Operating Regulation

for Interdepartmental/Interinstitutional Postgraduate Programmes

in accordance with the provisions of Law 4957/2022

CHAPTER A: GENERAL TERMS

Article 1

"Objectives of the MSc Programs"

With its prominent position internationally as a leading public university of science and technology, the NTUA organizes and operates Interdepartmental and Interinstitutional Postgraduate Programmes (MSc Programs) promoting interdisciplinarity. The MSc Programs of the NTUA lead to the awarding of a Diploma of Postgraduate Studies (DPS).

Depending on its duration, the DPS is equivalent to: 90 credits, for the MSc Programs of 3 academic semesters or 120 credits (ECTS), for the MSc Programs of 4 academic semesters.

The DPS is an academic qualification of specialization. It is equivalent to a *Master of Science* and is considered as a second postgraduate degree for holders of a 5-year integrated Master's Degree, such as engineers. The DPS serves as evidence of the high-level education its holder has received in the interdisciplinary discipline of the corresponding MSc Program. However, awarding of the DPS does not entail awarding of the NTUA's Diploma of undergraduate studies.

The MSc Programs of the NTUA are intended to address cutting-edge technological topics with approaches characterized by coherence and scientific depth, contributing therefore to the preservation and enhancement of the quality and international recognition of the degrees awarded by the NTUA.

Every MSc Program of the NTUA:

a) serves the objectives and strategic choices of the University as provider of high-quality postgraduate studies,

b) preserves the principle of interdisciplinarity and interdepartmentality of education,

c) addresses the scientific and technological disciplines served by the participating Schools; and

d) does not overlap significantly, in terms of content, with existing programs/specializations of the NTUA undergraduate studies or with actions aiming at professional training or lifelong learning.

Article 2

"Competent Bodies"

According to the Greek Law 4957/22 (Article 81), the competent bodies governing the establishment, organization, operation and administration of the MSc Programs are:

a) The Senate of the NTUA.

b) The Programme Studies Committee (PSC) of the MSc Program.

c) The Steering Committee (SC) of the MSc Program.

d) The Director of the MSc Program.

In particular:

a) **The Senate of the NTUA** is the body responsible for the academic, administrative, organizational and financial affairs of the MSc Programs, holding the following specific authorities:

i. approves the establishment and amendments in the composition and structure of the MSc Program,

ii. approves and amends the MSc Programs Regulations,

iii. grants extension of the MSc Programs duration,

iv. approves collaborations with domestic or foreign universities or research centers - institutes and technological entities of the Article 13A of the Greek Law 4310/2014 (A' 258) for the organization of joint (second-cycle studies) curricula as well as the protocols for academic or research cooperation with domestic or foreign entities,

v. establishes the Postgraduate Studies Committee of the university, upon recommendation of the Deaneries of the NTUA Schools,

vi. establishes the Programme Studies Committee, in the case of interdepartmental or interinstitutional or joint MSc Programs,

vii. decides on the abolition of the MSc Programs offered by the NTUA; and

viii. exercises those responsibilities relating to the MSc Programs that are not assigned by law to other bodies specifically.

A Postgraduate Studies Committee NTUA is established in accordance with the Greek Law 4957/2022 (Article 79).

As a body, the **Postgraduate Studies Committee** of the NTUA is advisory to the Senate and responsible for the supervision and general coordination of the University's postgraduate studies.

The Committee consists of one (1) Faculty Member from each School of the University, one (1) member from the categories of: the Special Teaching Staff (STS), the Laboratory Teaching Staff (LTS) and the Technical Laboratory Staff (TLS) of the University. The NTUA Vice-Rector, acting as the Committee Chairman, holds responsibility for academic matters. The Committee members

have experience in organizing and participating in second-cycle studies curricula. The Committee's term of office shall be two (2) academic years.

The Postgraduate Studies Committee NTUA:

i. submits its opinion on the establishment of new postgraduate programs or the amendment of existing, upon evaluation of the requests of the General Assemblies (GA) of the Schools. This evaluation considers the proposals for the establishment of new postgraduate programs, the accompanying reports on their feasibility and sustainability and the cost analysis of operating the MSc Program. The Postgraduate Studies Committee has the authority to refer back proposals if they lack sufficient justification or the accompanied reports are incomplete,

ii. prepares draft Regulation for the University's second- and third-cycle studies curricula and submits the documents to the Senate,

iii. prepares a model draft of the Regulation for a postgraduate programmes,

iv. oversees the compliance of the postgraduate programmes with the Regulations,

v. oversees the implementation of the legislation, Regulation and decisions of the University administrative bodies by the postgraduate programs; and

vi. oversees the implementation of the student fee waiver procedure.

b) **The Programme Studies Committee (PSC)**, is the body exercising the responsibilities of the General Assembly of the School in the case of interdepartmental, interinstitutional and joint MSc Programs. The PSC consists of Faculty Members of the participating Schools and is established by decision of the Senate of the NTUA upon the recommendation of the General Assemblies of the participating Schools or the competent bodies of the collaborating entities in accordance with the provisions of the Special Cooperation Protocol of the MSc Program. If other entities participate in the MSc Program (in accordance with par. 6 of Article 80), then at least one (1) representative from each collaborating entity shall participate as a member of the Committee. By decision of the PSC may be established a Steering Committee (SC) to serve a two-year term. In the SC must participate the Director of the MSc Program and four of the members of the PSC.

As long as they undertake teaching duties in the MSc Program, Professors Emeriti of the participating Schools may participate in the PSC and the SC. In the PSC meetings participates the officer of the Secretariat of the coordinating School being responsible for the Program's secretarial support and for taking record of the meeting minutes. Based on the findings of annual reports and evaluation procedures of the NTUA's MSc Programs and the scientific and technological advances, the PSC of each MSc Program decides on all educational and research affairs, with a view to the continuous improvement of the content, quality of

studies and general operation and development of the program.
The PSC shall exercise the responsibilities for the organization, administration and management of the MSc Program in accordance with par. 2 of Article 82 and par. 3 of Article 82 [in the absence of a Steering Committee (SC)] of the Greek Law. 4957/2022 as follows:

i. establishes Committees for evaluating the applications of candidate postgraduate students and approves their enrollment in the MSc Programs,

ii. assigns the teaching loads to the lecturers of the MSc Program,

iii. recommends to the General Assembly of the coordinating School the amendment of the decision by which the MSc Program is established, as also the extension of the MSc Program duration,

iv. establishes examination committees for the examination of postgraduate students' theses and designates the supervisor for each individual thesis,

v. ascertains that students have successfully completed their studies in order to be awarded the MSc degree; and

vi. approves the review report of the MSc Program, upon the recommendation of the Steering Committee (SC).

By decision of the PSC, the responsibilities described in points i) and iv) may be transferred to the SC of the MSc Program.

c) The **Steering Committee (SC)** may be established by decision of the PSC of the MSc Program to serve a two-year term. It consists of the Director of the MSc Program and four members of the Programme Studies Committee (PSC). The composition of the SC members shall be specified in the Special Cooperation Protocol.

Provided its establishment, the SC is responsible for monitoring and coordinating the operation of the program and in particular:

i. for preparing the initial annual budget of the MSc Program and its amendments, provided that the MSc Program has available resources in accordance with Article 84, and for recommending its approval to the Research Committee of the Special Account for Research Funding (SARF),

ii. for preparing the program report and recommending its approval to the PSC,

iii. for approving the expenditure of the MSc Program,

iv. for approving the awarding of (contributory or non-contributory) scholarships, in accordance with the provisions of the MSc Program establishment decision and of the Regulation for postgraduate and doctoral studies,

v. for recommending, to the PSC, the allocation of the teaching loads, as also the assignment of the teaching loads to the lecturer categories specified by the Greek Law 4957/2022 (Article 83),

vi. for recommending, to the PSC, the call for Visiting Professors in order to cover teaching needs of the MSc Program,

vii. for preparing a plan for the amendment of the academic curriculum, which subsequently has to be submitted to the PSC; and

viii. for recommending, to the PSC, the reallocation of courses between academic semesters as well as matters related to the qualitative upgrade of the academic curriculum.

d) **The Director of the MSc Program** comes from the Faculty Members of the participating Schools and is of the rank of Professor (preferably) or Associate Professor. The Director is a member of the PSC and is appointed by decision of the PSC to serve a two-year term, which is renewable without limitation, according to the provisions of the Special Cooperation Protocol. The PSC assembles with the most senior member as chairman and elects the Director.

The responsibilities of the **Director of the MSc Program** are:

i. to chair the PSC and SC, prepare the agenda and convene the meetings of both bodies,

ii. to recommend, to the PSC, agenda items related to the organization and operation of the MSc Program,

iii. to recommend, to the SC and the other (MSc Program and HEI) bodies, agenda items related to the effective operation of the MSc Program,

iv. to serve as the Scientific Manager of the program, in accordance with the Greek Law 4957/2022 (Article 234), and exercise the corresponding responsibilities,

v. to oversee the implementation of the decisions made by the MSc Program bodies and of the Regulation as well as to oversee the implementation of the MSc Program budget; and

vi. to exercise any other responsibility specified in the decision by which the MSc Program is established.

The Director of the MSc Program along with the SC and PSC members are not entitled to any remuneration or any kind of compensation for carrying out their assigned responsibilities in relation to performing their duties.

Article 3

"MSc Program Administrative Support at the NTUA"

a) School Secretariats are upgraded in order to support the postgraduate studies at School level, in line with the University's policy for decentralization of responsibilities and strengthening of the Schools.

b) At central administration level, within the University's Directorate of Studies, is created a dedicated department overseeing the University's programs of postgraduate studies.

c) The University aims at leveraging the staff hired for research projects of relevance to the postgraduate studies for supporting the teaching in the postgraduate programs of each School.

d) In each School's postgraduate programs, the administrative support is carried out by employing information technology aids and involves the following actions:

   i. Preparing, uploading and circulating the announcement of postgraduate study openings.

   ii. Providing information on the program to interested students responding to the announcement.

   iii. Collecting the applications and the supporting documents of candidate postgraduate students.

   iv. Administering the assessment procedure and compiling the lists of successful candidates.

   v. Running the postgraduate students enrollment procedure and preparing the catalogs of the enrolled postgraduate students per program and course.

   vi. Maintaining course attendance records (per course).

   vii. Maintaining a register to track the progress of each postgraduate student throughout their period of study.

   viii. Issuing student grade sheets.

   ix. Preparation of timetables and examination schedules.

   x. Arrangement of educational visits.

   xi. Maintaining a depository of postgraduate diploma theses written by the School's postgraduate students.

   xii. Continuous updating of the program's website.

   xiii. Issuing certificates and other documents, granted upon request of the postgraduate students.

xiv. Preparing procedures for granting loans and scholarships.

xv. Maintaining a computerized record of postgraduate students.

xvi. Supporting the PSC and SC of the MSc Program.

xvii. Providing all kinds of information and data concerning the School's postgraduate studies and uploading them to the world wide web.

xviii. Preparing procedures for the awarding of the DPS.

xix. Updating the record of DPS holders.

