ROAD CONSTRUCTION II-ROAD CONSTRUCTION WORKS

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40701	**SEMESTER**	7th
COURSE TITLE	ROAD CONSTRUCTION II-ROAD CONSTRUCTION WORKS		

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	3	5
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:	Road Construction I: Computer-Aided Road Construction
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 course has the goal of providing knowledge in road construction and the corresponding road construction works. It aims at familiarizing the students with the basic soil characteristics and their evaluation, the common techniques of computing bases and subbases, the asphaltic materials and pavements as well as their damages. In addition, it has the scope of introducing the student to methods of design and construction of road construction works.

With a successful completion of this course, the student will be in a position to:

- Has a knowledge of the historical evolution in road construction from traditional to medern construction techniques
- Knows the basic techniques for soil and ground material characterization for bases and subbases
- Can determine layer thicknesses in pavements
- Can recognise the various types of damages in pavements and knows ways of repairing them
- Knows the basic asphalt materials and how to calculate an asphaltic composition
- Has knowledge of the common road constuction works

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…*
	…….

- Decision-making
- Working independently
- Team work

3. SYLLABUS

Road construction. Historical review, methods and techniques over the years.
Earth works, construction of trenches, methods of excavation and landfilling.
Soil characterization, Atterberg limits and soil strength.
Characteristic soil tests (Los Angeles, sand equivalent, loaded plate, index VBR). Classification of soils.
Flexible and rigid pavements: internal structure of pavements, basic materials.
Construction of base and subbase. Determination of thickness of asphalt concrete or concrete, base and subbase.
Asphaltic materials: asphaltic solutions, asphalt mixtures and asphalt concrete. Basic chemistry of concrete.
Damages: Repair and rehabilitation of flexible and rigid pavements. Types of cracks and their rehabilitation.
Technical works of road construction: drainage works in urban and suburban roads, drainage ditches and drain cups.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in the classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Support of learning process through the electronic platform e-class
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	39
Individual work	56
Individual study	35
Course total	**125**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of*	Individual project 30% Final exam 70%

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.*	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

A.K.Mouratidis, Road Construction Works, University Studio Press, Thessaloniki, Greece 2007 (in Greek)-code in Evdoxos: 17434

E.J.Yoder and M.W.Witczal, Principles of Pavement Design, Wiley, 1975 (in Greek-translation by A.Giourdas Press, 1987)-code in Evdoxos: 12405

A.F.Nikolaides, Highway Engineering: Pavements Materials and Control of Quality, CRC Press, 2015 (Greek version by M.Triantafyllou Press, 2011)

- Related academic journals:

Journal of Transportation Engineering of the ASCE

International Journal of Pavement Engineering Road Materials and Pavement Design

SEISMIC RESISTANT DESIGN OF STRUCTURES

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40702	**SEMESTER**	7th
COURSE TITLE	SEISMIC RESISTANT DESIGN OF 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 the basic knowledgeof Statics, Reinforced Concrete and Dynamics of Structures.
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:

- properly form a structure based on the basic principles of seismic resistant design
- analyze a structure based on the seismic codes.
- identify the causes of structural damage from an earthquake.

They will also have acquired knowledge of:

- how to control earthquake vibrations using active and passive structural control systems
- the basic principles of repairs and strengthening of structures

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.
- Teamwork.
- Design of structures.
- Production of free, creative and inductive thinking.

3. SYLLABUS

- Seismic actions.
- Seismic response of structural system.
- Response spectrum. Ductility.
- Seismic code of buildings (Eurocode 8).

- Analysis methods i) linear and ii) nonlinear analysis.
- Conceptual design of reinforced concrete buildings.
- Rules for designing and detailing reinforced concrete buildings.
- Passive and active structural control systems.
- Seismic design using base insolation.
- Typical damage patterns of buildings due to earthquakes.
- Introduction to the technologies and applications of repairs of buildings load-bearing systems.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face-to-face.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Part of the teaching material is presented using PowerPoint.
• Supporting learning process using e-class on line platform and email</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>52</td></tr><tr><td>Individual practice tasks</td><td>16</td></tr><tr><td>Project workimplementing the learning outcomes</td><td>20</td></tr><tr><td>Independent Study</td><td>62</td></tr><tr><td></td><td></td></tr><tr><td>Course Load
(25 hours of workload per credit unit)</td><td>150</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</td><td>The students will be evaluated as follows:
• Final exam (including problem solving and answering questions).
• Individual practice tasks.
• Project work.

