Graduate Programs of Studies

Department of Civil and Environmental Engineering

University of Cyprus

INTRODUCTION

The Department of Civil and Environmental Engineering (CEE) offers graduate studies programs both at the level of Master (M.Eng., M.Sc.) and at the doctoral level (Ph.D.). In particular, the CEE Department offers, in total, 6 postgraduate titles at 3 levels of study, Master of Engineering (M.Eng.), Master of Science (M.Sc.) and Doctor of Philosophy (Ph.D.):

- Master of Engineering (M.Eng.) in Civil Engineering
- Master of Science (M.Sc.) in Civil Engineering
- Master of Engineering (M.Eng.) in Environmental Engineering
- Master of Science (M.Sc.) in Environmental Engineering
- Doctor of Philosophy (Ph.D.) in Civil Engineering
- Doctor of Philosophy (Ph.D.) in Environmental Engineering

The CEE Department also offers the possibility of obtaining the postgraduate-level degrees of Master of Science (M.Sc.) and Master of Engineering (M.Eng.) in "*Energy Technologies and Sustainable Design*" under an Inter-departmental Graduate Program of the Engineering School of the University of Cyprus, which is fully described in a separate guide.

Master of Engineering/Master of Science (M.Eng., M.Sc.)

The CEE Department offers two levels of graduate studies at the Master's level, namely, the Master of Engineering (M.Eng.) and the Master of Science (M.Sc.) in Civil Engineering or Environmental Engineering, with the Masters of Science focusing on research, having a small number of courses to attend and placing emphasis upon the completion of a research thesis with higher demands. A transfer between the two academic tracks (M.Sc. to M.Eng. or M.Eng. to M.Sc.) is allowed only after approval by the CEE Department's Council of a relevant application by the student. The Department's Council reserves the right for a mandatory transfer from the M.Sc. to the M.Eng. in case of unsatisfactory progress in the completion of the required research/ thesis.

- Civil Engineering Master's Specializations

The Master of Engineering and Master of Science (M.Eng. and M.Sc., respectively) in Civil Engineering is offered in four specializations as listed below; to specialize in any of these areas the graduate must fulfill certain course and research work requirements:

1. Structural Analysis and Earthquake Engineering
2. Novel and Traditional Construction Materials
2. Geotechnical Engineering
3. Construction and Transport Infrastructure Management

More specifically, for the Master of Engineering and Master of Science degrees (M.Eng. and M.Sc.) courses are grouped in four categories of courses (Annex-1), from which each student must successfully attend a specific number of courses in order to fulfill the requirements of the specialty thrust selected, as follows:

Categories	Description
A	Basic specialization graduate courses
B	Elective specialization graduate courses
C	CEE graduate courses other than those in categories A and B
D	UCY graduate courses

For the Master of Engineering and Master of Science degrees (M.Eng. and M.Sc.) in Civil Engineering, for each of the five thrusts, a number of successfully completed courses is required, as follows:

Courses:	A	B	C	D
M.Eng.	≥5	≤5	≤1	≤1
M.Sc.	≥ 4	≤3	≤1	

Therefore, completion of an M.Eng. degree in Civil Engineering in any particular thrust which requires successful passing of 10 graduate courses, the requirements correspond to at least 5 graduate courses from group A and up to 5 graduate courses from group B, while up to 1 course is allowed from group C and up to 1 course from group D, as specified for the particular of specialization. For example, a student could take 6 courses from group A and 4 courses from group B, or 5 courses from group A, 4 courses from group B and 1 course from group C or D, as specified for the particular specialization.

Respectively, for a Master of Science in Civil Engineering, which is more research-oriented and requires only 7 successfully completed graduate courses, at least 4 graduate courses are required from group A, up to 3 graduate courses are allowed from group B and up to 1 graduate course is required either from group C or D. For example, a student could select 5 graduate courses from group A and 2 courses from group B, or 4 courses from group A, 2 courses from group B and 1 course either from group C or D.

- **Environmental Engineering**

For the Master of Engineering and Master of Science (M.Eng. and M.Sc.) in Environmental Engineering, 10 and 7 graduate courses, respectively, must be successfully completed, while only one of these courses can be from outside of the course-catalogue for Environmental Engineering (Annex-3). After approval from the student's research supervisor, a second course from outside the catalogue can be taken.

Master of Engineering in Civil Engineering and Master of Engineering in Environmental Engineering (M.Eng.)

The degree of Master of Engineering (M.Eng.) in Civil Engineering (in one of the five thrusts or specializations), or Master of Engineering (M.Eng.) in Environmental Engineering is awarded to graduate students of the Department of Civil and Environmental Engineering upon successful completion of the M.Eng. Academic program of studies.

The required workload for the Master of Engineering in either Civil or Environmental Engineering corresponds to the successful completion of **90 ECTS (ECTS = course credits defined in the** European Credit Transfer and Accumulation System framework by the European Union): **10 graduate courses (80 ECTS)**, a **research project (CEE 689, 10 ECTS)**, as well as attendance at **8 Seminars for Postgraduate Students (CEE 610)** offered by the CEE Department. Note that the Independent Study (CEE 650) cannot be counted towards fulfilling the required course load for the M.Eng. Degree.

Requirements for Master of Engineering (M.Eng.)

Postgraduate courses: (10 courses of 8 ECTS each)	80 ECTS
CEE 610 Seminar for Postgraduate Students (8 attendances):	0 ECTS
Research Project (CEE 689.1 and 689.2):	10 ECTS
Total	**90 ECTS**

The maximum allowable duration of graduate studies towards the Master of Engineering degree is eight academic semesters.

The following table presents a sample academic program of studies leading to an M.Eng. in Civil Engineering (in one of the five thrusts of specialization), or an M.Eng. in Environmental Engineering, which can be completed in 1.5 calendar year.

1st semester (fall)	**2nd semester (spring)**
4 graduate courses 4x8=32 ECTS Total: **32 ECTS**	3 graduate courses 3x8=24 ECTS CEE689 Research Project 5 ECTS Total: **29 ECTS**
Summer	**3rd semester (fall)**
	3 graduate courses 3x8=24 ECTS CEE610 Graduate Seminar 0 ECTS CEE689 Research Project 5 ECTS Total: **29 ECTS**

Master of Science in Civil Engineering and Master of Science in Environmental Engineering (M. Sc.)

The M.Sc. degree is awarded to a graduate student of the CEE Department upon successful completion of the required number of courses according to the graduate program of studies, and upon authoring and successfully defending in public, of an M.Sc. thesis. Depending on the scientific topic of the student's Thesis and the program of graduate courses attended, the student is awarded either an *M.Sc. in Civil Engineering* (in one of the 5 specializations), or an *M.Sc. in Environmental Engineering*.

The required workload for the M.Sc. in Civil Engineering and the M.Sc. in Environmental Engineering corresponds to the successful completion of at least **110 ECTS**: **7 graduate courses (56 ECTS)**, a **research Thesis (CEE 680, 54 ECTS)**, as well as attendance at **8 sessions in the Postgraduate Student Seminar Series (CEE 610)** offered by the CEE Department.