Article 4

"Preparation and Approval of the MSc Programs Curricula"

The MSc Program curriculum is prepared by the PSC of each MSc Program every academic year, considering the recommendations of the GA of the coordinating School as well as of each participating School. It is approved by the Senate, after recommendation of the **Postgraduate Studies Committee of NTUA**.

a) Considering the MSc Program Regulation, the PSC of each MSc Program specifies the courses of the five-year curricula at the NTUA which provide the necessary background knowledge for the enrollment in the MSc Program and any other requirements. In particular, by decision of the PSC, considering also the findings of the evaluation procedures, the following must be specified by mid-April every year:

   i. the titles and detailed contents of the prerequisite courses from the NTUA's five-year programs, in conformance to the interdisciplinary discipline of each MSc Program, along with the bibliography and supporting teaching material,

   ii. the titles and detailed contents of all courses (obligatory and elective), in the same spirit with the above,

   iii. the weekly teaching hours for each course, in which all teaching activities shall be included,

   iv. the chronological sequence or interdependence of the courses,

   v. the course characteristics in terms of technical support,

   vi. the overlaps with other undergraduate and postgraduate courses offered; and

   vii. the course grading system.

The PSC of the MSc Program carries out continuous quality control and objective evaluation of all the courses of the program, in terms of the postgraduate, interdepartmental and interdisciplinary nature of the syllabus and examination topics. It is therefore verified that no overlap arises with the (undergraduate) five-year program of the School.

By a well-justified proposal, which should not alter the character of the MSc Program, the PSC may amend the program by adding, removing or merging courses. This could include the reallocation of courses between academic periods (semesters), yet always within the framework of the prescribed procedure for the preparation and approval of the MSc Program curriculum.

b) The procedure for the preparation and approval of the MSc Program curricula is the following:

   i. In accordance with the Senate decisions regarding the general principles, structure and content of the MSc Programs, the PSCs organize the necessary working groups per course, or sets of courses, they prepare the MSc Program curricula and the analysis of the proposed program; and also inform the GAs of the coordinating and of each participating, in the MSc Program, School.

   ii. Taking into account the recommendations of the GAs of the coordinating and of each participating School, the PSC formulates and approves the final recommendation for the curriculum and then forwards it to the Postgraduate Studies Committee through the Directorate of Studies.

   iii. The Postgraduate Studies Committee assembles, with the MSc Programs of the University as special agenda items, in the presence of the Directors of the MSc Programs and proceeds to detailed recommendations to the Senate on each of them.

   iv. The Senate assembles with the approval of the University's MSc Programs on the agenda. The associated decisions of the Senate are communicated to the PSCs and the GAs of the Schools, while their implementation is subject to periodic control by the Postgraduate Studies Committee.

   v. Non-compliance with the above procedure for the preparation, approval and reporting of the work of the corresponding MSc Program entails, first of all, the release of the NTUA from the duty to provide material or academic support and also from assuming the responsibility for the content and quality of the postgraduate studies offered by the MSc Program in question. Subsequently, through its bodies, the University initiates the procedure for discontinuing the operation of this MSc Program.

The above procedure is summarized in the following table.

Deadline	Competent body	Action
20/4	PSC	Prepares the draft curricula and lecturers' assignment for the next academic year and informs the GAs of the coordinating and of each participating, in the MSc Program, School.
20/6	PSC	Prepares and approves the final recommendation on the curriculum and lecturers' assignment for the next academic year taking into account the recommendations of the GAs of the coordinating and of each participating School and then forwards it to the Postgraduate Studies Committee.
30/7	Senate	Approves the MSc Program of the NTUA upon the recommendation of the Postgraduate Studies Committee.

Article 5

"Lecturers"

a) The teaching duties of the Postgraduate Programmes are assigned upon decision of the competent body of the Postgraduate Programmes, to the following categories of lecturers provided the relevance of their scientific and teaching work to the discipline of the MSc Program:

   i. Faculty Members,

   ii. members of the Special Teaching Staff (STS), Laboratory Teaching Staff (LTS) and Technical Laboratory Staff (TLS) of the Department or other Departments of the same or other Higher Education Institution (HEI) or Supreme Military Educational Institution (SMEI), who shall undertake additional workload (beyond their statutory obligations) in the case of a Postgraduate Programme with tuition fees,

   iii. Professors Emeriti or retired Faculty Members of the Department or other Departments of the HEI offering the MSc Program or of another HEI,

   iv. cooperating professors,

   v. designated lecturers,

   vi. visiting professors or visiting researchers,

   vii. researchers and expert scientists from the research and technological entities of Article 13A of the Greek Law 4310/2014 (A' 258) or from other research centers and universities (domestic or foreign); and

viii. scientists of recognized standing, specialized knowledge and experience in the discipline of the MSc Program.

b) The MSc Program teaching duties are assigned by decision of the PSC of the MSc Program, informing the GAs of the coordinating and each participating, in the MSc Program, School.

c) The right to supervise diploma theses is held by the Faculty Members. The same right is held also by the MSc Program lecturers mentioned in points ii) to vii) of par. a, provided that they hold a PhD. By justified decision of the PSC, the supervision of diploma theses may be assigned to the lecturers mentioned in point viii) of par. a. Also, by justified decision of the PSC, the supervision of diploma theses may be assigned to Faculty, STS and LTS members of the Schools (Departments for Interinstitutional Postgraduate Programmes) to whom no MSc Program -related teaching duties have been assigned.

d) Lecturers from all the above-mentioned categories may be remunerated from the MSc Program funds exclusively. No remuneration or other benefits are allowed from the state budget or the public investment program. The remuneration corresponding to each lecturer shall be determined by decision of the body of the MSc Program being responsible for the assignment of the teaching duties. As a particular case, lecturers with the status of Faculty Member may receive additional remuneration for their work in the MSc Programs provided that they fulfil their minimum statutory obligations, as they are defined in par. 2 of Article 155 of the Greek Law. 4957/2022. The last subparagraph shall also apply analogously to STS, LTS and TLS members, provided that they fulfil their minimum statutory obligations.

e) The application of teaching methods (such as laboratories, computer labs, study labs, fieldwork, thematic studies, group work with individual presentations of the group members, etc.) with high requirements in terms of technological support can be assisted by LTS and TLS members as well as by PhD degree holders, PhD students and other postgraduate students. For this, the PSC's approval is required, upon recommendation of the responsible lecturer. By decision of the PSC, and after informing the GAs of the Schools participating in the MSc Programs, assistant teaching duties may be assigned to PhD students of the Department or School, under the supervision of a MSc Program lecturer. Their participation in the teaching shall be indicated in the curriculum.

Article 6

"Postgraduate Student Eligibility"

a) In all the MSc Programs of the NTUA, HEI graduates of Greek or accredited-as-equivalent foreign universities are eligible for acceptance by the corresponding PSCs, after an open call for applications. In particular, applications from the following categories of graduates are welcomed:

i. Graduates of the NTUA Schools.

ii. Graduates of other Engineering Departments/Schools or graduates of Greek HEIs of other disciplines or graduates of foreign universities being accredited as equivalent to the Greek HEIs which are of relevance to the program's discipline. For these graduates, the awarding of the DPS does not entail awarding of the NTUA's diploma of undergraduate studies.

iii. Final-year students of the NTUA or other HEI from the above categories, as long as they provide evidence that they will be awarded a diploma/degree prior to the beginning of the MSc Program. In case of this being a pending issue, no certificate will be issued to the applicant until it is resolved.

iv. Graduates of other Departments, in accordance with the applicable provisions.

b) The MSc Programs of the NTUA are offered free of charge to all postgraduate students from EU countries. There is a participation fee of €500 per semester which may be modified.

Article 7

"Admission Requirements and Postgraduate Student Selection Criteria"

a) The general admission requirement for postgraduate students who wish to be enrolled in the program is to have the necessary academic background. This is specified by the PSC and may include the attendance of a number of prerequisite undergraduate courses which provide fundamental knowledge in the broader interdisciplinary field of the MSc Program.

b) As evidence of the above-mentioned background knowledge, candidates must submit, together with their resume, the syllabus of each relevant course attended during their previous academic studies. Else, they are required to pre-enroll and attend (with successful examination) the NTUA (prerequisite) courses specified by the PSC. In particular, during the student selection process, certain criteria are taken into account by the PSC, upon the recommendation of the Selection Committee.

c) As **selection criteria** are considered the following:

i. the degree grade,

ii. the ranking of the candidates (on the basis of their degree grade) in relation to the other graduates in the same School/Department and academic year,

iii. the grades in undergraduate courses which are of relevance to the postgraduate program,

iv. the candidates' performance and the subject of their final-year thesis, if the writing of such a thesis was formally required for successfully completing their undergraduate studies,

v. any other postgraduate qualifications being of relevance to the discipline of the MSc

Program,

vi. the research, professional and/or technological activity of the candidate,

vii. the proficiency in foreign languages, particularly English, and for non-Greek candidates, proficiency in the Greek language as well,

viii. the computer literacy,

ix. the letters of recommendation; and

x. for candidates who are employees, the needs and prospects of their employer company or organization.

The PSC shall specify the details of the postgraduate student selection criteria presented in the above. This includes specifying the language proficiency level and any additional criteria or conducting examinations or interviews, the results of all of which shall be taken into account in the selection process. In the case of interviews, these are arranged by the PSC and conducted by a three-member Selection Committee (designated by the PSC) composed of Faculty Members that are lecturers in the MSc Program, one of whom is PSC member.

d) The list of successful candidates is approved, after the recommendation of the Selection Committee, by the PSC. The list is then communicated to the GA of the coordinating School.

e) In addition to the number of admissions, each MSc Program may admit one scholarship holder from the State Scholarships Foundation who has succeeded in the relevant competition for domestic postgraduate studies in the discipline of the MSc Program and one non-Greek scholarship holder from the Greek State. The number of scholarship holders may be increased by decision of the PSC.

f) Those STS, LTS and TLS members who meet the requirements may, upon request, be enrolled as supernumeraries (yet only one per year) in an MSc Program of the School in which they offer service and provided the relevance of their work to the discipline of the specific MSc Program.

g) The maximum number of postgraduate students enrolled is determined by considering the number of the MSc Program lecturers and the students-to-lecturers ratio, the infrastructure in terms of material and equipment and the available classrooms. In the case of those MSc Programs offered exclusively in English, the number of postgraduate students should be determined such that at least half of them are Greek, provided of course that there is a sufficient number of applications. The total number of postgraduate students will be adjusted accordingly.

h) The background knowledge required for enrolment in the MSc Program is specified by the corresponding PSC, which is the body determining the prerequisite undergraduate courses that individual students should attend. For each student, the number of such courses cannot exceed a maximum of four (4) per semester while the courses themselves may be selected

from the Undergraduate Programs of the Schools participating in the MSc Program. The postgraduate students in question should successfully complete these courses within the prescribed period of attendance in the MSc Program and in all cases before the assignment of the postgraduate diploma thesis.

Article 8

"Study Guide"

For each MSc Program, the corresponding PSC is responsible for preparing the Study Guide, in accordance with the present Regulation. The Study Guide is uploaded to the MSc Program website.

Article 9

"Language of Instruction. Language Used for the Writing of the Postgraduate Diploma Thesis"

a) The language of instruction is Greek. Teaching an MSc Program course (or part of a course) in English is allowed upon the approval from the program's PSC. The language to be used for the writing of the Postgraduate Diploma Thesis (PDT) is Greek or English and is specified by decision of the PSC. The PDT must include an extensive abstract in both Greek and English.

b) Regarding the MSc Program offered in languages other than Greek, the language of instruction and writing of the PDT is English.