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. This maximum value of the factor will be 1. 30 for students who will get an A in the exercises and the project. The exercises and the project will have the same weight.</td></tr>
</table>

given, and if and where they are accessible to students.	

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- 'Design, Behavior of Reinforced Concrete Structure Resisting Earthquakes'. C. Karagiannis, Publisher: Sofia (in Greek)
- 'Seismic resistant design of structures, Eurocode, European standards, Structures'. M.N. Fardis, E. Carvalho, A. Elhashai, E. Faccioli, P. Pinto, A.. Plumer.Publisher: Kleidarithmos (in Greek)
- 'Seismic Design and Strengthening of Reinforced Concrete Buildings'. Kanellopoulos, Self-publishing (in Greek)
- 'Seismic Resistant Design of Concrete Structures'. G.G. Penelis – A.Kappos.Publisher: Ziti Pelagia & Co. I.K.E (in Greek)
- 'Seismic Resistant Design of Structures of Concrete and Masonry'. T. Pauley-M.J.N. Pristley, Publisher: Kleidarithmos
- 'Seismic Resistant Structures'. Anastasiades. Publisher: Ziti Pelagia & Co. I.K.E (in Greek)
- 'Reinforced Concrete Constructions According to the new codesof R/C and Seismic Resistant Structures'. G. Penelis, K. Stylianides, A. Kappos, C. Ignatiadis, Publisher: Charalambos Nick. Aivazis (in Greek)

COMPUTER-AIDED STRUCTURAL ANALYSIS

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40703	**SEMESTER**	7th
COURSE TITLE	COMPUTER-AIDED STRUCTURAL 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 (ECTS)**
LecturesandLaboratoryExercises	6 hours/week *(LECTURES4hours&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 Knowledgecourse / Scientific Area course**
PREREQUISITE COURSES:	There are no prerequisite courses, however, the students should already have attended the previous semesters' courses 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/CIVIL107/ (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/768101/)

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:

- Know the principles of Computer-Aided Structural Analysis.
- Know the **matrix analysis of framed structures** using the stiffness method and the relevant computer programs.
- Calculate the stiffness matrices of the members of framed structures.
- Create/construct the stiffness matrix of a framed structure and solve the relevant system of equations for the unknown displacements.
- Use the stiffness method and the related computer programs to analyze framed structures (plane trusses, plane frames, space trusses, plane grillages, space frames) and analyze/solve Civil Engineering structures (bridges, truss roofs, buildings, etc.).
- Know the **Finite Element Method** and the related computer programs.
- Understand the static function of a structure and select the appropriate finite element model to simulate it.
- Simulate simple and complex structures with the finite element method.
- Analyze surface/planar structures(plates, shells, walls, etc.) by the Finite Element Method and the use of computer programs.
- Use the Finite Element Method and the related computer programs to solve Civil Engineering problems and structures (bridges, retaining walls, buildings, etc.).
- Know the **Boundary Element Method** and the related computer programs.
- Simulate simple and complex structures with the boundary element method.
- Analyze surface/planar structures by the Boundary Element Method and the use of computer programs.
- Use the Boundary Element Method and the related computer programs to solve Civil Engineering problems and structures.

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

- Introduction to Computer-Aided Structural Analysis.
- **Matrix analysis of framed structures using the stiffness method.**Structural analysis of framed structures by the stiffness method and the use of computer programs (software) : computer-aided analysis of plane trusses, computer-aided analysis of plane frames, computer-aided analysis of space trusses, computer-aided analysis of plane grillages, computer-aided analysis of space frames.Applications in Civil Engineering problems and structures.
- **Introduction to the Finite Element Method.**Structural analysis of framed structures and surface/planar structures by the Finite Element Method (FEM) and the use of computer programs (software). Applications of FEM in Civil Engineering problems and structures.
- **Introduction to the Boundary Element Method.**Structural analysis of surface/planar structures by the Boundary Element Method (BEM) and the use ofcomputer programs (software). Applications of BEM in Civil Engineering problems and structures.