Requirements for the Master of Science (M.Sc.)

Graduate courses: (7 courses of 8 ECTS)	56 ECTS
CEE 610 Seminar for Postgraduate Students (8 attendances):	0 ECTS
Thesis Research (CEE 680):	54 ECTS
TOTAL	**110 ECTS**

The M.Sc. degree requires the successful completion of original research work and a corresponding M.Sc. Thesis (CEE 680), which should be successfully presented and examined. The topic of the student's research is chosen in consultation with the advisor (supervisor) of the thesis. The student must submit copies of the thesis to the members of the Thesis Committee at least 1 week prior to its defense. The thesis defense is open to the public and consists of a presentation by the candidate, which should not be longer than 30 minutes, followed by an open discussion and a closed session with the Thesis Committee. The Thesis Committee is responsible for approving the candidate's thesis and defense presentation, and in the event that these are deemed inadequate, the Committee will suggest the appropriate revisions to the thesis and a corresponding timeline for the candidate to make those revisions.

For the completion of this process, the candidate should submit two original copies of the thesis (one for the CEE Department records and one for the University of Cyprus Library) bound and signed in accordance with the University regulations, plus one electronic copy of the thesis for dissemination purposes.

If the thesis is rejected, the candidate may request a second opportunity to defend their research. In that case, the time and terms for resubmission and defense are determined by the Thesis Committee in writing.

M.Sc. theses may be graded as "Excellent", "Very Good", "Good" or "Inadequate". The intellectual merit of the thesis must be based on research findings by the M.Sc. candidate, distinguished clearly from the work of others, testifying to the candidate's personal contribution, and acknowledging support by others within or outside the University.

The maximum allowable duration for obtaining a Master of Science Degree is eight academic semesters.

The following table presents a sample academic program of studies leading to an M.Sc. in Civil Engineering (in one of the five thrusts of specialization), or an M.Sc. in Environmental Engineering. The program can be completed in 1.5 calendar year, provided that the student will perform part of the required research during the summer months between the 2nd and the 3rd academic semesters.

1st semester (fall)		**2nd semester (spring)**	
4 graduate courses	4x8=32 ECTS	2 graduate courses	3x8=24 ECTS
	Total: **32 ECTS**	CEE680 M.Sc. Research	6 ECTS
			Total: **30 ECTS**
Summer		**3rd semester (fall)**	
CEE680 M.Sc. Research	17 ECTS	2 graduate courses	2x8=16 ECTS
	Total: **17 ECTS**	CEE610 Graduate Seminar	0 ECTS
		CEE680 M.Sc. Research	31 ECTS
			Total: **30 ECTS**

The course “Independent Study” (CEE 650) can be counted as one graduate course for the specializations in Civil Engineering or for Environmental Engineering (Annex-3) and must focus on a different topic than the M.Sc. research. For the M.Sc in Civil Engineering, the “Independent Study” may be counted for any specialization as a course of group A or B. A student may be credited a maximum of 8 ECTS under the “Independent Study” course. If a student has successfully attended graduate courses in the framework of another postgraduate program, they can be credited up to 16 ECTS, provided that these courses have not been counted towards acquiring another postgraduate title.

Research Advisor (Supervisor)

After the M.Sc. student – supervisor have mutually agreed to pursue their research collaboration, the student must submit to the Graduate Studies Committee a memorandum of understanding, signed by the academic advisor who has taken the student under their supervision.. The academic advisor supervises the student’s research or other work and offers the necessary guidance. The academic advisor is also responsible for recommending to the Department’s Faculty Council for approval, through the Graduate Studies Committee, the members of the student’s Thesis Committee. The Thesis Committee consists of the Thesis advisor as the head of the Committee, and at least another faculty member either from within or outside the University of Cyprus. External Committee members can only be faculty members of other accredited institutions or research centers, or other qualified experts holding a Ph.D. degree.

Doctor of Philosophy (Ph.D.)

A graduate student (Ph.D. candidate) is awarded by the CEE Department a doctorate (also referred to as a Degree of Doctor of Philosophy, Ph.D.) upon successful completion of the required number of courses according to the graduate program of studies, successful completion of a qualifying examination and authoring and successfully defending a Ph.D. Thesis in public, as described in detail below. Depending on the research area of the student's Thesis, the student is awarded either a Ph.D. in Civil Engineering, or a Ph.D. in Environmental Engineering.

Research Advisor (Supervisor)

The doctoral student must find a thesis advisor at the latest within the first semester of studies after admission to the program. Once the doctoral student and their academic advisor have come to a mutual understanding regarding their collaboration in research, the doctoral student must submit to the Graduate Studies Committee a memorandum of understanding, signed by the academic advisor who has taken the student under their supervision. The research/thesis advisor is responsible for monitoring the research work of the Ph.D. candidate and for providing the necessary guidance for completion of the doctoral research.

Program of Study

The minimum length of study for the degree, for full-time students in the CEE Department is six academic semesters and the maximum allowable length of study is eight academic years.

The required workload for the Ph.D. in Civil Engineering and the Ph.D. in Environmental Engineering corresponds to the successful completion of at least **240 ECTS**: **10 graduate courses (80 ECTS)**, a **research Thesis (CEE 690, 160 ECTS)**, as well as attendance at **16 sessions of the Departmental Seminar Series offered for Postgraduate Students (CEE 610)** by the CEE Department.

Requirements for Doctor of Philosophy (Ph.D.)

Graduate courses: (10 courses of 8 ECTS: 80 ECTS in total)	
• Graduate CEE courses related to the Ph.D. research	48 ECTS
• Graduate courses in/outside CEE programs	32 ECTS
CEE 610 Seminar for Postgraduate Students (16 attendances):	No ECTS
Thesis Research (CEE 690):	160 ECTS
TOTAL	**110 ECTS**

Courses from the first course group (Graduate CEE courses related to the Ph.D. research) should all be from the list of courses relevant to the degree sought (civil engineering or environmental engineering), as listed in Annex 2 or 3, respectively.

The course "Independent Study" (CEE 650 or CEE 651) counts as a course of the second category (Graduate courses in/outside CEE programs) and must focus on a different topic than the Ph.D. research. A maximum of 8 ECTS of "Independent Study" may be credited towards the Ph.D. degree. Courses outside the CEE department may be selected, but only after approval from the student's academic advisor.

Students who have joined the doctoral program after successfully completing a relevant Master program can be credited with a maximum of 56 ECTS for graduate courses they have successfully attended previously. These 56 ECTS count towards fulfillment of the required 80 ECTS coursework. The maximum number of ECTS that can be credited to students with a graduate degree in Civil or Environmental Engineering is 56, while the maximum number of ECTS that can be credited to students with a graduate degree in other fields of study is 32. The crediting of ECTS is not automatic; it is subject to the approval of the Department's Council based on recommendations made by the CEE Graduate Studies Committee. The committee's recommendations follow a well-documented petition by the student and relevant recommendation by his academic advisor. For the fulfillment of the required 80 ECTS coursework, the student must choose and successfully attend courses that are not the same or similar with those credited from previous studies.