Article 10

"MSc Programs' Structure"

a) In exceptional cases in which a postgraduate student successfully completes the obligations for the Diploma of Postgraduate Studies (DPS) to be awarded in a period shorter than the minimum duration of the MSc Program provided for and, in all cases, in a period of not less than one (1) year, the Senate may approve, upon the recommendation of the PSC to the Postgraduate Studies Committee, the awarding of the DPS.

b) The maximum time period within which students can pursue the DPS, measured from the official time of enrollment in the MSc Program, is two (2) years. By exception, in special cases, a short-period extension of up to one (1) additional year may be granted, upon a reasoned PSC decision. On completion of the second year, the PSC shall decide on whether the student's period of study should be discontinued, in which case a certificate with the courses passed and corresponding grades should be issued.

c) Courses requiring laboratory practice or computer use aim to provide, as far as possible,

individualized training for the postgraduate students. The introduction of new teaching methods that will enhance active participation of students is pursued. Particular emphasis will also be placed on the training of postgraduate students in groups, with distinctive role for each participating student, in order to enhance their teamwork skills and synthetic ability.

d) The structure of postgraduate studies is organized into groups of obligatory and elective courses. In the group of obligatory courses, prerequisite basic (also called “core”) courses and specialization courses may be included. The PSC has the authority to decide whether courses can be offered by other Schools of the NTUA or of another HEI. Also, the PSC decides on whether courses may be offered as electives in other MSc Programs of the NTUA. Obviously, many of the MSc Program courses appear as elective in Doctoral Studies Programs.

e) All the MSc Programs coordinated by a NTUA School follow the “Unified Academic Timetable of Postgraduate Studies”, which is prepared by the Postgraduate Studies Committee and approved by the University’s Senate on an annual basis.

f) In the case of an Inter-University or part-time MSc Program, the duration of studies is specified by the PSC and then finally approved by the Senate, in the framework of the procedures for the preparation and approval of the MSc Program curricula, while the academic timetable is adjusted accordingly. The academic semesters that add up to the total number of credits of a full program cannot exceed, given that they refer to part-time programs, twice the duration of the full-time MSc Program, i.e., four (4) years.

g) By a written request, postgraduate students of the MSc Program may temporarily suspend their studies for a period not exceeding two (2) consecutive semesters. The semesters of student status suspension shall not be counted towards the maximum period provided for regular study.

Article 11

“Attendance - Examination - Course Grading System”

a) Students are required to attend the MSc Program courses and participate in the related educational activities and coursework. If there are extremely serious and documented reasons justifying a postgraduate student’s inability to attend, the PSC may excuse a certain number of absences which cannot exceed a maximum of 1/3 of the total number of lectures delivered. Postgraduate students who have not reached the required number of attendances in a course are entitled to repeat the course (or an equivalent one designated by the PSC) in the next (being also the final) academic year of study, as long as there is such a provision in the specific MSc Program.

b) The course grading system is on a 0-10 scale, without involving fractional units, with the grade 5 representing the lowest pass. A course grade has to be derived not only from the final examination but also, with non-negligible weight, from the performance of the students

in the applied teaching methods (laboratories, personal computer labs, study labs, design labs, fieldwork, thematic studies, group work with individual presentations of the group members) carried out during the course, with a relative weighting that is determined in each course by the responsible lecturer, approved by the PSC and which cannot be less than 30% of the total course grade. It is also clarified that only the DPS grade, which is the average of grades awarded by the individual examiners, may be expressed in a form including the half of a fractional unit.

c) The final examination is held after the end of the teaching period, within a two-week examination period, in accordance with the University's Unified Academic Timetable of Postgraduate Studies and relevant PSC decisions.

d) The results are issued by the responsible lecturers within two weeks from the date that the final examination was held.

e) There is no provision for repeating the examination period. In exceptional circumstances, the PSC may, by a documented decision, accept a special additional examination for a maximum number of two (2) courses per postgraduate student and academic year, provided that the postgraduate student was unable to take the examination due to force majeure events. Also in exceptional cases, the PSC may set re-examination.

f) Students failing the examinations have the option to re-enroll the following year in the same courses or change these courses, if they are elective. In cases of two-year programs in which re-enrolling is not possible in the following year, only one additional examination period, set at a suitable time by the PSC, is allowed as an exception.

g) Postgraduate students who fail examinations in up to two courses, in which case they cannot successfully complete the program according to the provisions of the present Regulation, are entitled to be examined, upon their request and a reasoned PSC decision, by a three-member committee of Faculty Members of the School. The members of this committee are designated by the PSC of the MSc Program and should have expertise in the same or at least closely related discipline as the examined courses. Lecturers of the courses in question are exempt from this committee.

h) It is possible for postgraduate students who have attended courses of another recognized postgraduate program and have successfully passed the associated examinations to be exempted from the corresponding courses of the MSc Program upon a submitted written request, receiving the positive recommendation of the responsible lecturers and the decision of the PSC.

i) Lectures not given have to be re-scheduled in order to reach the number of 13 teaching weeks, required for all the MSc Program courses. Re-scheduling is decided and announced by the PSC of the MSc Program, which takes care of complying with the academic timetable to the greatest extent possible.

Article 12

"Educational Process Based on Modern Synchronous and Asynchronous Distance Learning Methods"

a) The Senate can decide, based on the recommendation of the Postgraduate Studies Committee and its approval from the PSC of the MSc Program, to organize the educational process in the MSc Program using, partially or fully, modern synchronous or asynchronous distance learning methods. The use of these methods should comply with the European rules and specifications ensuring the excellent pedagogical design and the interactivity of the educational processes as well as the protection of personal data. The decision shall be accompanied by an analysis on the methods used in general for organizing the distance learning process, such as: synchronous, asynchronous, blended learning, the digital educational material, any digital assessment methods for students and digital assessment material, the University infrastructure and equipment to support distance learning programs and the digital skills of the teaching personnel.

b) The organization and delivery of courses, as well as of other educational activities, using modern distance learning methods refer to traditionally-conducted classroom courses, to which such methods are readily applicable. This does not include the practical or laboratory training of students, which both require students' physical presence.

c) Courses and other educational activities can be organized and delivered using asynchronous distance learning methods, with the aim of supporting individuals with disabilities or as part of the University's internationalization efforts. The material intended for asynchronous education may include lecturer's notes, presentations, exercises and indicative solutions as well as video lectures, provided that their compliance with the applicable legislation on the protection of personal data is ensured. Any kind of educational material is exclusively provided for the educational use of the students enrolled.

d) The educational process may be carried out using modern distance learning methods, even in MSc Programs that have not included this possibility in their founding decision. This applies exclusively to the following cases:

   i. in force majeure events or exceptional circumstances rendering impossible to conduct the in-person educational process or use the NTUA's infrastructure for educational, research and other activities; and

   ii. organization of courses and tutorial exercises, in addition to the instruction time prescribed per course.

e) The distance learning process in the MSc Programs is administered through the NTUA's Helios online course management platform. For its support, the NTUA Computer Centre and the NTUA Network Centre are jointly responsible.

Article 13

"Postgraduate Diploma Thesis – DPS Awarding and Grade"

a) After completing the second semester of the first year of studies, postgraduate students can select the subject and supervisor for their Postgraduate Diploma Thesis (PDT), provided that, by that time, they have fulfilled all requirements for at least half of the MSc Program courses. For postgraduate students who re-enroll in the following year in order to attend first or second semester courses, the PSC decides on whether they can be allowed to start working on their PDT from the beginning of the second academic year of study.

b) Postgraduate students are required to submit an application in which shall be indicated the proposed title and supervisor of the PDT, with an abstract of the proposed thesis attached. Then, the PSC designates the supervisor and establishes the three-member Examination Committee. This Committee consists of the supervisor and at least one MSc Program lecturer from those identified in a) to f) of the Greek Law 4957/2022 (Article 83, par. 1) and from those identified in Article 5 of the present document. The scientific expertise of the Examination Committee members must be the same with, or relevant to, the discipline of the MSc Program. By the supervisor's proposal, postgraduate students may be scientifically assisted in the preparation of their PDT by PhD holders, PhD students or other postgraduate students and other scientific collaborators of the NTUA or invited external lecturers. In addition, support for the preparation of the PDT in terms of laboratory equipment may be provided by the technical staff (STS, TLS, LTS, and others), whenever such a need arises. The grade of the PDT is calculated as the average of the grades received from the three examiners on a 1-10 scale, rounded to the nearest half fractional unit, with the minimum pass mark being 5.5 (five and 50%). The PSC is responsible for setting uniform evaluation criteria.

c) The text of the PDT is composed by using a suitable text compiler, following the template approved by the PSC. On the cover page should appear the University's logo. The thesis should be submitted electronically and, if requested by the Examination Committee and the NTUA Library, in hard copy. It must include a 1,200 to 2,000-word abstract, table of contents, bibliographical references and a 300 to 500-word abstract in Greek and in English. Regarding foreign-language MSc Programs, the abstract shall be written in English only. After the approval of the PDT, postgraduate students are required to deposit an electronic file of their thesis at the NTUA Central Library and to electronically submit the file to the NTUA Institutional Repository. The PDTs approved by the Examination Committee have to be uploaded to the MSc Program website.

d) If the PDT is not successfully completed within the 3rd semester of the program, it can be continued for one more academic semester.

e) In all cases, successful completion of the postgraduate courses and the PDT is required in order for the DPS to be awarded. If this is not achieved within the maximum prescribed period of study, the postgraduate student receives a simple certificate of attendance for the

courses passed and withdraws.

f) The DPS grade is calculated as the weighted average of the grades received in the postgraduate courses and the PDT. The PDT can be considered to correspond to one (1) semester of courses.

g) Once a year, specifically in November, the Secretariat of the coordinating School compiles a list of postgraduate students graduating, in which are included those who have successfully completed their obligations in the MSc Program during the previous academic year. The degrees are awarded annually, at a special ceremony organized by the coordinating School, by the corresponding Dean and the Director of the MSc Program.

Article 14

"Degree Type - Diploma of Postgraduate Studies (DPS)"

a) The degree type (Diploma of Postgraduate Studies) awarded, being either NTUA Interdepartmental or Interinstitutional with the NTUA in the role of the coordinating university, is given in Chapter B of the present Regulation.

b) Under the responsibility of the Director of the MSc Program and the administrative care of the coordinating School, the DPS are issued timely with the computer support of the NTUA's IT Administration.

c) The DPS is accompanied by a transcript in which are listed all the courses of the MSc Program that the student has successfully attended, with the corresponding grades received. In the transcript, is indicated the subject of the postgraduate student's thesis (PDT) as also the grade the thesis received.

d) The DPS and the transcript are awarded in Greek and/or in English, in accordance with the applicable provisions.

e) In the original DPS issued is not indicated the numerical value of the diploma grade. Instead, a characterization in accordance with the scale "Good", "Very Good", "Excellent" appears, which is determined in correspondence with the total grade attained. As regards the correspondence between the two scales, the same with the undergraduate studies apply, i.e., "Excellent" implies a grade from 9 to 10, "Very good" from 7 to 8.99 and "Good" from 5 to 6.99. If the postgraduate student wishes, the numerical value of the DPS grade will be indicated on the corresponding certificate of studies.

Article 15

"Prize for Best Postgraduate Diploma Theses (PDT) Awarded by the NTUA"

The NTUA may award prizes to the best PDTs written for the University MSc Programs by exploiting endowment resources. The procedure for the evaluation of the theses is described below.

a) A thesis is nominated for a prize by the thesis supervisor who submits a written recommendation concisely stating the reasons why the specific PDT or doctoral thesis is recommended for a prize. The recommendation is accompanied by:

   i. a duly filled submission form in which the thesis author declares that an electronic file of the PDT is submitted in order to be evaluated for winning the prize corresponding to a specific endowment,

   ii. abstract of the PDT; and

   iii. the electronic file of the PDT.

b) Following the selection criteria applied for prize awards at the NTUA, the PSC compiles a list of the PDTs nominated. The number of PDTs included in this list should correspond to the number of the prizes awarded. The list needs to be approved by the GA.

c) In the selection criteria should be included the following:

   i. the originality and novelty of the PDT; and

   ii. the papers in high-quality journals and conferences that have been published based on material produced for the PDT.

d) The Postgraduate Studies Committee establishes an Evaluation Committee, consisted of three (3) or four (4) Faculty Members from different Schools, in which supervisors of evaluated papers cannot participate.

e) The Evaluation Committee takes into account the evaluations of the Schools and submits its recommendation to the Postgraduate Studies Committee, which reaches a decision that is subsequently announced to the Senate.

f) The prizes are awarded in a ceremony featuring short presentations of the top three PDTs.