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. Lecture Notes authored by the Assoc. Professor Dr. D.-P. N. Kontoni (137 pages) are provided. 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. Specialized structural analysis software. Support of the learning process through the electronic e-class platform. The Laboratory education takes place at the Computer Center B4. 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.) Software related to the subject of the course: Free and open source software (from the official websites). Software trial versions (trial versions, evaluation versions) (from the official websites). Also, two of the textbooks (provided through the "Evdoxos" Electronic Service) are accompanied by a CD with program codes. 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 (4 hours x 13 weeks)	52
Participation in optional practice exercises that are given in the classroom and focus on Civil Engineering applications	7
Preparation for the laboratory exercises	7
Laboratory exercisesusing computer on computational applications in Civil Engineering (2 hours x 13 weeks)	26
IndependentStudy	55
Final examination (3 hours)	3
Coursetotal	***150***
(25 hours workload per credit)	***(6 ECTS x25) = 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, other

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

Written Final Examination at the end of the semester. Delivery of weekly laboratory exercises in the computer center B4, intermediate laboratory examination 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.

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 January 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-Aided Structural Analysis" (Lecture Notes), T.E.I. of Patras, T.E.I. of Western Greece, University of the Peloponnese, Patras, 1995/1999/2002/2019. [In Greek].
- P. Komodromos, "Structural Analysis - Modern Computer-Aided Methods", 3rd edition, KLEIDARITHMOS LTD Publications, Athens, 2018. (Book Code in "Eudoxos" 77108689). [In Greek].
- M. Papadrakakis, "Structural Analysis with the finite element method", Papasotiriou Publications, Athens, 2001. (Book Code in "Eudoxus" 9629). [In Greek].
- I. Avramidis, A. Athanatopoulou, K. Morfidis, "THE FINITE ELEMENT METHODSimulation and Structural Analysis", "Sophia" Publications, Thessaloniki, 2016. (Book Code in "Evdoxos" 59369378). [In Greek].
- 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.
- P. Kakavas, "The Method of Finite Elements", A. Tziolas& Sons SA Publications, Athens, 2016. (Book Code in "Eudoxos" 59385060).[In Greek].
- 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“Computer-aided Structural Analysis”in the Civil Engineering Specialty", Patras, 1985-2019.
- Extensive Bibliography in English on topics of “Computer-aided Structural Analysis” in problems of the Civil Engineering specialty.
- Scientific Publications in English authored by Dr. D.-P. N. Kontoni on relevant topics.

COMPOSITE STRUCTURES

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40704	**SEMESTER**	7th
COURSE TITLE	COMPOSITE 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	3	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*	Specialised general knowledge
PREREQUISITE COURSES:	There are no prerequisite courses. Students must have knowledge of“Strength of Materials”,“Steel Structures” and“Reinforced Concrete”.
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 aim of the course is to educatethe students on the basic principles of composite structures, consisting of two different materials, steel and reinforced concrete.
Upon successful completion of the course the student will be able to know:
- General subjects on composite constructions, definitions, advantages and disadvantages in comparison to conventional construction.
- The basic characteristics of the materials used.
- Design principles.
- The mechanics of full and partial shear connection.
- Importantsubjects on the analysis and design of composite structural elements: beams, slabs, columns.
- The basic principles ofdesigning structures with composite structural elements.
- Basic elements of seismic design of composite structures.
- Ultimate limit state and serviceability limit state checksbased on Eurocode 4.

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
Decision-making
Working independently
Project planning and management

3. SYLLABUS

Introduction to the design of structural elements consisting of two different building materials, steel and reinforced concrete. Materials, design principles, full and partial shear connection. Analysis and design of composite structural elements: beams, slabs, columns. Design of structures with composite structural elements: connections, structural systems, seismic design. Ultimate limit state and serviceability limit state checks based on Eurocode 4.