Students should select, in consultation with their advisors, the courses that will help them toward the completion of their Ph.D. Thesis. Graduate courses from outside the CEE Department may be accepted subject to prior approval from the CEE Graduate Studies Committee and upon application by the student approved by his advisor. In order for the selected courses to count towards the requirements of the Ph.D. program, the CEE Graduate Studies Committee must approve the petition before the student registers for the respective courses.

Qualifying Examination

Admission to candidacy for the Ph.D. program is actually granted when the student has successfully passed a written qualifying examination, which intends to assess fundamental knowledge and ability in civil or environmental engineering, as well as more specialized knowledge and understanding of the intended research area.

The topics in the qualifying examination cover three areas of study and are given by at least three faculty members, with equal score weight (1/3) for each topic. The weight per member of the Qualifying Exam Committee in the total score of an exam should not exceed 40%. The Ph.D. candidates' written solutions of the exam questions are evaluated by the Qualifying Exam Committee. The areas of study examined and the Qualifying Exam Committee for each candidate are assigned by the Department's Council upon recommendation from the CEE Graduate Studies Committee, based on a written application by the candidate's academic advisor. The CEE Graduate Studies Committee should ensure that the topics per examination area and student are of uniform depth and level of difficulty at each examination period. The qualifying exam has duration of 4 hours. The results of a candidate's qualifying exam are considered successful when the candidate earns a total score of at least 60%. In the event of not meeting the 60% minimum passing grade, a Ph.D. candidate is allowed to retake the exam one more time prior to the completion of the 5-th academic semester of study in the PhD program. In this re-examination, the student has the right to be examined only in those areas where the score attained in the first examination was less than 50%, provided that a score of at least 40% was obtained in all areas. Hence, the student has the right to transfer to the re-examination those scores that are ≥50% from the first examination in one or two of the areas examined, provided that all three scores obtained in the first examination were ≥40%.

The qualifying examination must be taken within the first 4 academic semesters from the candidate's entry into the Ph.D. program. The exam is given in the beginning of

the fall and spring semesters (it is usually scheduled during the second week from the start of each academic semester).

Dissertation Proposal

Each doctoral student must prepare a brief written proposal of the intended doctoral research and make a comprehensive oral presentation on the proposed work that demonstrates a sound understanding of the dissertation topic, in depth awareness of the relevant literature and the research methodology to be employed. The proposal presents the work done on the topic by the student to-date, as well as the intended steps to be taken toward the completion of the doctoral Thesis.

The proposal must be scheduled according to the Regulations for Graduate Studies. The written proposal must be submitted to the candidate's three-member Doctoral Examination Committee at least one week before the date of examination. This Committee is assigned for each candidate by the Department's Council upon recommendation from the CEE Graduate Studies Committee, based on a written petition by the candidate's academic advisor. One of the Committee's members may be from another academic department of the University of Cyprus in a field of study relevant to the doctoral candidate's Thesis research, or from another university, or a research center. The oral presentation given to the three-member Doctoral Examination Committee should not exceed 30 minutes and is followed by a discussion with the Committee members. If the Committee members have concerns about either the substance of the proposal or the students' understanding of the topic, then the student will prepare a second presentation that focuses on the areas of concern. The second presentation has a tentative duration of 15 minutes and is followed by a new discussion with the Committee members. Students can continue their research only if the proposal is approved.

Doctoral Dissertation

The doctoral degree requires the successful completion of original research work and a Thesis. A doctoral candidate's research topic is selected in collaboration with the candidate's academic advisor. The level of quality of doctoral Theses is warranted through the satisfaction of basic conditions, as these are stated by the University's Senate (Rules of Study and Student Issues of the University Cyprus and Graduate Studies Regulations). It is therefore imperative that all doctoral students study this guideline carefully.

Dissertation Defense

Each doctoral candidate is required to defend the originality and quality of research during an oral dissertation defense, which is administered by the *Examination Committee* consisting of at least 5 members. This Committee is assigned by the Department's Council upon recommendation of the Department's Graduate Studies Committee in consultation with the candidate's academic advisor. The Examination Committee includes 3 CEE faculty members (one of which is the candidate's academic advisor), one member from another University or research institute and one member from the faculty of another department of the University who has relevant knowledge to the Ph.D. research topic or from another University or research institute. The Examination Committee is chaired by a member of the CEE Department, but not the Thesis advisor.

The candidate is required, at least one month prior to the thesis defense, to submit a copy of the dissertation to each member of the Examination Committee. At the same time, the candidate must make an additional copy available to any member of the university community wishing to read the dissertation prior to the defense, and must also arrange for the issuance of a public notification of the upcoming defense by the CEE Graduate Studies Committee.

A thesis defense consists of three stages: (a) a public presentation of the doctoral research work by the candidate with a maximum duration of 60 minutes, which is followed by public discussion, (b) a discussion on the Thesis work with the Examination Committee members and (c) a concluding closed session of the Examination Committee for making a collective assessment of the doctoral work.

The examining committee will determine the acceptability of the candidate's dissertation and oral performance, and propose modifications to the written dissertation if appropriate, as well as a time plan for the candidate to address such changes, in mutual agreement with the thesis advisor.

Upon the completion of the candidate's doctoral defense, the Examination Committee submits in writing to the CEE Chairman its justified recommendation together with possible comments on the candidate's Thesis. The Chairman forwards the Committee's recommendation to the University Senate for approval. In the event that the Examination Committee recommends modifications or improvements to the doctoral Thesis in question, final approval by the Senate is granted only after the academic advisor confirms in writing the successful compliance to the Committee's comments. The candidate must then submit two original hard copies of the dissertation, one to the university library and one for the CEE Department records, as well as an electronic version of the dissertation to the CEE Department for documentation and dissemination. If the dissertation is rejected, the candidate is entitled to request a repetition of the defense one more time. In this case, the terms for resubmission of the dissertation must be set out in writing by the Examination Committee.