Article 16

"MSc Program Monitoring and Evaluation"

a) The MSc Programs are subject to a periodic evaluation/accreditation process conducted by the Hellenic Authority for Higher Education (HAHE). In this context, the overall work carried out by each MSc Program is evaluated. This includes evaluating: the extent to which the objectives that had been set at the time of its establishment have been fulfilled, the

program's longer-term economic viability, the employment record of its graduates, its contribution to research, internal evaluations provided by postgraduate students, the reasons for extending its operation as well as other aspects relating to the quality of the work produced and its contribution to the national strategy for higher education.

b) Postgraduate students attending courses in the MSc Programs at the NTUA actively participate in the course evaluation process. This is based on questionnaires which have already been approved by the NTUA Senate (2012). The PSC is responsible for their processing. The questionnaires mainly concern the quality and means of teaching and research, the structure and content of the studies, student services, administrative services and the infrastructure in terms of material and equipment. The questionnaires are filled in electronically and anonymously.

c) The results of the processing are communicated to the responsible lecturers after they have issued the corresponding course grades. The members of the PSC and the Director are informed of the results for all courses. The PSC has the authority to modify the content of the questionnaires and ask, possibly through alternative means, for additional evaluation from the postgraduate students and/or MSc Program graduates in order to improve the quality of the program.

d) Should an MSc Program, undergoing evaluation as per par. a), be found not to meet the necessary conditions for continued operation, its activities will cease upon the graduation of the students already enrolled. This aligns with the decision of MSc Program establishment and the Regulation for postgraduate and doctoral programs.

Article 17

"Intellectual Property Rights of Postgraduate Theses"

a) As the author, the postgraduate student holds the intellectual property rights to the thesis. This stems from the nature of the procedures followed for the examination and awarding of the corresponding postgraduate diploma/degree, requiring the thesis to reflect the student's personal, unique and original contribution. Also, the author is responsible for the content of the PDT.

b) Intellectual property rights may be reserved with a suitable statement on the intellectual property rights page, which is placed right after the title page of the PDT, accompanied by information such as © [Year], [Full Legal Name]. ALL RIGHTS RESERVED.

c) Postgraduate students who avail of the NTUA's infrastructure, staff and expertise, under the guidance of the supervisor, should provide service to the University.

d) The role of the supervisor must be acknowledged in the PDT and indicated on the front and inside cover. In addition, the supervisor and infrastructure used (e.g., laboratory, fellowship, funding) should be included in the acknowledgements.

e) Under the amended Greek Law 2121/1993 currently in force, the broader scientific and research work of Faculty Members cannot be considered as part of their official duties.

f) By agreement or contract, the author grants the University a non-exclusive right to publish (e.g., through the institutional repository of the NTUA Library), reproduce and make the thesis available for educational, research and non-commercial purposes. In order for the University to legitimately use the above-mentioned rights for commercial purposes, it is essential that the authors of the composite work at hand formally assign these rights to the University through a contractual agreement.

g) The supervisor/head of research group/laboratory may utilize and publish the results produced (data, studies, computer programs, applications, prototypes, etc.). These actions do not concern commercial exploitation, but rather the use of the results in the context of research and science.

h) In the case of funded research, the intellectual property rights of the PDT are not transferred. Rather, the right to use/exploit the research results (data, studies, computer programs, applications, prototypes, etc.) is granted to the Scientific Director and/or funder, in accordance with the provisions of the contract between the NTUA and the commissioning entity.

i) If there is a potential for economic exploitation of the research product (or resulting patent), an agreement or a contract securing the right of the individuals who have substantially contributed to the development of the composite work/product has to be established on the basis of the applicable legal framework.

j) Both the author and supervisor names are included in the publication of early/completed papers during or after the completion of the PDT. Other persons who may also have contributed creatively to the work produced are listed with a statement of their actual contribution.

k) Use of or reference to copyrighted material in the context of the PDT must comply with the rules of academic ethics. Violation of these rules entails violation of the copyright law and will be addressed accordingly by the University.

CHAPTER B: SPECIFIC TERMS FOR THE INTERDEPARTMENTAL POSTGRADUATE PROGRAMME “ANALYSIS AND DESIGN OF STRUCTURES”

Article 18
“Structure of the MSc Programme”

The School of Civil Engineering at the National Technical University of Athens (NTUA), within the framework of the Operational Programme for Education and Initial Vocational Training, submitted a proposal in 1997 for the operation and funding by the EU of an Interdepartmental-Interdisciplinary Postgraduate Programme (MSc Program) entitled “Analysis and Design of Structures”. This program has been in operation since February 1, 1998, based on the provisions of Law 2083/92, the decisions of the Ministry of Education, Religious Affairs and Sports Β7/33/26.1.94 (Government Gazette Β 87/10.2.94) and Φ.711/153/Β7/378 (Government Gazette Β 628/30.7.96), and based on the unanimous decision of the Civil Engineering School of NTUA dated 19.2.98, which was approved by the Senate's decision dated 20.2.98. It was restructured by Ministerial Decision 3002 (Government Gazette Β 423/7.4.06) and Ministerial Decision 209731/Z1 (Government Gazette Β 3591/31-12-2014). It was re-established by Ministerial Decision 40522 (Government Gazette 3762/3.9.2018) and has been included in the internationalization project of NTUA’s postgraduate studies [the project “Support of internationalization actions of the postgraduate studies of the National Technical University of Athens” is co-financed by Greece and the European Union (European Social Fund) through the Operational Programme “Human Resources Development, Education and Lifelong Learning”], with the aim to promote both the studies opportunities for international students and the research and educational activities of NTUA.

The Structural Engineering Department, in collaboration with the Geotechnical Engineering Department of the School of Civil Engineering at NTUA, coordinates this Interdisciplinary-Interdepartmental Postgraduate Programme, with the partnership of the Schools of Applied Mathematics and Physical Science, Electrical and Computer Engineering and Mining and Metallurgical Engineering of NTUA.

The ADS Programme runs under the administration of the School of Civil Engineering.

Article 19
“Aims and Objectives of the MSc Programme”

The Interdisciplinary Postgraduate Programme aims to provide advanced education and promote knowledge in the field of structural design and analysis. It also offers the essential scientific foundation for conducting original research.

The **objectives** of this MSc Program are:

a) To specialize civil engineers in the modern methods and techniques of the interdisciplinary approach, cooperation and research in the field of analysis and design of structures to cover the

growing needs of Greece's public and private sector, as well as European or other countries' in the scientific areas of the Programme.
b) To in-depth train scientists to become capable of producing new knowledge in research centers and university institutions at home and abroad. The programme emphasizes on modern methods of analysis as well as on the design of structural projects based on the New Greek Regulations and Eurocodes.

Article 20
"Postgraduate Title"

The MSc Programme awards Postgraduate Studies Diploma - Master of Science in the field of "Analysis and Design of Structures" after the completion of the postgraduate course of study.
The programme offers classes in two scientific fields, in
Direction A: "Structural Engineering" and in
Direction B: "Analysis and Design of Earthquake Resistant Structures".

Article 21
"Duration of Studies"

The minimum duration of studies for the acquisition of the Postgraduate Studies Diploma- Master of Science is three (3) semesters and the maximum two (2) years, including the completion of the postgraduate diploma thesis. Extensions are generally not permitted. However, in special cases and upon a justified request by the postgraduate student, the Programme Studies Committee (PSC) may grant the necessary extension for reasons of force majeure.
Postgraduate students have the option of suspending their studies, which cannot exceed a total of two academic semesters, following a reasoned request to the Programme Studies Committee (PSC). The semesters of suspension of student status are not counted towards the prescribed maximum duration of enrollment.
Postgraduate students who exceed the maximum study time from their initial enrollment in the programme without having completed their educational obligations are automatically dismissed from the programme. Dismissed students will be notified by the Secretariat and exit the program with a certificate of attendance for the courses they attended and successfully passed.
Part-time study is allowed in the ADS according to the existing provisions, following a decision of the Programme Studies Committee (PSC) after a justified request from the student. The duration of studies in this case does not exceed twice the full-time enrollment.

Article 22
“Admission - Selection Criteria - Call of Interest”

Admission

The MSc Program “Analysis and Design of Structures” (ADS) admits graduates of the Civil Engineering and other NTUA Schools or of Polytechnic Schools in Greece or abroad, graduates of other Departments/Faculties of science and technical Universities, University degree holders in the field of engineering from accredited Engineering Schools with duration of 4 or 5 years, internationally recognized and equivalent to NTUA. Candidates must have sufficient knowledge of the English language (C1/C2 level). Students that will be graduating in upcoming September’s period are also eligible to attend.

Apart from civil engineers, engineers who graduate from all other Science Schools in Greece or abroad can be admitted to the MSc, provided that they attend additional structural and geotechnical courses offered by the undergraduate course of studies of the NTUA’s Civil Engineering School. The attendance of these courses lasts up to 2 semesters. If the candidates fail in the additional courses, they cannot enroll in the postgraduate Programme. These semesters are not counted towards the maximum duration of studies.

For Civil Engineers not specialized in Structural or Geotechnical Engineering, certain obligatory postgraduate courses may be required, as deemed necessary, based on the recommendation of the relevant committee and the decision of the Programme of Studies Committee (PSC) of the MSc Programme. These obligatory courses count towards the 10 required for obtaining the Postgraduate Studies Diploma - Master of Science.

Selection Criteria

For the selection of postgraduate students certain criteria are taken into consideration such as the overall diploma grade, the grades of the thesis and the grades, in relevant to the Master's Programme undergraduate courses, IT knowledge, research and work experience, letters of recommendation, and the candidate's overall profile (awards, distinctions, general ranking).
The Programme Studies Committee annually determines the application of these criteria, including the level of language proficiency, the definition of additional criteria or the conduct of examinations or interviews, which will be taken into consideration for the students’ selection.

Call of Interest

A call for admission in the "Analysis and Design of Structures" Programme is published on an annual basis. The call specifies the available positions, the deadlines for submitting the required files, the categories of candidates and the required supporting documents. The call is published on the websites of the MSc and NTUA. The programme starts in the winter semester of each academic year.

Article 23
"Tuition Fees"

The Postgraduate Programmes at NTUA are offered free of charge to all postgraduate students coming from EU nations. Non-EU students must pay tuition fees of 500€ per semester.

Article 24
"Language of Instruction. Language of Writing of the Postgraduate Diploma Thesis"

The MSc Programme "Analysis and Design of Structures" has been included at the internationalization project of NTUA postgraduate studies [the project "Support of internationalization actions of the postgraduate studies of the National Technical University of Athens" is co-financed by Greece and the European Union (European Social Fund) through the Operational Programme "Human Resources Development, Education and Lifelong Learning"], with the aim to promote the studies opportunities for international students, along with the research and educational activities of NTUA. In this context, the Programme is offered fully in the English language.

