,II'. M.Fardis. Publisher: University of Patras. (in Greek)

ARCHITECTURAL COMPOSITION

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	BACHELOR		
COURSE CODE	40405	**SEMESTER**	4th
COURSE TITLE	ARCHITECTURAL COMPOSITION		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2+2	4
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The students should be able to shape the space, inside and outside of the buildings that constitute their object, as well as more widely in the surrounding area of architectural ensembles.

Upon successful completion of the course the student will be able to:

- Understand the fundamental principles of architectural composition and the basic concepts and elements that make up space.
- Be updated on modern architectural concepts.
- Manage problems related to professional activity.
- Understand the functional and morphological study of simple buildings.

General Competences

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…

…….

Autonomous work

Group work

3. SYLLABUS

Introduction to the concepts of Architectural Composition and Methods of Architectural Design. Approach to the synthetic process: conception, investigation, formulation, processing, finalization, presentation of a proposal. Reference to the individual concepts and symbols of space such as symmetry-asymmetry, introversion-outflow, transparency-opacity, capacity-static, vacuum-full, public-private, atomic-collective, built-free space, building coefficient, coverage rate, etc.
The relationship of volumes to each other, but also the inclusion of the total volume in the wider environment. Interior design. The proportion of the sizes of the individual architectural elements and their significance in the final performance of the form of the work. The management of space in general and the importance of ergonomics combined with the functional and morphological performance of the Architectural Project.

Introduction to the range of problems of space organization, architectural communication and the parameters involved in contemporary design reflection. Verification of the size, character and organization of Architectural and Urban Elements. Materials and construction as integral expression of form. Transfer of building programs into a synthetic proposal. Organization of the synthetic proposal itself, the quality of which will depend on the degree of processing and incorporation into it of basic parameters for Architectural Design.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Yes
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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.* *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*	

Activity	***Semester workload***
Lectures	25
Practice exercises that focus on the application of methodologies and analysis of studies in smaller groups of students	25
Group work on a study	50
Course total	100

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *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* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	i. Written final examination ii. Presentation of group work

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

ΕΜΠ, Σχολή Αρχιτεκτόνων Μηχανικών, Εισαγωγή στην Αρχιτεκτονική Σύνθεση Ι, 2003, Εκδόσεις Παπασωτηρίου.

Τζώνος Π., Οργάνωση της αρχιτεκτονικής μελέτης, [ΦΕΚ 944/Τεύχ. Β΄/2004], Εκδόσεις Ζήτη.

Φατούρος Δημήτρης, Ένα συντακτικό της Αρχιτεκτονικής Σύνθεσης, Εκδόσεις Παπασωτηρίου.

Arnheim R., Η δυναμική της αρχιτεκτονικής μορφής, [ΦΕΚ 382/
Τεύχ. Β΄/24-3-2005], Εκδόσεις UNIVERSITY STUDIO PRESS, ISBN 960-12-1194.

Ching Francis, Αρχιτεκτονική, Μορφή, Χώρος, Διάταξη 2η Έκδοση, [ΦΕΚ 403/Τεύχ. Β'/2003], Εκδόσεις ΙΩΝ, ISBN 960-405-945-9.

Neufert / Neff, Αρχιτεκτονικός Σχεδιασμός και Εφαρμογές, [ΦΕΚ 451/Τεύχ. Β΄/2002], Εκδόσεις Κλειδάριθμος, Κωδ. 40504.

Neufert Ernst, Οικοδομική και Αρχιτεκτονική Σύνθεση, 2003, [ΦΕΚ 334/Τεύχ. Β΄/2006], Εκδόσεις Μ. Γκιούρδας.

- Related academic journals:

SPECIAL TOPICS IN SURVEYING-GEOGRAPHIC INFORMATION SYSTEMS

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40406	**SEMESTER**	4th
COURSE TITLE	SPECIAL TOPICS IN SURVEYING-GEOGRAPHIC INFORMATION SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2 (Lectures/Theory)	4
	3 (Laboratory)	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific area course
PREREQUISITE COURSES:	Surveying
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The goal of the course is to provide knowledge to the students in the area of topography by modern instruments and techniques. The course aims at familiarizing the students with modern topographical instruments and techniques as applied to civil engineering works as well as to chartography, earthquake monitoring, landslides monitoring and ground digital modeling. Another basic goal of the course is to introduce students to Geographical Information Systems (GIS) and to a related software. Finally, during the lab part of the course, the students become familiar with the use of the Total Station and conduct complex exercises as parts of teams.

After the successful completion of the course, students are expected to be able to:

- Know the basic areas of modern topographical applications
- Know the basic design methods in technical works
- Create and use a digital ground modeling
- Know fundamental concepts and apllications of chartography
- Draw conclusions from measurements of surface movements (faults, landslides)
- Understand GIS and use relevant software
- Know the basic principles and methods applying systems GPS/GNSS

General Competences

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…
…….

- Working indepedently
- Team work
- Decision-making

3. SYLLABUS

Lectures (Theory):

Modern topographic instruments (EDM, Total Station, GPS/GNSS, Laser Scanner etc). Geometrical design of technical works: complex traversing, geometrical design of curved and straight lines, calculation of the volume of earthworks.
Digital models of the ground.
Complex topographical applications in infrastructure works (monitoring of landslides-dams, vibrations of bridges, buildings and monuments, townplanning mappings, monitoring of natural disasters such as floods, volcanos etc).
Topography and seismology: topographical methods of computation.
Geographical information systems (GIS): introduction to GIS, landmaps, multi-subject maps, applications in infrastructure works and their management.
GIS software (open access code) and familiarity through exercises.

Laboratory:

Introduction to mapping using total station. Drawing of a closed traversing for the mapping of a building complex. Determination of the nodes of a traversing and construction of relevant report.
Measurement of the lengths of the sides of the traversing.
Levelling of the nodes of a traversing and error correction. Intersection and determination of coordinates and direction of the starting note of the traversing. Measurement by a total station of the length of the sides and the angles of the traversing. Computation and correction of a closed traversing with respect to coordinates and angles. Measurement and calculation of the coordinates of the roof corners of a building and other elements around it. Drawing of a topographic diagram on the basis of code provisions. Familiarity with the use of GPS/GNSS. Calculation of the coordinates of a traversing by GPS/GNSS and electronic drawing of the diagram in accordance with code provisions.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to –face in classroom or lab</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Support of learning process through the electronic platform e-class</td></tr>
<tr><td>TEACHING METHODS

The manner and methods of teaching are described in detail.

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.

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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Field exercises</td><td>39</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Individual theoretical work</td><td>30</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Team lab work</td><td>30</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

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

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Final exam 50%

Individual theoretical work 20%

Laboratory (exercises & exam) 30%</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

P.Savvaidis, I.Ifantis, I.Doukas, Geodesy II: Topographical Mappings and Design, Kyriakidi Press, Thessaloniki, 2017 (in Greek)-code in Evdoxos: 6203.

G.Pantazis, E.Lambrou, Applied Geodesy, Ziti Press, Thessaloniki, 2010 (in Greek)-code in Evdoxos: 11432.

P.A.Longley, M.F.Goodchild, D.J.Macquire, D.W.Rhind, Geographical Information Science and Systems (GIS), 4th edition, Wiley, 2015 (Translation in Greek by Klidarithmos, Athens, 2010)

- Related academic journals:

Journal of Surveying Engineering of ASCE