APPENDIX-1

COURSE CATEGORIES FOR CIVIL ENGINEERING SPECIALIZATIONS

1. Structural Analysis and Earthquake Engineering

	Category-A (Basic Courses)
1	CEE 501 - Advanced Computer-Aided Structural Analysis
2	CEE 521 - Structural Dynamics and Earthquake Engineering
3	CEE 523 - Passive and active control of structural systems
4	CEE 526 - Finite Element Methods
5	CEE 528 - Advanced Topics in Structural Analysis
6	CEE 531 - Seismic Behavior and Assessment of Reinforced Concrete Structures
7	CEE 537 - Rehabilitation and Strengthening of Structures
8	CEE 540 - Behavior and Design of Reinforced Concrete Structures
9	CEE 541 - Structural Stability
9	CEE 545 - Nonlinear Structural Analysis
10	CEE 555 - Soil Dynamics and Engineering Seismology

	Category-B (Relevant Courses)
1	CEE 512 - Risk Analysis in Civil and Environmental Engineering
2	CEE 517 - Operations Research in Civil and Environmental Engineering
3	CEE 532 - Advanced Technology of Materials
4	CEE 533 - Local and Traditional Building Materials
5	CEE 535 - Plasticity Theory
6	CEE 538 - Experimental Methods in Structural Engineering
7	CEE 547 - Masonry Structures
8	CEE 556 - Advanced Foundation Engineering

Course categories: A – Basic, B – Relevant, Γ – CEED, Δ - UCY

2. Novel and Traditional Construction Materials

	Category-A (Basic Courses)
1	CEE 532 - Advanced Technology of Materials
2	CEE 533 - Local and Traditional Building Materials
3	CEE 534 - Physical properties and related durability problems of construction materials
4	CEE 353 - Plasticity Theory
5	CEE 538 - Experimental Methods in Structural Engineering
6	CEE 539 - Advanced Topics in Novel and Traditional Construction Materials
7	CEE 546 – Building Physics
8	CEE 547 – Masonry Structures
9	CEE 562 - Asphalt Materials

	Category-B (Relevant Courses)
1	CEE 531 - Seismic Behavior and Assessment of Reinforced Concrete Structures
2	CEE 526 - Finite Element Methods
3	CEE 536 - Energy Efficiency of Buildings
4	CEE 537 - Rehabilitation and Strengthening of Structures
5	CEE 543 - Bridge Engineering
6	CEE 540 - Behavior and Design of Reinforced Concrete Structures
7	CEE 586 - Sustainable Built Environment

Course categories: A – Basic, B – Relevant, Γ – CEED, Δ - UCY

3. Geotechnical Engineering

	Category-A (Basic Courses)
1	CEE 509 - Computational Mechanics
2	CEE 526 - Finite Element Methods
3	CEE 535 - Plasticity Theory
4	CEE 555 - Soil Dynamics and Engineering Seismology
5	CEE 556 - Advanced Foundation Engineering
6	CEE 557 - Coastal and Offshore Geotechnical Engineering
7	CEE 558 - Advanced Topics in Geotechnical Engineering
8	CEE 574 - Environmental Geotechnics

	Category-B (Relevant Courses)
1	CEE 534 - Physical properties and related durability problems of construction materials
2	CEE 511 - Construction Engineering and Management
3	CEE 512 - Risk Analysis in Civil and Environmental Engineering
4	CEE 521 - Structural Dynamics and Earthquake Engineering
5	CEE 543 - Bridge Engineering
6	CEE 562 - Asphalt Materials

Course categories: A – Basic, B – Relevant, Γ – CEED, Δ - UCY

4. Construction and Transport Infrastructure Management

	Category-A (Basic Courses)
1	CEE 511 - Construction Engineering and Management
2	CEE 516 - Building Information Models
3	CEE 517 - Operations Research in Civil and Environmental Engineering
4	CEE 560 - Advanced Transport Planning
5	CEE 563 - Advanced Topics in Traffic Engineering and Intelligent Transport Systems-ITS

	Category-B (Relevant Courses)
1	CEE 512 - Risk Analysis in Civil and Environmental Engineering
2	CEE 513 - Specifications and Conditions of Construction Contracts
3	CEE 515 - Advanced Topics in Construction Management
4	CEE 543 - Bridge Engineering
5	CEE 561 - Highway Design and Road Safety
6	CEE 562 - Asphalt Materials
7	CEE 564 - Civil/Transport Economics and Finance
8	CEE 565 - Multi-Modal Systems and Logistics
9	CEE 566 - Transit Systems
10	CEE 567 - Advanced Topics in Transport Infrastructure
11	CEE 581 - Environmental Risk Assessment

Course categories: A – Basic, B – Relevant, Γ – CEED, Δ - UCY

APPENDIX-2

CIVIL ENGINEERING COURSES

CEE 501	Advanced Computer-Aided Structural Analysis
CEE 509	Computational Mechanics
CEE 511	Construction Engineering and Management
CEE 512	Risk Analysis in Civil and Environmental Engineering
CEE 513	Specifications and Conditions of Construction Contracts
CEE 515	Advanced Topics in Construction Management
CEE 516	Building Information Models
CEE 517	Operations Research in Civil and Environmental Engineering
CEE 521	Structural Dynamics and Earthquake Engineering
CEE 522	Advanced Topics in Earthquake Engineering
CEE 523	Passive and active control of structural systems
CEE 526	Finite Element Methods
CEE 528	Advanced Topics in Structural Analysis
CEE 531	Seismic Behavior and Assessment of Reinforced Concrete Structures
CEE 532	Advanced Technology of Materials
CEE 533	Local and Traditional Building Materials
CEE 534	Physical properties and related durability problems of construction materials
CEE 535	Plasticity Theory
CEE 536	Energy Efficiency of Buildings
CEE 537	Rehabilitation and Strengthening of Structures
CEE 538	Experimental Methods in Structural Engineering
CEE 539	Advanced Topics in Novel and Traditional Construction Materials
CEE 540	Behavior and Design of Reinforced Concrete Structures

CEE 541	Structural Stability
CEE 543	Bridge Engineering
CEE 545	Nonlinear Structural Analysis
CEE 546	Building Physics
CEE 547	Masonry Structures
CEE 555	Soil Dynamics and Engineering Seismology
CEE 556	Advanced Foundation Engineering
CEE 557	Coastal and Offshore Geotechnical Engineering
CEE 558	Advanced Topics in Geotechnical Engineering
CEE 560	Advanced Transport Planning
CEE 561	Highway Design and Road Safety
CEE 562	Asphalt Materials
CEE 563	Advanced Topics in Traffic Engineering and Intelligent Transport Systems-ITS
CEE 564	Civil/Transport Economics and Finance
CEE 565	Multi-Modal Systems and Logistics
CEE 566	Transit Systems
CEE 567	Advanced Topics in Transport Infrastructure
CEE 574	Environmental Geotechnics
CEE 586	Sustainable Built Environment
CEE 650	Independent Study

APPENDIX-3

ENVIRONMENTAL ENGINEERING COURSES

CEE 500	Engineering Applications with Software Development
CEE 512	Risk Analysis in Civil and Environmental Engineering
CEE 534	Physical properties and related durability problems of construction materials
CEE 536	Energy Efficiency of Buildings
CEE 571	Computational Hydraulics
CEE 572	Groundwater Hydrology
CEE 574	Environmental Geotechnics
CEE 576	Environmental Fluid Mechanics
CEE 580	Dynamics of the Atmosphere and Air Pollution Dispersion
CEE 581	Environmental Risk Assessment
CEE 582	Solid and Hazardous Waste Management
CEE 583	Physicochemical and Biological Processes for the Treatment of Wastewater
CEE 584	Advanced Topics in Environmental Engineering
CEE 585	Experimental methods in water and wastewater analysis and treatment
CEE 586	Sustainable Built Environment
CEE 596	Renewable Energy Sources management