Article 25
"Academic Advisor"

For each postgraduate student, one faculty member among the lecturers of the programme, is appointed by the Programme Studies Committee (PSC) as the supervising academic advisor. The advisor collaborates with and guides the postgraduate student in selecting appropriate courses according to their interests and goals throughout their studies. Additionally, they monitor the overall progress of the postgraduate student in the MSc Programme. The academic advisor is not necessarily the one to supervise the Postgraduate Diploma Thesis.

Article 26
"Academic Requirements"

To obtain the Postgraduate Studies Diploma – Master of Science, students must attend and successfully pass ten (10) courses, five (5) courses taken in the winter and five (5) courses taken in the spring semester, as well as develop and present the Postgraduate Diploma Thesis (PDT).

The ADS Programme is equivalent to 90 ECTS (European Credit Transfer and Accumulation System). 60 ECTS credits equal the studies of two semesters (30+30), while the rest 30 ECTS equal to the Postgraduate Diploma Thesis.

Article 27

"Curriculum"

The MSc "Analysis and Design of Structures" Programme spans two (2) semesters of coursework, followed by one (1) semester dedicated to the development of the Postgraduate Diploma Thesis. To obtain the Postgraduate Studies Diploma-Master of Science, students must attend and be successfully examined at 10 courses, five (5) in the winter and five (5) in the spring semester, as well as develop a Postgraduate Diploma Thesis. Four (4) out of these ten (10) courses should be selected among the ones offered in the chosen direction, three (3) should be selected among the ones from the Geotechnical category, and three (3) among the Analysis category.

Students have the option to enroll in additional courses (upon their interest) among all courses offered. The maximum number of additional courses is four (4) with the limitation that only up to three (3) courses may be from the non-selected direction. The marks acquired in the additional courses are not counted for the overall diploma grade.

Table of Courses (Description - Content: see Annex A)

SPECIALIZATION A: STRUCTURAL ENGINEERING

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
101. Advanced Concrete Technology	CE	3	6	WINTER
102. Design Models for Aseismic Repair and Strengthening	CE	3	6	WINTER
103. Design of Steel Buildings	CE	3	6	WINTER
104. Recent Advances in RC Design Models	CE	3	6	WINTER
105. Reliability of Structures	CE	3	6	WINTER
106. Steel Structures for Marine Applications	CE	3	6	WINTER
107. Advanced Mechanics of Masonry	AMPS	3	6	SPRING
108. Design of Cable and Membrane Structures	CE	3	6	SPRING
109. Design of Technical Projects II	CE	3	6	SPRING
110. Information Systems in Construction Management	CE	3	6	SPRING
111. Engineering Materials	MME	3	6	SPRING

SPECIALIZATION B: ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
201. Nonlinear Analysis of Frame Structures and Applications in Seismic Engineering	CE	3	6	WINTER
202. Novel Methods for Seismic Isolation and Response Control of Structures	CE	3	6	WINTER
203. Signal Processing in Earthquake Engineering	CE	3	6	WINTER
204. Engineering Seismology	CE	3	6	SPRING
205. Experimental Earthquake Engineering	CE	3	6	SPRING
206. Pathology and Design of Structures under Seismic Action	CE	3	6	SPRING
207. Special Topics in Earthquake Engineering	CE	3	6	SPRING

208. Structural Intervention on Cultural Heritage Structures	CE	3	6	SPRING

GEOTECHNICAL COURSES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
301. Computational Geomechanics	CE	3	6	WINTER
302. Geotechnical Engineering in the Design of Structures	CE	3	6	WINTER
303. Ground Investigation Methods	CE	3	6	WINTER
304. Computational Methods in the Analysis of Underground Structures	CE	3	6	SPRING
305. Seismic Design of Surface and Underground Geotechnical Structures	CE	3	6	SPRING

ANALYSIS COURSES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
401. Advanced Plastic Analysis of Framed Structures	CE	3	6	WINTER
402. Advanced Structural Dynamics	CE	3	6	WINTER
403. Applied Structural Analysis of Framed and Shell Structures	CE	3	6	WINTER
404. Design of Technical Projects I	CE	3	6	WINTER
405. Theory of Shells	SCE	3	6	WINTER
406. Mechanics of a Continuous Medium	AMPS	3	6	WINTER
407. Machine Learning	ECE	3	6	WINTER
408. Boundary Elements	CE	3	6	SPRING
409. Load-carrying Behavior and Design of Structural Systems	CE	3	6	SPRING
410. Non-linear Finite Element Analysis of Structures	CE	3	6	SPRING
411. Stochastic Finite Elements	CE	3	6	SPRING
412. Structural Optimization	CE	3	6	SPRING
413. Applied Elasticity	AMPS	3	6	SPRING
414. Plasticity and Fracture of Materials	AMPS	3	6	SPRING

Modifications regarding the courses available can be made through decisions of the competent bodies.

Article 28
"Teaching Assignments"

The Secretariat of the MSc Programme gathers recommendations from the Departments of the School of Civil Engineering and collaborating Schools regarding the teaching assignments for the programme's courses by the end of March. The Programme Studies Committee (PSC) compiles the upcoming academic year's curriculum as well as the teaching assignments, up to the end of June. Any problem that may arise is resolved by PSC's decision.

External lecturers, (beyond the participating entities), may be invited upon justified PSC decision. These lecturers participate in the Programme either voluntarily (unpaid teaching) or with

compensation, which is decided according to the Programmes's budget, provided that there are available resources.

The courses take place mainly at the facilities of the Civil Engineering School, as well as at the facilities of the collaborating Schools of the MSc Programme, with the physical presence of students. By justified recommendation on the adequacy of the relevant means, the PSC may approve the teaching of the courses remotely. The PSC can also determine the number of remote courses as well as the percentage of hours for remote teaching for each of them.

Σε περίπτωση απώλειας διδακτικών ωρών μαθήματος, η αναπλήρωση αυτών γίνεται με κοινή συνεννόηση των διδασκόντων και των ΜΦ με το συντονισμό της γραμματείας του ΔΠΜΣ. Η αναπλήρωση πραγματοποιείται εντός της τρέχουσας εκπαιδευτικής περιόδου.

The replacement of lost hours that may occur is made upon mutual agreement of the lecturers and the postgraduate students and is coordinated by the Secretariat of the MSc Programme, within the current educational period.

Article 29
“Enrollment - Attendance”

Enrollment in each semester is mandatory regardless of whether the postgraduate students have fulfilled the courses requirements and are developing their Postgraduate Diploma Thesis.
Postgraduate students may enroll in up to six (6) courses per semester. The students who have fulfilled the Programme’s requirements (5 courses from the winter and 5 courses from the spring semester) have the option to enroll in additional courses up to the total number of 14 throughout their studies. Postgraduate students who have attended courses from another recognized Postgraduate Programme and have successfully passed them have the option to apply to the Programme Studies Committee (PSC) for exemption from equivalent courses of the MSc Program, accompanied by the recommendation of the respective lecturers.
If it is deemed necessary for the students’ further academic training to attend and be examined in courses offered by other NTUA’s Postgraduate Programmes, this option is also offered by applying to the PSC accompanied by the recommendation of their academic advisors.
Courses that do not meet the minimum number of five (5) enrolled students are suspended for the current semester, with the consent of the instructors.
Each semester lasts for 13 weeks. Attendance in courses is mandatory, with a maximum allowable number of three (3) absences per course. Participation in related educational activities, such as weekly exercises, assignments, exams etc., is also compulsory.
Postgraduate students who have not reached the required number of attendances in a course have the right to retake it (or an equivalent one designated by the PSC) during the next and final academic year of study. If students have been successfully examined in a course, it is not allowed to retake it.

Article 30
"Examination and Grading System"

Examinations are held at the end of each semester and they last two weeks according to the academic calendar of NTUA and specific PSC decisions. Only postgraduate students who have not exceeded the maximum number of absences per course are eligible to participate in the exams. The results are issued by the instructors within two weeks after the examinations and are and are communicated to the postgraduate students.

Re-sitting of exams is scheduled every September upon PSC decision. Each student is allowed to be examined to a maximum number of 4 courses, 2 from the winter and 2 from the spring semester. When the mark is over the base of five (5), no re-examination is allowed. To participate in the September's exams students need to apply for it after the spring semester has ended.

The grading system is on a 1-10 scale without fractional part and with the passing grade being five (5). The mark comes from the final written exam plus the exercises, projects or other assignments given during the semester.

Article 31
"Evaluation of Courses and Lecturers of the MSc Programme"

The evaluation of courses and lecturers of the MSc Programme is conducted by the postgraduate students through questionnaires, and it takes place between the 11th week of teaching and the end of each semester's courses. The questionnaires mainly concern the quality and means of research and teaching, the structure and content of the studies, administrative services, and the infrastructure. Questionnaires are filled out electronically and anonymously.

The result of the questionnaires' processing is communicated to the respective lecturers after each course has been graded. The members of the Programme Studies Committee (PSC) and the Director are informed of the results for all courses. The PSC with the aim to improve the quality of the curriculum has the authority to modify the content of the questionnaires and also to request additional or alternative means of evaluation by the postgraduate students or even by the graduates of the MSc Programme.

Article 32
"Postgraduate Diploma Thesis"

The undertaking of a Postgraduate Diploma Thesis (PDT) is carried out during the third semester of studies, provided that the postgraduate student has successfully completed 80% of the required ten (10) courses by that point.

The Programme Studies Committee (PSC), upon the student's application, which includes the proposed title of the thesis, the suggested supervisor, and an abstract of the thesis, appoints the supervisor and forms the three-member Examination Committee for its approval. The Examination Committee consists of the supervisor and members of the same discipline as the thesis' objective; these members may also come from other Schools or Institutions. The list of approved

postgraduate theses, as determined by the examination committee, is published on the official website of the Postgraduate Programme.

The PDT is to be written in English. The guidelines for writing and formatting the thesis text are determined by the Programme Studies Committee. Additionally, The thesis must include an extensive abstract in both Greek and English.

Following the presentation and examination of the thesis, postgraduate students are obligated to submit online their thesis to the Central Library of the National Technical University of Athens.

The assessment of the Postgraduate Thesis is conducted by the three-member examination committee using uniform criteria established by the PSC. The passing grade for the thesis is 5.5 on a 0-10 scale and it may include fractional parts.

Article 33
"Graduation – Master's Degree"

For the Postgraduate Studies Diploma – Master of Science to be awarded, a cumulative grade in both postgraduate courses and the Postgraduate Diploma Thesis as well as a total of 90 ECTS credits are required, according to the Programme's academic requirements.

The overall grade of the MSc is derived as the weighted average of the grades of the postgraduate courses and the postgraduate thesis, where the latter is considered equivalent to the teaching units of one (1) semester of courses (Sum of grades of ten (10) courses and five times the grade of the postgraduate thesis divided by 15).

In case the student succeeds in more than 10 courses, then the ones with the highest mark are counted for the overall Diploma grade, provided that the requirements specified in the programme of studies are met. If mandatory courses have been assigned to the student, they are counted for the overall grade even if they are not the ones with the highest mark.

To qualify as graduates, students are required to provide the Programme's Secretariat with the following documents: a) Certificates from the Library of NTUA confirming: i) the online submission of the postgraduate diploma thesis and ii) the absence of any outstanding obligation, b) A copy of the cover page of the postgraduate diploma thesis and, c) An abstract both in greek and in english of the Postgraduate Diploma Thesis.

The MSc programme "Analysis and Design of Structures" has three graduation periods: February, June, and October. Annually, the Secretariat of the MSc programme compiles a list of graduates who have successfully completed all the requirements of the Programme, and a special diploma award ceremony is organized upon invitation by the Coordinating School.