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

Use of ICT in teaching (eg. Powerpoint presentations, photographs etc.).
Support of learning process through e-class electronic 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

Activity	*Semester workload*
Lectures	39
Independent study	61
Course Total (25 hours of workload per ECTS credit)	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.

Written final exam (100%) of problem-solving exercises with combined content and short-answer questions.

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Triantafyllou, Th., Composite Structures, GOTSIS Publications, 2016. (in Greek)

Vagias, I., Composite Structures from Steel and Reinforced Concrete, Kleidarithmos Publications, 4th edition, 2018. (in Greek)

EN 1994-1-1: Design ofcomposite steel and concrete structures – Part 1-1: Generalrules and rules for buildings, CEN 2003.

GEOLOGY AND ROCK MECHANICS – TUNNELS

1. GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40705	**SEMESTER**	7th
COURSE TITLE	GEOLOGY AND ROCK MECHANICS – TUNNELS		

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)**
Lectures	4 hours/week	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*	Scientific Area course
PREREQUISITE COURSES:	There are no prerequisite courses, however, the students should already have attended the previous semesters' courses and must also attend the current semester courses, especially Mechanics, SoilMechanins I and Soil Mechanins II.
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 e Learning platform).

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 comprehend and calculate:

- The different types of rocks and their classification
- Recognize the impending and ongoing landslides and the calculation of their stability.
- The tunnel construction methods and the principles of design and dimensioning of support measures.
- The design of support measures for the NATM method with empirical 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… …….*

- Working independently.
- Team work.
- Project planning and management
- Respect for the natural environment
- Production of free, creative and inductive thinking.

3. SYLLABUS

- Geology of rocks and the relevant definitions that characterize their properties. Types of rocks. The stress state of the rock. Elastic, plastic behavior, analysis and synthesis of stresses and deformations.
- Landslides and control of rocky slopes. Hoek & Bray method.
- Construction of tunnels and underground works. Vertical and horizontal tunnel opening methods.
- Construction of open vertical tunnels (CUT and COVER). The up-down method. Methods of construction and slope support technics.
- TBM method. Types of drilling machines.
- NATM method, design of temporary support measures with the theory of plastic zones, anchors and bolts, dimensioning of the final supporting ring.

- Theories on the calculation of stresses in tunnel walls.
- Basic empirical rock classification methods for the construction of tunnels: Bieniawski, GSI, Barton. Design of support measures with empirical methods.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face. Lectures in the class in Power Point with the use of videoprojector. The Laboratory education takes place at the Soil Mechanics Laboratory.
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.Support of the learning process through the electronic 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*	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Attendance of Lectures (3 hours x 13 weeks)</td><td>26</td></tr><tr><td>Participation in optional practice exercises that are given in the classroom and focus on Civil Engineering applications</td><td>54</td></tr><tr><td></td><td></td></tr><tr><td>IndependentStudy</td><td>50</td></tr><tr><td>Course total</td><td>150</td></tr><tr><td>(25 hours workload per credit)</td><td>(6 ECTS x25) = 150</td></tr></table>
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 evaluation is done: • With practice exercises. The participation in the final grade is 20%. • With the final written exam that participates by 80% in the final grade.

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. ΤΕΧΝΙΚΑ ΕΡΓΑ ΥΠΟΔΟΜΗΣ, ΧΡΗΣΤΟΣ ΜΑΡΑΓΚΟΣ, Έκδοση ιδίου, 2003
2. Στοιχεία Μηχανικής των Πετρωμάτων, Χαρ. Τσουτρέλη.
3. Hoek, E. & Brown, E.T., Underground excavations in rock, Chapman and Hall, London 1997.
4. TBM Tunneling in jointed and faulted rock, Nick Barton.

TIMBER STRUCTURES

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	40706	**SEMESTER**	7th
COURSE TITLE	TIMBER 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	3	3
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. Studentsmust have at least basic knowledge of “Statics” and “Strength of 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*

At the end of the course students will be able to:

- know the mechanical properties of wood and the types of timber used in structures.
- calculate the strength of timber in compression, shear and bending.
- to design connections of timber elements.
- to design timber structural systems such as roof, truss, building.