APPENDIX-4

CEE GRADUATE COURSE DESCRIPTIONS

CEE 500 Engineering Applications with Software Development

From Procedure-Oriented to Object-Oriented Programming (OOP). OOP with Java. Development of OOP software for solving engineering problems utilizing classes and objects, inner and anonymous classes, interfaces, inheritance and polymorphism. Webpage development including Java applets. Software development with graphical-user interfaces and graphical components. Events and exception handling. Utilizing multithreading. Design patterns for developing extendable software applications. (8 ECTS)

CEE 501 Advanced Computer-Aided Structural Analysis

Computational simulation of planar and spatial structures with modern structural analysis software (GT-Strudl, SAP2000 or/and ETABS). Direct stiffness method based on the principle of virtual work and its software implementation. Substructures and static condensation. Numerical methods for eigenvalues analysis, numerical integration of single and multi-degree of freedom systems, modal superposition and direct integration of equations of motion for the computation of time-history response. Construction of response and design spectrum. Programming numerical methods for structural analysis (using Matlab) Finite element methods for both static and dynamic analysis based on the displacement method. Single- and multi-degree of freedom experiments using a small-scale shake-table. Seismic isolation and simulation of seismically isolated structures. Simulation of inelastic structural response. (8 ECTS)

CEE 509 Computational Mechanics

Basic concepts and solution techniques: preliminaries, non-linear Finite Element Analysis, geometrically non-linear Analysis, solution Techniques in quasi-static Analysis, solution techniques for non-linear dynamics. Computational analysis with damage mechanics, plasticity models and time-dependent material models. Coupled Problems: pore pressure - deformation analysis. (8 ECTS)

CEE 511 Construction Engineering and Management

Construction management techniques and construction engineering. Project, schedule and cost control, and resource management. Earned value analysis. Construction productivity. Conflict resolution and negotiations. Information systems in construction management and use of relevant software packages. Health and safety in construction. Law and the construction industry. (8 ECTS)

CEE 512 Risk Analysis in Civil and Environmental Engineering

Advanced topics is stochastic analysis in Civil and Environmental Engineering. Probability and statistics, data analysis, risk assessment and analysis, hypothesis testing, multifactored analysis, decision trees, neurofuzzy systems, regression, system reliability, Markov chains and simulation of civil and environmental systems. Applications from the field of civil and environmental engineering. (8 ECTS)

CEE 513 Specifications and Conditions of Construction Contracts

General issues of contract law (offer, acceptance, consideration, legal relations, terms and conditions, construction of contracts), conditions of construction contracts, business risk allocation, breach of a contract and claims examination. Conditions of contracts for construction, conditions of subcontracts, design contracts, design and build contracts, public – private – partnership. Tender documents and procedures for awarding public work contracts, general issues for technical specifications for construction works and dispute resolution procedures. (8 ECTS)

CEE 515 Advanced Topics in Construction Management

Advanced and contemporary topics in construction engineering and management. The topics include, among other, offerings on Fully Integrated and Automated Project Processes (FIAPP), 3D/4D computer-aided modelling of construction processes, decision-support systems in construction, construction and the law, etc. (8 ECTS)

CEE 516 Building Information Models

Building information models (BIM) and fully integrated and automated project processes in construction engineering and management. Development of relational database management systems for BIM, model-centric and data-centric BIM architectures. Application of BIM in design, quantity takeoff, costing, scheduling, resource productivity and management, structural analysis and energy efficiency of buildings. Use of specialized BIM software (Revit, Primavera, SQL/ODBC, Ecotect). (8 ECTS)

CEE 517 Operations Research in Civil and Environmental Engineering

Introduction in operations research and optimization. Linear programming: mathematical formulation of problems, graphical solution, Simplex algorithm, sensitivity analysis and duality. Integer programming. Non-linear programming: fundamental concepts, classical and heuristic optimization methods, single- and multi-objective optimization. Dynamic programming. Network analysis. Queuing theory and Markov chains. Special topics. Civil and environmental engineering examples (structural analysis and design, construction management and scheduling, transportation, environmental issues, etc.) and practical applications with software usage. (8 ECTS)

CEE 521 Structural Dynamics and Earthquake Engineering

Elements of analytical dynamics. Lagrange’s equations. Dynamic response of discrete single- and multi-degree-of-freedom systems. Vibration isolation. Modeling of damping in structures. Numerical evaluation of dynamic response. Earthquake response analysis. Frequency-domain method of response analysis. Dynamic response of continuous systems. Rayleigh's method. Dynamic response of seismically isolated structures. (8 ECTS)

CEE 522 Advanced Topics in Earthquake Engineering

This course has not a specific course material, but it is offered circumstantially by specialists in the particular specification visiting faculty or special scientist, covering special topics in earthquake engineering. (8 ECTS)

CEE 523 Passive and active control of structural systems

Introduction, seismic isolation principles, history. Seismic isolation systems (elastomeric, sliding, rocking, etc.). Elastomeric isolation systems LRB, HRB (Low-damping, High-damping Rubber Bearings). Linear theory of base isolation. Sliding isolation systems. Energy dissipation systems. The principle of active structural control. Theoretical and practical considerations. (8 ECTS)

CEE 526 Finite Element Methods

The concept of numerical simulation. The direct stiffness method. Truss/frame Finite Elements (FEs). Plane stress and strain FEs (triangular, quadrilateral). Isoparametric FEs. Solid FEs. Higher order FEs. Estimation of discretization error - adaptive FEs. Solution of FE equilibrium equations. Basic principles of FE programming. Substructuring methods. Special topics. Learning and usage of FE software. (8 ECTS)

CEE 528 Advanced Topics in Structural Analysis

This course has not a specific course material, but it is offered circumstantially by specialists in the particular specification visiting faculty or special scientist, covering special topics in structural analysis. (8 ECTS)

CEE 531 Seismic Behavior and Assessment of Reinforced Concrete Structures

The course deals with the strength and deformation capacity of reinforced concrete structures, the hierarchy of mechanisms of resistance and failure of structures, the effects of large amplitude cycling and consequent strength degradation of the hysteretic performance of structures. ADRS spectra – damping – local vs global demands. Chord rotation (relative drift ratio) in reinforced concrete structures. Typical deficiencies of old-type lightly reinforced construction. Available deformation capacity, evaluation of beam-column joints, anchorages and lap-splices, short-columns, identification of the weak link in the structural system, establishing the pushover (resistance) curve of the structure. Lateral stiffness, strength at yielding and at failure, examples of direct assessment of structures damaged in past earthquakes, forensic investigation of collapse. Maximum tolerable ground acceleration in existing structures limiting collapse. (8 ECTS)

CEE 532 Advanced Technology of Materials

Concrete components, microstructure, and properties of portland cement. Heat of hydration and thermal stress development in concrete. Strength, fatigue, failure mechanisms (fracture mechanics), creep, shrinkage, and durability of hardened concrete. Special concretes: self-compacting, high performance, recycled concrete and ultra-high performance. Fiber reinforced concrete. Behavior and mechanical properties. Mechanics of fiber reinforced concrete. Fiber reinforced polymer composites. High performance materials. Sustainability. Experimental investigation. (8 ECTS)