ANNEX A

SPECIALIZATION A: STRUCTURAL ENGINEERING

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
101. Advanced Concrete Technology	C.E.	3	6	WINTER
Introduction : Concrete materials, Cement, types and production methods. Selection of the cement. Aggregates properties and their influence on concrete performance. Water, additive materials, admixtures. Fresh concrete. Strength (Compressive, tensile) resistance to cyclic loading, fatigue, strength under uniaxial, biaxial and triaxial loading. Factors affecting the strength of concrete. Durability of concrete and design, Corrosion of reinforcement, Service life of RC structures. Shrinkange, Elasticity, Creep. High performance concrete. Mixing, transportation, casting, compaction, curing. Special concretes. In lab and in situ quality control. Concrete standards and regulations.				
102. Design Models for Aseismic Repair and Strengthening	C.E.	3	6	WINTER
Short historical review / Inspection / Measurements / Assessment of available bearing capacity/ The logic of the intervention-categories and criteria/ Design actions and partial safety factors/ Constitutive laws of force transfer mechanisms across interfaces (Triaxial compression, Friction, Pullout, Dowel action)/Shear capacity of interfaces/ The target of redesign (performance levels and critical behavior values)/Available plastic rotation/ Theory and redesign applications (using steel or FRPs): Increase of bending capacity/increase of shear capacity/inadequate overlap length/increase of local ductility/infill shear walls/new shear walls.				
103. Design of Steel Buildings	C.E.	3	6	WINTER
Design of singly story steel buildings, Design of singly story steel buildings, Dissipative Structural systems for Seismic Resistance, Loads on Buildings				
104. Recent Advances in RC Design Models	C.E.	3	6	WINTER
Concrete behaviour: Strength, stress-strain behaviour under short-term loading, cracking, failure mechanism. Behaviour of structural concrete elements: Modes of failure, causes of failure, physical model of element behaviour. Design of structural concrete elements: Compressive force path method, earthquake-resistant design, application of the method for the design of beams, columns, structural walls, slabs, frames, etc.				
105. Reliability of Structures	C.E.	3	6	WINTER
Introduction, probabilistic vs deterministic design of structures. Basic notions on probabilities. Central limit theorem. Distributions. Estimation of parameters. Maximum likelihood. Transformations. Regression analysis. Return period. Monte Carlo simulation (independent and correlated variables). Probabilistic models of resistances. Probabilistic models of actions (wind, snow, earthquake, self-weight). Combination of actions. Time varying actions, fatigue. Stochastic processes. Probability of failure, Level II method. Safety index. Reliability of serial and parallel systems. Bayes theorem, updating prior information reliability of existing structures. Code format, partial safety factors. Probabilistic design of special structures. Conformity criteria.				
106. Steel Structures for Marine Applications	C.E.	3	6	WINTER
The course introducing the students to issues pertaining to the behavior, analysis and design of marine and offshore structures, with emphasis on steel structures. The course covers issues of configuration of structural systems for various types of steel structures for marine				

applications (jetties for loading/unloading, offshore platforms, offshore wind turbines), optimum member sections, types of connections between members, relation between selection of structural system and method of erection, numerical modeling issues (software selection, types of elements, mesh density, modeling of connections), analysis methods (static vs. dynamic, linear vs. nonlinear, interpretation of results), dimensioning (concept of limit state design verifications, design criteria, failure criteria, member verifications, buckling lengths, connection verifications,fatigue), construction drawings (general layout, assembly, part and erection drawings).				
107. Advanced Mechanics of Masonry	AMPS	3	6	SPRING
Technology of old and modern masonry. Behaviour of masonry in compression, in tension, in shear (Out-of-plane) Buckling and bending of plain, confined and reinforced masonry The Mechanics of tie-beams (timber or RC) Behaviour of interfaces within masonry. Mechanisms of load transfer (friction between mortar and stone or brick, pullout/push-in, dowel action) Methods of analysis of masonry structures In situ assessment of mechanical properties of historic masonry Pathology of masonry structures Assessment of residual properties of masonry Intervention materials and techniques Design and redesign models for masonry				
108. Design of Cable and Membrane Structures	C.E.	3	6	SPRING
The course introducing the students to issues pertaining to the behavior, analysis and design of tension structures. The objectives of the course are multiple: (a) to understand the peculiarities of behavior and analysis of such structures, due to their lack of compressive, shear and bending stiffness, and their resulting flexibility to transverse loads, which leads them to nonlinear behavior, (b) to present their significant advantages for covering large spans, either in roofs or in bridges, (c) to address technological issues regarding their materials of construction, connections, the importance and ways of application of pretension and the erection methods, and (d) to be introduced to design methods of structures including cables and membranes: individual cables, guyed towers, suspended and cable-stayed bridges, cable roofs, cable nets, prestressed and air-supported membranes.				
109. Design of Technical Projects II	C.E.	3	6	SPRING
Planning of development projects. Procedures for design, construction, and supervision. Total quality and environmental planning. Bridge axis alignment, selection, and arrangement of spans. Structural morphology and systems of concrete and steel bridges. Design actions in highway, railway, and pedestrian bridges. Cable suspended bridges, aerodynamic considerations. Special topics on steel bridges (Orthotropic deck, Fatigue etc.). Bearing and expansion joints. Design of bridge piers and abutments, protection against scouring. Design methods of concrete bridges (slab bridges, T-beam girders, box girders). Aseismic design of bridges. Design for environmental effects. Modern construction methods.				
110. Information Systems in Construction Management	C.E.	3	6	SPRING
Overview of information systems in construction management. Review of construction management as an information processing system (techniques, procedures, Books of Knowledge (BoKs), Contract types). Review of time scheduling methodologies (MPM, linear methods, simulation, critical chain, monte carlo), Use of commercial systems (Primavera, MS-Project, Excel, 4D systems). Information Systems Analysis and Design Techniques (Data bases, Systems Analysis, Systems Design). IT & telecommunications applications in construction management (PDA's, wearable computers, wireless & satellite networks, project websites, e-site, e-construction, document				

control systems).				
111. Engineering Materials	MME	3	6	SPRING
Classes of materials: Metals and alloys, ceramics, polymers and composite materials. Technological evolution and trends, properties and cost comparison, main applications. Structure-properties relationships: Nature of chemical bonding, crystal structure and imperfections, dislocations. Solidification of metals. Mechanical properties and their dependence on the microstructure. Hardness, tensile strength, ductility, toughness, strain hardening, recovery and recrystallization. Fracture mechanisms, elements of fractography. Impact strength, transition from ductile to brittle fracture. Other properties: Fatigue and fretting fatigue. Creep. Wear resistance. Corrosion and high temperature oxidation. Protection against corrosion (coatings, anodic and cathodic protection). Study of some common alloys: Iron and steel, cast iron, aluminium and light alloys, copper alloys. Production and processing methods and their relation to mechanical properties: Casting, hot and cold forming, powder metallurgy. Defects, inclusions, texture and anisotropy. Welding: Welding methods, welding joints, welding defects and non destructive methods. Construction steels: Plain carbon and low-alloy steels. High elastic limit steels, dual phase steels, controlled rolling and microalloyed steels. Stainless steels. Steels for low temperature applications. Reinforced concrete steels: Types and relevant mechanical properties. Resistance to high temperatures. Weldability and welding techniques.				

SPECIALIZATION B: ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
201. Nonlinear Analysis of Frame Structures and Applications in Seismic Engineering	C.E.	3	6	WINTER
1st Part: Introduction – algorithms for solving non-linear problems Introduction and types of non-linear problems, Introduction to algorithms for solving non-linear problems (full and modified Newton-Raphson method, method failures), Non-linear methods for exceeding limit points (pure incremental solution, displacement control, arc-length), Solvers and structure of a non-linear analysis code. 2nd Part: Geometric non-linearity Geometrically non-linear mesh element Kinematic relations of a beam in the plane (corotational theory) Geometrically non-linear beam element Application to solving buckling problems of structures. 3rd Part: Introduction to material non-linearity Introduction to non-linear simulations for the inelastic analysis of structures Comparison of the step-by-step method with the Newton-Raphson method Uniaxial constitutive laws in terms of stress-strains (σ-ε): (a) bilinear s-e relation, (b) kinematic, isotropic and mixed hardening, (c) constitutive relations for steel and concrete Phenomenological simulations in terms of torque-rotation (M-ϕ) (Clough-Johnston, Takeda models, stiffness and strength reduction) Cross-sectional analysis: (a) moment-axial interaction plots, (b) curvature moment plots Lumped plasticity Fiber elements displacement & force elements Spatial frames - torsion				

Simulation of shear Simulation of diaphragm 4th unit: Non-linear dynamic analysis and applications The Newmark method for nonlinear dynamic problems The mass matrix (lumped, consistent mass matrix) Formulation of damping matrix (The problem of spurious moments in the case of models of concentrated plasticity). Convergence and accuracy of non-linear dynamic problems Non-linear dynamic analysis using seismic records.				
202. Novel Methods for Seismic Isolation and Response Control of Structures	C.E.	3	6	WINTER
1. Introduction to seismic isolation (recap from UG course) Development of Seismic Isolation Worldwide. Theoretical Basis of Seismic Isolation. Seismic response of Seismic Isolated Hospitals during the Feb. 6th, 2023 Turkey earthquake sequence. 2. Isolation System Components (recap from UG course) Mechanical Characteristics and Numerical Modeling of Isolators. Advanced FEM aspects. Software example: Seismostruct 3. Code Provisions for Seismic Isolation. Review of new generation North America, Asian and European Seismic Codes. 4. Ground Motion Selection for Seismically Isolated systems Design Earthquake Ground Motion Selection and Scaling for SI 5. Design of a new SI building Worked Example: Stavros Niarchos Foundation complex (Library and Opera buildings) 6. Design of a SI bridge Worked example: Egnatia Highway overpass 7. Redesign and seismic upgrade of existing R/C buildings with SI. Worked example: Multi-storey R/C building including cost/benefit comparison with conventional redesign 8. Redesign and seismic upgrade of existing URM buildings with SI. Worked Example: Rehabilitation of the Theological School of Chalki using multiple layer SI 9. Geotechnical and Low-Cost Seismic Isolation methods for low-income regions. Worked Example: A school building in Nepal founded on PVC-sand-PVC sliding foundation system 10. In class tutorial 11. Novel control methods Novel passive, semi-active, active and hybrid mass dampers for buildings in seismic regions. Limitations of control systems. 12. Coupled seismic isolation and control systems Coupled systems of geotechnical seismic isolation and active damping. Case study: Rion-Antirion bridge 13. Use of TMDs in seismic regions Tuned mass damper inerter systems for control of buildings subjected to earthquake ground motions. Challenges and limitations.				
203. Signal Processing in Earthquake Engineering	C.E.	3	6	WINTER
The course consists of three parts. 1) Introduction to signal analysis. Autocorrelation and crosscorrelation. Analysis in the frequency domain, Fourier transform and power spectra. Wavelet theory and applications. Transfer functions. 2) Ground motion time histories, analysis, correction and filtering. Intensity measures, energy and pulse-like content. Signal rotation for the extraction of mean values and directivity azimuth. Synthetic and semisynthetic				