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

Project planning and management

3. SYLLABUS

- Wood properties. Types of timber.
- Introduction to the design of timber structures.
- Load combinations.
- Calculation of the design values of resistancesintimber structures according toEurocode.
- Ultimate limit state checks.
- Serviceability limit state checks.
- Connections of timber elements.
- Composite sections.

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*	Use of ICT in many lectures. Support of learning process through e-class electronic 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, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Written final exam (100%) of problem-solving exercises with combined content.

Activity	***Semester workload***
Lectures	39
Some individual essay writing	16
Independent study	20
Course Total (25 hours of workload per ECTS credit)	75

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Timber Structures, E. Katsaragakis (in Greek)
- Timber Structures, Volumes A and B, W. Gerhard.
- Eurocode 5, Design of TimberStructures, 1995-1-1.

REHABILITATION OF HISTORICAL CENTERS AND ENSEMBLES

1. GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	BACHELOR		
COURSE CODE	40707	**SEMESTER**	7th
COURSE TITLE	REHABILITATION OF HISTORICAL CENTERS AND ENSEMBLES		

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**
	3	3
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:	
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*

Students should acquire the necessary knowledge so that they can evaluate an architectural ensemble and use design and legislative tools to prepare a study for its protection.

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

- Follow an analytical process (recognition of the existing situation, general characteristics of space, typological and morphological characteristics, data analysis, problem diagnosis, intervention possibilities).
- Draft a protection study (evaluation and degree of protection of buildings, consolidation of historical complex, road plan, special urban planning regulation, architectural and urban interventions).
- Prepare proposals for the protection, enhancement and revitalization of historic centers and ensembles.

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…*
	……

Autonomous work

Group work

3. SYLLABUS

Basic knowledge of urban planning. Relationship between the building and the wider urban environment. Systematic approach to the methods of analysis, recording and evaluation of historic residential complexes. Institutional framework. Protection policy. International Conventions for the Protection of Historic Cities. Philosophy of protecting and restoring architectural ensembles. Trends - Schools. Views on architectural heritage. Objects of protection and rehabilitation. Historic city areas. Traditional houses. Historic landscapes.

Production and layout of urban space. Networks of settlements. History of the creation of European cities. Sociological dimension. Urban environment. Organization of uses and networks. Restoration of residential complexes. Needs that cause regeneration. Particularities of historical settlements. Terminology of regeneration. Typology of reconstruction in terms of scale of intervention. Typology of reconstructions in dealing with architectural shells. Typology of reconstructions in terms of type of intervention and the form of utilization of the history of the residential complex. Typology of reconstructions in terms of the degree of preservation of the social composition of the historic settlement complex.

Analytical procedure (recognition of the current situation, general characteristics of the site, typological and morphological features, data analysis, diagnosis of problems, possibilities of intervention).

Synthetic process - design protection study (assessment and degree of protection of buildings, restoration of historical background, urban plan, special planning regulation, architectural and urban planning interventions).

Proposals for the protection, promotion and revival of historic centers and ensembles.

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>In classroom</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Yes</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>25</td></tr>
<tr><td>Practice exercises that focus on the application of methodologies and analysis of studies in smaller groups of students</td><td>25</td></tr>
<tr><td>Group work on a study</td><td>25</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
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<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>75</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>i. Written final examination

ii. Presentation of group work</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Νομικός Μ., Αποκατάσταση επανάχρηση ιστορικών κτιρίων και συνόλων. Μεθοδολογία – εφαρμογές, Θεσσαλονίκη, Α.Π.Θ. Τμήμα Αρχιτεκτόνων / Εκδόσεις Γιαχούδης, 1997.

Καραμάνου Ζ., Αναβάθμιση Προβληματικών Οικιστικών Περιοχών, Εκδόσεις Γιαχούδης, ISBN 960-7425-14-6.

Φιλιππίδης Δ., Νεοελληνική Αρχιτεκτονική, Εκδόσεις Μέλισσα, ISBN 960-204-176-5.

Πρακτικά Διεθνούς Συμποσίου, Επανασχεδιασμός Υποβαθμισμένων και Κατεστραμμένων Περιοχών της Ευρώπης, Εκδόσεις UNIVERSITY STUDIO PRESS, Κωδ.1119-02.