CEE 533 Local and Traditional Building Materials

Natural building and decorative stones and Stone structures, Properties of local stones, Decay and protection of stone, Imported stone carbon footprint, Local aggregates: characteristics and their effect on the quality of composite materials, Fired clay bricks, Binders, mortars and plasters, Local and traditional mortars, Earthen architecture and Adobe, Timber. (8 ECTS)

CEE 534 Physical properties and related durability problems of construction materials

Porosity and Porous media, Saturated and Unsaturated Flow, One dimensional flow, Sorptivity, Sharp Front Theory, Applications of Sharp Front Theory, Evaporation and Drying, Salt crystallization, Rising damp. (8 ECTS)

CEE 535 Plasticity Theory

Stresses and strains. Elasticity. Non-linearity. Yield surface. Elastic - perfectly plastic behavior. Hardening and softening. Constitutive modeling. Numerical integration of constitutive models. The constitutive models in the finite element method. Limit analysis. Upper and lower bounds. The method of characteristics. (8 ECTS)

CEE 536 Energy Efficiency of Buildings

Basic Principles of energy efficiency of buildings, methodology of energy analysis, steady and unsteady heat transfer in two- and three-dimensional analysis of structural materials and components with conduction, convection and radiation, pre-requisites of energy efficiency, materials for thermal insulation, simulation methods for energy efficiency, certification, European and Cypriot standards and codes for energy efficiency, assessment of energy efficiency, optimized technologies for energy efficient design, passive cooling and heating, case studies in buildings (residential, offices, organizations etc). (8 ECTS)

CEE 537 Rehabilitation and Strengthening of Structures

Rehabilitation strategy and methods of intervention. Particular emphasis is placed on detailing of interventions with FRPs in the context of EC8 – III and the Greek Retrofit Code 2010. Assessment of the structural implications of corrosion particularly with reference to earthquake resistance. Use of FRPs in corrosion repairs. Required global and local interventions for earthquake resistance of old, lightly reinforced construction. Strength implications for foundation redesign Reinforced Concrete Jackets. Addition of walls, infills, diagonal braces. Detailing of retrofit. Other repair and strengthening methods. Injections of grouts, metallic nets. Local interventions with composites. Debonding. Strengthening for flexure using Externally bonded plates and Near-Surface mounted reinforcement. Confinement, shear strengthening, strengthening of anchorages. Clamping action. Assessment and retrofit against torsional eccentricities in structures. Unreinforced masonry structures: repair and retrofit with advanced composites. Historical constructions, assessment and strengthening. (8 ECTS)

CEE 538 Experimental Methods in Structural Engineering

Introduction to experimental mechanics. Structural Models. Dimensional Analysis-Similitude Laws. Static and Dynamic Modeling. Design of an experimental setup. Strain Gage Instrumentation. Force-Displacements-Velocity-Acceleration-Pressure-Temperature Transducers. Non-destructive testing. Data Acquisition Systems. Accuracy-Reliability-Statistical Analysis of Experimental Data. Experimental testing. (8 ECTS)

CEE 539 Advanced Topics in Novel and Traditional Construction Materials

This course has not a specific course material, but it is offered circumstantially by specialists in the particular specification visiting faculty or special scientist, covering special topics in novel and traditional construction materials. (8 ECTS)

CEE 540 Behavior and Design of Reinforced Concrete Structures

Confined concrete models. Optimal design of reinforced and prestressed concrete members. Prestress limits in continuous prestressed concrete bridges. Plasticity theorems for concrete design. Design of deep beams and corbels using strut-and-tie models. Compressive-field and compressive-path theories for shear. New materials as main reinforcement in concrete design. (8 ECTS)

CEE 541 Structural Stability

Consolidation of basic concepts in structural stability and development of solid understanding of the effect of buckling phenomena. Development of quantitative and qualitative skills for the analysis of nonlinear structural behaviour. Application of the fundamental concepts of nonlinear structural behaviour for the design of steel structures according to Eurocode 3. Failure modes in structural elements. Practical examples of structures demonstrating nonlinear behaviour. Energy methods for the study of structural stability. Equilibrium and stability criteria. Application of energy methods for the analysis of different types of single degree of freedom systems. Influence of initial imperfections. Instabilities in compression members. Euler buckling, Perry-Robertson concept, influence of support conditions, Timoshenko and Rayleigh-Ritz methods. Instabilities in beams. Instabilities in plates. Introduction to multiple degree of freedom systems.

CEE 543 Bridge Engineering

Conceptual and preliminary design of bridges - bridge loads - substructures and foundations -bridge analysis, design and construction (prestressed concrete, steel, composite steel-concrete, truss, masonry arch, cable supported and suspended, floating, movable) - design for durability - bridge whole life costing - problems and failures - bridge strengthening and restoration. (8 ECTS)

CEE 545 Nonlinear Structural Analysis

The aim of the course is to introduce students to nonlinear structural analysis through practical simulation applications for static and dynamic analysis, design and assessment of structures. The course is based on the learning and usage of modern structural analysis software and consists of a series of computational lab sessions, during which the way to simulate each application is described and the basic relevant theory is given. The structure types examined include trusses, plane and space frames made of steel or reinforced concrete, as well as masonry structures. The course is concerned with the evaluation of the limit load and the collapse mode of a structure, the exploitation of various material models for structural steel, reinforced concrete and masonry, the use of concentrated or distributed plasticity, the implementation of nonlinear static (pushover) and dynamic time-history structural analysis, etc. (8 ECTS)

CEE 546 Building Physics

Fundamental and Applied topics in Building Physics: transfer of heat and moisture, air flow indoors and outdoors, natural ventilation mechanisms. The course focuses on the design of structural components such as foundations, windows, roofs for issues of heat and moisture transfer, energy saving, as well as issues of climate, thermal comfort and indoor air quality. (8 ECTS)

CEE 547 Masonry Structures

Masonry materials (stone, adobe/earth-based brick, mortar, timber) and their mechanical behaviour. Masonry types and construction techniques (unreinforced, reinforced, tier-laced, confined-masonry). Mechanical behaviour of masonry in compression, tension, bending, shear due to in/out-of-plane actions (as a result mainly of gravitational and seismic loads). Behaviour of interfaces within the masonry and force transfer mechanisms. Construction details of masonry buildings (lintels, arches, etc.). Evaluation of mechanical characteristics of masonry and its constituent materials (in situ or at lab). Assessment, damage/pathology and retrofit/strengthening of masonry buildings. Eurocodes and other codes for designing/assessing masonry walls and buildings. Simulation of masonry structures and static/dynamic analysis using finite element software. (8 ECTS)

CEE 555 Soil Dynamics and Engineering Seismology

Strong ground motion characteristics. Seismic hazard analysis. Soil behavior under cyclic loading. Seismic wave propagation, reflection and refraction. The viscous dashpot analogue. Ground response analysis. Soil liquefaction due to earthquakes. Stability of slopes and retaining walls under seismic conditions. Bearing capacity of foundations subjected to earthquake loading. Soil-structure interaction. (8 ECTS)