accelerograms. 3) Characteristics of structural dynamic response time histories. Elastic and inelastic response of single degree of freedom systems. Deterministic methods for the evaluation of structural dynamic characteristics and their transformation. Application of wavelets. Design based evaluation. Probabilistic methods based on fragility curves. Homework problems including a small project based on the analysis of structural response time histories under severe ground motion are used to cover all topics.				
204. Engineering Seismology	C.E.	3	6	SPRING
The lesson of Engineering Seismology presents the following subjects dealing with the estimation of earthquake hazard and loss assessment. Presentation of regional seismicity, fault description and earthquake source mechanism. Characteristics and effects of near field ground motions. New generation attenuation relationships. Evaluation of seismic hazard. Site effects on ground motion. Artificial accelerograms and simulation of near field pulses. Selection of seismic records for design. Review of earthquake loss assessment methods. Presentation of loss assessment HAZUS methodology. Displacement based loss assessment methods.				
205. Experimental Earthquake Engineering	C.E.	3	6	SPRING
Accelerometers, Electromechanometers, Other sensors, Data collection systems, Experiments in scale structures, Experiments using the seismic simulator, experiments with the pseudodynamic method, Analysis of recordings a) in the time domain, b) in the frequency domain, Measurements of dynamic characteristics of buildings.				
206. Pathology and Design of Structures under Seismic Action	C.E.	3	6	SPRING
Typical damage to structures from earthquakes and their interpretation. Correlating them with the seismic motion-excitation and the characteristics of the structure. Analysis of the function of the basic structural elements and structural members according to the materials composed of. Correlation of the function of these elements with damping and stiffness. Influence of the position and function of the various members on the final seismic behavior of the structures. Criteria for selecting position, type and operation of the various structural members. Simulation of structures, depending on the material, the function of the member and the geometry of the structure.				
207. Special Topics in Earthquake Engineering	C.E.	3	6	SPRING
Principles of seismic design of special structures (e.g. bridges, tanks, dams). Criteria for the selection of the appropriate structural model. Displacement based seismic design. Dynamic soil-structure interaction / methods of analysis and applications. Dynamic structure-water interaction / methods of analysis and applications to representative systems (dams, tanks). Principles of seismic design of structures with base isolation / applications. Seismic assessment of existing structures. Retrofit and strengthening of structures / methods of analysis and applications.				
208. Structural Intervention on Cultural Heritage Structures	C.E.	3	6	SPRING
1. Masonry monuments (dry connection) This type of monuments include classical-Hellenistic monuments (temples, towers, fortifications, etc.) as well as some prehistoric ones (the most emblematic vaulted tombs), Ottoman (minarets) or more recent ones (parts of				

monuments, e.g. porches, as well as burial monuments). This module spans 4-5 lessons and includes:
(a) Typology, structural analysis and routine pathology;
(b) Theoretical approach to structural behavior, methods of analysis, controls etc.,
(c) Planning and dimensioning interventions with reference to principles and regulatory framework, and
(d) Examples of analyzes and interventions.
2. Masonry monuments (with mortars)
This type of monuments includes Roman, Byzantine, post-Byzantine, Ottoman and newer monuments. This module spans 6-7 lessons and includes:
(a) Typology of common and special structures, analysis, common pathology and reference to the principles and regulatory framework (materials and typical structures, causes and development of damage, categorization of structures, institutional framework and legislation),
(b) Methods of investigating an existing situation;
(c) Theoretical approach to structural behavior, simulation and analysis methods (masonry mechanics, simulation methods and linear analysis methods, inelastic static analysis, local mechanisms),
(d) Planning and dimensioning of interventions,
(e) Examples of analyzes and interventions.
3. Supporting lectures (1 or 2 lectures)
(a) Protection of monuments in practice, in the context of the Archaeological Service and the Ministry of the Interior: history of the protection, preservation and restoration of monuments in Greece,
(b) Building materials, materials of historical constructions and repair materials (reference to stones & bricks, emphasis on mortars & grouts): brief historical review, methods of analysis and characterization of materials, pathology, determination of repair and reinforcement material requirements (performances), design.
4. Guest speaker lecture
It will concern various relevant topics related to the protection of monuments, such as: archaeology, material science, modern methods of recording, security of museum exhibits, etc. In this way, students will obtain an overview on the expertise of other specialties involved in the protection of monuments and archaeological sites.

GEOTECHNICAL COURSES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
301. Computational Geomechanics	C.E.	3	6	WINTER
1. Introduction to plasticity. Yield function, plastic potential, loading/unloading. 2. The Tresca and von Mises models and their application in modelling undrained clay. 3. The Mohr-Coulomb and Drucker-Prager models, and their application in modelling drained soil behaviour. 4. Integration of the constitutive relations. 5. The concept of critical state. Modified Cam-Clay and its application in modelling soil behaviour. 6. Formulation and solution of seepage problems using finite element analysis. 7. Formulation and solution of transient, coupled pore pressure-deformation (consolidation) problems using finite element analysis.				
302. Geotechnical Engineering in the Design of Structures	C.E.	3	6	WINTER
The topics of seepage, compression and consolidation are examined briefly and are related to engineering practice and to current research work. By using an extended case study of the Tower of Pisa as a theme, the concepts can be applied to different soils and the long-term settlement of soil can be assessed. The major challenges facing designers of multi-propped deep excavations, particularly in crowded urban areas are examined. Embedded retaining walls such as secant bored pile walls and diaphragm walls used in the construction of deep sections of retained cuttings and cut-and-cover tunnels in road schemes and excavations in urban cities are				

studied with emphasis on the stress transfer and deformation mechanisms around diaphragm walls. The study of retaining systems is extended to include reinforced soil retaining walls and/or steepened embankments, as a relatively new cost effective method of construction which reduces embankment width and land-take and is environmentally acceptable. The classic preliminary design methods, including Eurocode 7, are presented both for retaining walls and reinforced soil. By using case studies (e.g. Egnatia Motorway) the Codes of practice are applied through analytical programs. The earthquake loading is assessed for conventional retaining walls, reinforced soil walls and bridge abutments.				
303. Ground Investigation Methods	C.E.	3	6	WINTER
General principles and methods of ground investigation. Geological maps and sections. Interpretation of aerial photographs. Sampling drilling for geotechnical purposes, description of samples, preparation of geotechnical sections. In-situ tests for geotechnical purposes (cross-hole, permeability, standard penetration, static penetration, determination of in-situ stresses, direct shear, pressometer and dilatometer tests). Geotechnical monitoring methods for the design and construction of civil engineering works. Fundamentals of the geophysical methods (seismic, electrical and other) with applications in the design and construction of engineering projects.				
304. Computational Methods in the Analysis of Underground Structures	C.E.	3	6	SPRING
Elasto-plastic stress and deformation analysis around circular tunnels. Derivation of elasto-plastic convergence-confinement curves. Analysis of tunnel end-effects (Panet curves). Principles of numerical methods for the analysis of underground structures (modeling of the 3-D problem in 2-D) - rockmass loosening methods (methods of deconfinement and stiffness reduction). Numerical analyses of the excavation and temporary support (staged excavation, temporary support measures) using Finite Element programs (application using the computer program RS2). Analysis of the loading on the permanent support of tunnels. Analysis of face stability and face reinforcement techniques.				
305. Seismic Design of Surface and Underground Geotechnical Structures	C.E.	3	6	SPRING
This post-graduate course has the following themes: 1. Introduction to Geotechnical Earthquake Engineering. Basic elements of engineering seismology, with emphasis on strong ground motion. 2. Single degree of freedom structural vibration with base excitation, elastic response spectra. 3. Seismic wave (P, S, Rayleigh, Love) propagation in homogeneous and inhomogeneous soil. 4. Seismic design of underground tunnels and pipelines against seismic waves and permanent ground displacements. 5. Soil amplification (or de-amplification) of seismic ground motion with analytical and numerical methods. Practice with dedicated software. 6. Seismic design of retaining walls with the Mononobe-Okabe method (pseudo-static design) and with Richards-Elms (allowable displacements), 7. Topography effects and seismic design of soil and rock slopes. 8. Liquefaction, with emphasis on assessment methods and on its effects on Civil Engineering works. Description of ground improvement methods and methods for mitigating the effects of liquefaction.				

ANALYSIS COURSES

COURSES	SCHOOL	HOURS /WEEK	ECTS	SEMESTER
401. Advanced Plastic Analysis of Framed Structures	C.E.	3	6	WINTER
Introduction to the plastic design of structures. Redistribution of forces. Ductility. Relation with the Codes of				

Practice. Step-by-step 1st order elastoplastic analysis of frames. Principle of virtual work. Lower and upper bound theorems of plastic collapse. Safe moment distribution. Collapse mechanisms. Holonomic and non-holonomic behaviour. Mathematical programming. Kuhn-Tucker conditions. Linear programming. Simplex method. Mesh and nodal description. Static-kinematic duality. Flow rule. Stable materials. Rigid plastic behaviour. Alternative linear programs of limit analysis. Uniqueness of limit load. Automatic limit load evaluation. Optimal plastic design. Automatic optimal plastic design using linear programming. Variable loading. Alternating plasticity. Incremental collapse. Shakedown. Residual stress. Melan's theorem. Mesh-unsafe shakedown linear program and automatic shakedown load evaluation. Relation between limit and shakedown load. Elastoplastic analysis with 2nd order effects. Large displacements. Geometric non-linear elasto-plastic stiffness matrix. Arc-length method. Comparison of limit loads with and without 2nd order effects. Merchant-Rankine formula. Inelastic dynamic analysis of MDOF systems. Seismic response of buildings. Ductility ratios. Pounding of buildings. Reference to approximate static methods (pushover, etc.). Practice with commercial packages (SAP, Abaqus, etc.).
Scope
The course aims to the in-depth understanding of the inelastic behaviour of framed structures since plasticity is the basis of all today's Codes of Practice. Emphasis is also put on the mathematical framework and the computational techniques of plastic analysis. In this way the course addresses both the practicing engineer and the researcher.

402. Advanced Structural Dynamics	C.E.	3	6	WINTER

Dynamic loads and dynamic models of structures. Methods of derivation of equations of motions for structural systems (Equilibrium of forces, principle of virtual displacements, Hamilton's, principle, Langrage equations). Damping (viscous, Coulomb, structural). Discretization of continuous systems. Free and forced vibrations of SDOF systems. The finite element method for beam structures. (plane and space trusses and frames). Rigid bodies in elastic structures. Axial constraints. Free vibrations of MDOF systems. Modal damping, proportional damping. Numerical evaluation of eigenfrequencies and mode shapes. Partially restrained structures. Forced vibrations of MDOF systems. The method of modal superposition. Modal participation, static correction method. Reduction of degrees of freedom (kinematic constraints, Ritz vectors). Support excitation. Response spectrum analysis (ABSSUM, CQC, SRSS). Nonlinear response of structures Numerical solution of the equations of motion in time domain. Dynamic analysis of multi-storey buildings. Base isolation. Applications to civil engineering structures.

403. Applied Structural Analysis of Framed and Shell Structures	C.E.	3	6	WINTER

The displacement vector of a particle of a body. Components of strain of a particle of a body. Implications of the assumption of small deformation. Traction and components of stress acting on a plane of a particle of a body. Proof of the tensorial property of the components of stress. Properties of the strain and stress tensors. Components of displacements for a general rigid body motion of a particle. The compatibility equations. Equations of equilibrium. Stress-strain relations. Formulation and solution of boundary value problems using the linear theory of elasticity. The principle of Saint-Venant. Prismatic bodies subjected to pure tension. Prismatic bodies subjected to pure bending. Plane stain and plane stress problems in elasticity. Fundamental assumptions of the theories of mechanics of materials for line members. Internal actions on a cross-section of line members. The boundary value problems in the theories of mechanics of materials for line members. The boundary value problem for computing the axial component of translation and the internal force in a member made from an isotropic linearly elastic material subjected to axial centroidal forces and to a uniform change in temperature. The boundary value problem for computing the angle of twist and the internal torsional moment in members made from an isotropic linearly elastic material subjected to torsional moments. Primary and secondary warping functions. Warping normal stresses. The classical theory of beams. Solution of the boundary value problem for computing the transverse components of translation and the internal actions in prismatic beams made from isotropic linearly elastic material. The Timoshenko theory of beams. A displacement and a stress function solution to transverse shear loading of beams. Computation of the shearing components of stress in beams subjected to

bending without twisting. Shear center. Theory of plates. Buckling of elastic structures. Nonlinear theory of elasticity.				
404. Design of Technical Projects I	C.E.	3	6	WINTER
Presentation of major bridge projects. Design principles, methods of construction. Design of bridges. Static and dynamic models of bridge structures. Slab and continuous body structures. Static and dynamic models of bridge structures. Slab and beam structures, box shaped bridges. The grid model for the analysis of bridge structures. Support of bridge structures and its modelling. Oblique and curved bridges. Torsional parameters of elements for the analysis of framed structures. Introduction to thin walled beams. Comparison between open and closed sections. Analysis of warping due to torsion. Stress state due to the warping restrain. The concept of bimoment and its relation to the stress state. The basic equation of torsional behavior and its practical treatment through the analogy with the laterally loaded tensioned beam. Box-girder bridges. Rectilinear girders under eccentric traffic loading. Stress-state due to the deformability of cross-section profile under eccentric loading. Curved box-girders in bridge design. Determination of longitudinal bending and torsional state-of-stress. Lateral response of section walls. Influence of prestressing on the curved girders of bridges. Reducing the torsional response through prestressing.				
405. Theory of Shells	C.E.	3	6	WINTER
Introduction to shell structures. An historical overview. Basic elements of differential geometry. Space curves, parametric representation. Surfaces as grid of families of space curves. First fundamental form. Applications. Assumptions of thin shell theories. Stress resultants per unit length. Equilibrium Equations. The general initial and boundary value problem of theory of shells. Statical indeterminacy of the general problem. Membrane theory assumptions. Cylindrical shells. General solution for the statically determinate problem. Strains and displacements. Applications. Use of symbolic language i.e. Maple or Mathematica for the solution of cylindrical shells for various loading cases and support conditions. Membrane theory of conical shells. Equilibrium equations. General solution. Applications. Use of symbolic language i.e. Maple or Mathematica for the solution of conical shells for various loading cases and support conditions. Membrane theory of Shells of revolution. Equilibrium equations. General solution for axisymmetric loading cases. Spherical Shell. Hyperbolic shells. Applications for open or closed spherical shells. Shells of revolution for arbitrary loading. Fourier series solution, symmetric and antisymmetric cases. Differential geometry notion of curvature. Second fundamental form. Gauss-Godazzi conditions. Bending theory of cylindrical shells. Axisymmetric loading. Beam on elastic foundation type of solution. Donnell theory. Applications for cylindrical shells with different boundary conditions. Comparison with numerical solutions with finite element method. Design provisions of Eurocode 3 for steel thin shell structures.				
406. Mechanics of a Continuous Medium	AMPS	3	6	WINTER
Tensor analysis. The Rayleigh transport theorem. The deformation gradient. The polar decomposition theorem. Rotations and stretches. Lagrangian and Eulerian description of deformation metrics. Mass conservation. Conservation of linear momentum. Conservation of angular momentum. The stress tensors: Cauchy, 1st and 2nd Piola-Kirchhoff. Objective deformation measures. The velocity gradient tensor. Decomposition to strain rate and spin. Principal stretches and principal directions. Invariants of symmetric tensors. Orthogonal tensors. Equilibrium equations and the Virtual Work theorem. Constitutive equations in elasticity and fluid mechanics. Anisotropy. Hyperelasticity. Internal constrains: incompressibility, inextensibility. The first thermodynamic theorem. The second thermodynamic theorem. Objective stress rates. Objective deformation rates. Mechanical power and work conjugate stresses and deformation tensors. Jump conditions and discontinuities. Problems of large deformation elasticity. Problems of fluid mechanics.				

407. Machine Learning	ECE	3	6	WINTER
Neural network models (Perceptron, multilayer backpropagation NDs, radial basis function NDs, feedback NDs, self-organizing neural networks). Neural learning. Use of neural networks in function approximation / visualization, identification of static and dynamic systems and automatic control. Fuzzy sets and fuzzy logic. Unclear reasoning. Fuzzy relational equations. Use of fuzzy logic and reasoning in decision making and systems identification / control. Neurofuzzy systems. Special applications of neural and fuzzy systems in building and construction problems.				
408. Boundary Elements	C.E.	3	6	SPRING
Introduction. Boundary Elements and Finite Elements. Historical development of the BEM. Preliminary Mathematical Concepts. The Gauss-Green theorem. The divergence theorem of Gauss. Green's second identity. The Dirac delta function. The BEM for Potential Problems in Two Dimensions. Fundamental solution. The direct BEM for the Laplace and the Poisson equation. Transformation of the domain integrals to boundary integrals. The BEM for potential problems in anisotropic bodies. Numerical Implementation of the BEM. The BEM with constant boundary elements. The Dual Reciprocity Method for Poisson's equation. Computer program for solving the Laplace equation with constant boundary elements. Domains with multiple boundaries. The method of subdomains. Boundary Element Technology. Linear elements. Higher order elements. Near-singular integrals. Applications. Torsion of non-circular bars. Deflection of elastic membranes. Bending of simply supported plates. Heat transfer problems. Fluid flow problems. The BEM for Two-Dimensional Elastostatic Problems. Equations of plane elasticity. Betti's reciprocal identity. Fundamental solution. Integral representation of the solution. Boundary integral equations. Numerical solution of the boundary integral equations. Body forces. Computer program for solving the plane elastostatic problem with constant boundary elements. Applications.				
409. Load-carrying Behavior and Design of Structural Systems	C.E.	3	6	SPRING
Structural behavior and design of steel and reinforced concrete beams Structural behavior and design of prestressed concrete beams.The treatment of prestressing Structural behavior of one-story and multistory frames. Gravity loads, Horizontal loads, Lateral stiffness. Juxtaposition of shearing and bending behavior. The influence of deformations on the structural behavior of beams (Second order theory) The influence of deformations on the structural behavior of frames (Second order theory) Structural behavior and design of arches and arch-beam systems Load-carrying behavior and design of cable prestressed structures Main characteristics of the structural behavior of grids Specific topics on the structural action, behavior and design of reinforced and prestressed concrete slabs				
410. Μη γραμμικά Πεπερασμένα Στοιχεία	C.E.	3	6	SPRING
Issues of continuum mechanics and basic tensor analysis. Introduction to nonlinear analysis. Incremental equations of motion, Green Lagrange strain tensor. Cauchy stress tensor, Piola Kirchhoff stresses, Incremental total and updated Lagrangian formulations. Principle of Virtual work in a non-linear setting. Linearization of non-linear equations of motion and incremental - iterative solution methods. Newton-Raphson algorithm. Path following techniques. Arc-Length. Geometric Non linearity. Finite element method for geometric non – linear problems: Truss and Cable elements, Plane Strain and plane stress elements, Three-dimensional solid elements, Structural elements: beam and general shell elements. Material nonlinearity. Problem statement. Elastoplastic problem in one dimension. Isotropic and Kinematic Hardening. J2 Plasticity. Deviatoric stress. Deviatoric strain. Yield surface. Von Mises & Tresca Yield criteria. Drucker's postulate. Maximum dissipation principle. Associated and non-associated flow rules. Perfect plasticity. Radial return algorithm. Algorithms for isotropic, kinematic and combined hardening. Algorithmic tangent operator. Finite element method for materially nonlinear problems.				

Implementation using MSOLVE and Commercial Software.				
411. Stochastic Finite Elements	C.E.	3	6	SPRING
Scope: The course aims at the investigation of the effect of uncertain parameters (material and geometric properties, loading) on structural response variability. Introduction: Random variables, cumulative distribution function, probability density function, statistical moments (mean value, variance, skewness and kurtosis), covariance. Stochastic processes and fields: Definition, stationary stochastic processes, ergodicity, analysis in the frequency domain-Fourier transform: autocorrelation and spectral density functions, Gaussian stochastic processes. Representation/discretization of stochastic processes and fields using (i) Point discretization methods: midpoint, integration and nodal point methods (ii) Average discretization methods: local average and weighted integral methods (iii) Spectral representation method: simulation of stationary Gaussian stochastic processes and fields. Formulation and solution of the stochastic problem: Stochastic virtual work principle, formulation of the stochastic stiffness matrix using the local average and weighted integral methods, solution by Taylor, Neumann series expansion and by Monte Carlo simulation. Applications: Computer applications on framed structures and 2D elasticity problems: investigation of the effect of several stochastic field parameters (probability distribution, correlation length and autocorrelation function) on structural response variability.				
412. Structural Optimization	C.E.	3	6	SPRING
Basic concepts. Design variables, objectives and constraints. Optimal sizing, shape and topology design problems for skeletal and 2D structures. Continuous and discrete optimal design problems. Methods of mathematical programming. Linear programming problem, simplex method and interior point methods. Nonlinear programming. Approximate methods of solution. Duality principle. Optimality criteria methods, fully stresses design and redesign formulas. Applications with Excel, Fortran and Matlab. Sensitivity analysis, approximate methods. Accuracy and reliability of sensitivity analysis methods. Sensitivity analysis of skeletal and 2D structures analyzed with the finite element method. Direct method of sensitivity analysis. Adjoint method. Applications by using the finite element method computer program NASTRAN. Discrete optimization problems. Some basic problems of integer programming. Dynamic programming, simple applications. Genetic algorithms- evolutionary optimization algorithms. Applications to structural design problems.				
413. Applied Elasticity	AMPS	3	6	SPRING
Elements of Tensor Analysis. Traction. Stress Tensor. Balance Laws. Equations of Motion and Equations of Equilibrium. Symmetry of Stress Tensor. Strains and Rotations. Equations of Compatibility. Constitutive Elasticity Equations. Strain Energy. Generalized Hooke's Law. Anisotropy – Isotropy. Navier-Cauchy Equations and Beltrami-Michell Equations. Boundary Conditions. Boundary Value Problems. Two-Dimensional Problems. Plane Strain and Plane Stress. Airy's Stress Function. Exact Theory of Torsion. Prandtl's Stress Function. Stress-Concentration Problems. Williams' Technique. Self-Similar Problems. Flamant-Boussinesq and Kelvin Problems. Contact Problems. Energy Theorems and Methods. Uniqueness Theorem. Principle of Superposition. Rayleigh-Ritz Method. Several Generalizations. Elasticity and Thermodynamics. Wave Propagation. Viscoelasticity. Thermoelasticity. Elements of Fracture Mechanics. Griffith's Theory – Applications in the Design of Structures.				
414. Plasticity and Fracture of Materials	AMPS	3	6	SPRING
A. Plasticity of Materials A.1 Introduction A.2 Limit analysis - reminders A.3 Absolutely solid-perfect plastic body A.4 Elastoplastic analysis A.5 Rate effects A.6 Special issues				

A.7 Thermodynamics
A.9 Large plastic deformation and rotation
A.8 Cyclic plasticity and low cycle fatigue
B. Breakage of Materials
B.1 Small and large cracks
B.2 Crack analysis with linear elasticity
B.3 Analysis of cracks with nonlinear elasticity and plasticity
B.4 Diffuse micro-cracking and damage parameter