CEE 556 Advanced Foundation Engineering

Analysis of beam and mat foundations using computer software. Computation of pile and pile group settlements. Dynamic analysis of pile driving. Piles and pile groups subjected to lateral loading: lateral bearing capacity and deformations. Applications of soil-structure interaction: foundations, walls of deep excavation, tunnel liners. Seismic soil-pile-structure interaction. Caisson-type foundations. Analysis and design of foundations on expansive soils. (8 ECTS)

CEE 557 Coastal and Offshore Geotechnical Engineering

Introduction. Coastal and offshore construction. Underwater site investigation. Types, physical properties and mechanical behaviour of seabed soils. Piled Foundations. Shallow Foundations. Mobile jack-up platforms. Anchoring systems. Geotechnics of pipelines and subsea installations. Geotechnical analysis of quay walls, breakwaters and cofferdams. Marine landslides and other geohazards. (8 ECTS)

CEE 558 Advanced Topics in Geotechnical Engineering

This course has not a specific course material, but it is offered circumstantially by specialists in the particular specification visiting faculty or special scientist, covering special topics in geotechnical engineering. (8 ECTS)

CEE 560 Advanced Transport Planning

This is a course that examines the complex relationship between transportation, land use and urban form, and the varied methods and concepts available to planners seeking to influence this relationship. The course provides an overview of alternatives available to transportation planners, as they attempt to (a) avoid long and unnecessary motorized travel and (b) shift the movement of people to socially efficient modes such as walking, biking and public transit. Moreover, the course looks at how transportation planners craft projects and policies that are both technically sound and feasible at the same time, introducing (and critiquing) some of the tools and skills used by

professionals in this field. The course is quantitatively-based and advanced modeling skills are developed (8 ECTS)

CEE 561 Highway Design and Road Safety

This course aims on the advanced concepts, tools and technologies concerning the design of roadways. An emphasis is given on the geometric design as well as on the equipment that is used in contemporary highway design. Moreover, the elements of risk and safety is introduced, covering related practical and methodological aspects. This course consolidates knowledge from highway design, traffic engineering and safety research, in a contemporary and comprehensive framework. (8 ECTS)

CEE 562 Asphalt Materials

Identification and physical properties of asphalt materials, asphalt refining, uses and properties, physical properties of aggregates, aggregate testing, hot mix asphalt (HMA), cold mix asphalt, HMA design methodology, factors affecting HMA, HMA material characterization, quality control, equipment and construction, behaviour of flexible pavements and typical distresses, maintenance of HMA pavements, pavement rehabilitation, recycling of HMA, and special mixes and additives. (8 ECTS)

CEE 563 Advanced Topics in Traffic Engineering and Intelligent Transport Systems-ITS

This course aims on deepening the understanding on the traffic flow phenomenon and the analytical models that are used in this area. The perspective of the course will guide to the technological aspects of contemporary traffic networks surveillance, operations and control, as those are incorporated in the broad area of Intelligent Transportation Systems (ITS). Students with interest in engineering, transportation systems, communication systems, vehicle technologies, transportation planning, transportation policy, and urban planning are encouraged to participate, since ITS refers to information and communication technologies, as applied to transportation infrastructure and vehicles, improving transportation sector's efficiency, safety and the environment. The recent availability and accessibility of mobile technology, suggests that ITS applications is an area of rich academic and industrial opportunities. It is noted that ITS is an international methodological paradigm intended to improve the effectiveness and efficiency of surface transportation systems through advanced technologies in information systems, communications, and sensors. In addition to technology discussions, this course will include topics related to policy, economics, security, as well as, urban and rural planning. (8 ECTS)

CEE 564 Civil/Transport Economics and Finance

The content covers a wide variety of topics relating to the economic aspects of transportation, government regulatory policies regarding transportation, and issues of concern to transportation industry planners. The unifying theme concerns the application of economic theory and/or applied economic methodologies to transportation questions. Methods of funding and financing transport network maintenance, improvement and expansion are debated extensively and form part of the transport economics field. Funding issues relate to the ways in which money is raised for the supply of transport capacity. Taxation and pricing of transport services will de also included, covering issues of loans, bonds, public-private partnerships and concessions and other methods of financing transport investment. (8 ECTS)

CEE 565 Multi-Modal Systems and Logistics

This course will cover the fundamental analytic tools, approaches, and techniques which are useful in the design and operation of multimodal transport, logistics systems and integrated supply chains. The material is offered from a managerial perspective, with an emphasis on where and how specific tools can be used to improve the overall performance and reduce the total cost of a supply chain. A strong emphasis is given on the development and use of fundamental and advanced models to illustrate the underlying concepts involved in both intra and inter-company multimodal and logistics operations. While the main objective is to develop and use models to help us analyze these situations, extended use of examples from industry and realistic illustrations of the concepts in practice will be provided. This is neither a purely theoretical nor a case study course, but rather an analytical course that addresses real problems found in practice. (8 ECTS)

CEE 566 Transit Systems

This course covers the strategic and operational planning and design of transit systems both within the urban (bus, Tram and Metro systems) as well as in the means of mass transportation in the interurban space. Issues related to capacity, level-of-service, optimal design and management, routing, scheduling (of rolling stock as well as of personnel), technological developments, pricing strategies and the particularities emerging in alternative transit systems are analyzed. Competitiveness and complementarity among means of transport is also covered, while new organization schemes (e.g. Demand Responsive Systems, dedicated transit systems, taxi market organization) are discussed. A special care for paratransit systems is taken. The course balances the theoretical and practical aspects of transit systems, with an emphasis on modeling and decision-making. (8 ECTS)

CEE 567 Advanced Topics in Transport Infrastructure

This course covers several topics of transport infrastructure, like Terminal Design, Transit Systems, Railways and Metro/Tram Systems, Pipelines and several other related but not covered in other courses. (8 ECTS)

CEE 571 Computational Hydraulics

Principles of Computational hydrodynamics with emphasis on finite differences and finite volumes. Application Examples include open channel flows, rivers, lakes, and open seas as well as hydrodynamic loading of structures. (8 ECTS)

CEE 572 Groundwater Hydrology

Significance of groundwater hydrology. Physico-chemical properties of groundwater. Fundamentals of groundwater flow. Measurement of flow parameters. Design and Analysis of control pump. Contaminant transport in groundwater. Computational models for simulation of subsurface flow and contaminant transport in groundwater. Soil remediation methods and protection of aquifers, e.g. risk assessment remediation from accidental leaks of toxic substances. (8 ECTS)

CEE 574 Environmental Geotechnics

Introduction. Sources of contamination and acceptable limits. Hydrogeology. Interaction of contaminants with soil. Mechanisms of contaminant mobility. Ground

investigation. Waste disposal by landfill. Ground remediation and protection of soil and ground-water. Risk assessment of failure of large construction structures. (8 ECTS)

CEE 576 Environmental Fluid Mechanics

Introduction to environmental flows. Basic transport mechanisms in the water and the atmosphere (convection, molecular and turbulent diffusion, dispersion). Mixing and dispersion in 2-D systems. Analytical solutions. Retention times. Stratified flows: Boussinesq approximation, momentum jets, buoyant plumes, influence of environmental conditions. Elements of geophysical fluid mechanics: large scale flows, effect of earth's rotation (Coriolis effect), Ekman layer. (8 ECTS)

CEE 580 Dynamics of the Atmosphere and Air Pollution Dispersion

Meteorology and Structure of the Atmosphere. Meteorological events as events of atmospheric dynamics: weather-climate-climate change, wind, tornadoes and hurricanes, dust storms, El Nino phenomenon, rain, storms. Atmospheric Pollution Dispersion: Sources and Transport Mechanisms. Turbulent atmospheric flows. Jets and Plumes in the atmosphere. Atmospheric chemistry. Research and Operational air pollution dispersion models. (8 ECTS)

CEE 581 Environmental Risk Assessment

Introduction to risk assessment, definitions, methodology (problem formulation, hazard identification, exposure assessment, exposure-response assessment, risk characterization), basic knowledge in chemistry and biology, fate of pollutants in environmental media, mass and energy balances, toxic organic compounds, heavy metals, physicochemical properties (ideal gas law, Dalton's law, Raoult's law, Henry's law, Le Chatelier 's principle), sorption, adsorption, evaporation, hydrolysis, photochemical transformations, biological transformations, bioconcentration, bioaccumulation, uncertainties in risk assessment, case studies. The course covers topics relating to characterizing source areas, linking fate and transport mechanisms, evaluating exposure pathways and applying toxicology data to evaluate environmental risk in a variety of differing contexts. (8 ECTS)

CEE 582 Solid and Hazardous Waste Management

Management of solid and hazardous waste (definitions, legislative framework, waste generation and characterization, classification and labeling). Analysis and design of waste collection and treatment systems: recycling, resource recovery, mechanical, thermal and biological treatment processes. Landfills for solid and hazardous waste (design principles, hydrology, geotechnical aspects, gas production, management of leachates, environmental risks, operation and monitoring, closure, aftercare and final use). (8 ECTS)

CEE 583 Physicochemical and Biological Processes for the Treatment of Wastewater

Introduction to the wastewater treatment (terminology, legislative framework). Characterisation of the wastewater (sampling methods, principles of the analytical methods, physical – chemical and biological parameters, toxicity tests, TOC, BOD5, COD). Description of the various types of reactors. Physical processes (screening, solid reduction/removal, grit removal, flow equalisation, fat and grease removal, primary sedimentation, clarification, floatation, aeration). Chemical processes

(chemical precipitation and coagulation, removal of P, N, and heavy metals, chemical oxidation). Basic principles of the biological processes (kinetic of microbial growth, suspended growth biological treatment processes, attached growth and combined biological treatment processes, anaerobic suspended and attached growth biological treatment processes). Advanced wastewater treatment (membranes, adsorption, gas stripping, ion-exchange, advanced oxidation technology). Disinfection processes (basic principles, disinfection by-products, chlorination, ozonation, UV). Treatment, reuse and disposal of sludge (dewatering, stabilisation, aerobic – anaerobic digestion, composting, drying). Management of odours. (8 ECTS)

CEE 584 Advanced Topics in Environmental Engineering

Special advanced topics in environmental engineering such as: advanced wastewater treatment technologies, advanced water treatment technologies, aquatic chemistry, ionic equilibrium, solubility and pH calculations in water, monitoring of solid waste disposal, development of management systems for special waste, energy recovery from biomass, monitoring and control of industrial emissions, integrated management systems of water resources, advanced environmental fluid dynamics including geophysical and coastal fluid dynamics, weather forecasting systems, climate change prediction, atmospheric dynamics and air pollution dispersion, dynamics of atmospheric boundary layer, monitoring and control of atmospheric pollution. (8 ECTS)

CEE 585 Experimental methods in water and wastewater analysis and treatment

Sampling, samples transport and preservation, laboratory analytical methods, quality assurance and quality control. Water analysis (organoleptic methods, volumetry, nephelometry, spectrophotometry, spectroscopy, chromatography, mass spectrometry), microbiological analysis, the physics, chemistry and biology of water. Water and wastewater characterization (fresh water / potable water / industrial wastewater / urban wastewater). Treatability of wastewater (e.g. sedimentation, coagulation-flocculation (jar tests), oxidants demand). Biological treatment (membrane bioreactor), chemical treatment (UV/H_2O_2, homogeneous and heterogeneous photocatalysis, ozonation), Ultrafiltration. Eco- and phyto- toxicity tests. (8 ECTS)

CEE 586 Sustainable Built Environment

Holistic approach and lateral integration of fundamental aspects and current challenges in the sustainable design of the built environment. Includes: climate change, urban physics, environmental pollution, global energy demands, sustainable building materials, rational water use, waste management, renewable/alternative energy technologies, perception of human comfort, ecological footprint analysis, legal framework, environmental and operational management & strategies. The course also demonstrates examples of both sustainable and unsustainable aspects of current design practice of the built environment, and how international policy frameworks can act as both drivers and barriers to sustainable solutions. (8 ECTS)

CEE 596 Renewable Energy Sources management

Forms and sources of energy, basic thermodynamic principles, efficiency and losses during the conversion and transfer of energy. Energy and society, energy resources - characteristics , properties and exploitation technologies, applications and potential of renewable energy resources, energy storage systems resources, photothermal and photoelectric systems, geothermal systems of high, medium and low enthalpy.

Biomass technologies for managing urban and agricultural / livestock waste for energy production (conversion). Legislative framework and European / National Directives on Renewable Energy. Recycling and energy production. (8 ECTS)

CEE 610 Seminars for Graduate Students

Graduate seminars organized by the CEE Department, on contemporary research issues of local and international interest. The list of seminars is announced at the start of each academic semester (approximately 6-7 seminars per semester) and graduate students (MEng/MSc) are required to attend at least 8 seminars during their course of studies. Doctoral candidates are required to attend at least 16 seminars during their course of studies, in addition to presenting one seminar themselves in relation to their doctoral research. (0 π.μ.)

CEE 650 Independent Study

Individual study, research, or laboratory investigations under faculty supervision. (8 ECTS)

CEE 680-683 M.Sc. Research

Program of graduate research leading to the defence and writing of an M.Sc. thesis. (ECTS units assigned by the thesis advisor)

CEE 689 Research Project

Individual research project leading to the completion of the M.Eng. degree. (10 π.μ.)

CEE 690-696 Ph.D. Research

Graduate research within the Ph.D. program.

CEE 697-699 Ph.D. Thesis Authoring

Authoring of the Ph.D. thesis. These courses are only taken upon completion of all ects units required under the “PhD Research” course-codes. (ECTS units assigned by the thesis advisor)

CEE 701-702 Examination of the Research Proposal for the Doctoral Thesis

Examination of the research proposal, for the doctoral thesis, by the 3-member doctoral committee, according to the Graduate Studies Regulations of the UCY.