

Institute of Earthquake Engineering and Engineering Seismology
"Ss Cyril and Methodius" University, Skopje

IZIIS - CENTER OF EXCELLENCE

Education Program - I

NEW IZIIS' EDUCATION CURRICULUM
OF
POST-GRADUATE (MASTER) STUDIES

Skopje, 2007

1. OBJECTIVES OF THE IZIIS' MASTER STUDIES

The study of the recent scientific achievements in the field of modern civil engineering and particularly structural engineering and earthquake engineering with engineering seismology as key disciplines represents the main prerequisite for adequate practical improvement and permanent development of several main and/or essential industrial sectors.

Almost all the countries in Southeast Europe and a large number of countries in Europe and worldwide are located in seismically active regions that, with their permanent and high seismic activity, represent the most serious source of heavy natural catastrophes.

The moment of occurrence of earthquakes can still not be predicted, but due to the increasing urbanization of a large number of regions worldwide, the earthquakes represent today the most serious and the largest natural catastrophes. The annual average loss of human lives amounted to several tens of thousands according to the existing statistic data from the XX century. In most of the cases, the extraordinarily huge losses of material property has caused heavy economic and social impact on entire countries and regions.

From the stated reasons, in all the seismically vulnerable countries and regions in Europe and the World, it is necessary to undertake urgent and adequate measures for the purpose of minimizing the consequences of seismic effects in future. One of the most effective approaches is undertaking of national scientifically based integral technical and organizational measures for minimizing of both direct and indirect losses due to future earthquakes.

To successfully effectuate the integral national strategy for minimization of earthquake consequences, the first, i.e., the main step is education of staff through organization of post-graduate master studies in specific fields as are modern structural and earthquake engineering, engineering seismology, geotechnical engineering, ecology and alike.

Due to the stated reasons, the post-graduate master studies that enable continuous training of corresponding necessary staff and experts are of an extraordinary importance and are socially and economically justified. In addition to their contribution to the advancement of the civil engineering in general, they will also continuously contribute to the development of the technology for minimization of earthquake catastrophes in future in both our country and beyond, in the seismically active regions in Europe and the World.

Therefore, the main purpose of the post-graduate master studies held at IZIIS is permanent education of adequate staff in the specific scientific fields not only in our country but also the other neighbouring and European countries as well as countries beyond. These wide international achievements will be realized through international exchange of students and involving own and world renowned experts in the process of permanent education. Through acceptance of foreign students and establishment of distributed post-graduate master studies abroad, a wide international positive contribution to the realization of the set out universal educational goals will be achieved. In the course of the same educational process, adequate compatibility of the proposed educative programme with similar programmes that are being realized in the developed countries worldwide (which have widely been accepted in the modern educative, development and applicative practice in the World) will be provided.

2. COVERED SCIENTIFIC FIELDS AND ACADEMIC TITLES

Generally, the post graduate master studies in R. Macedonia organized by the Institute of Earthquake Engineering and Engineering Seismology, Skopje are dispersed, if necessary, as independent or cooperative studies abroad or as studies for a joint degree in all the specific scientific fields in the domains of seismic construction, earthquake engineering and wider.

According to the curricula, the post-graduate lecturing in this phase will be organized permanently or cyclically in the following fields:

1. Structural engineering and seismic design (Programme – 1)

Upon completion of the master studies in this scientific field, the candidates will acquire the academic title of:

- Master of technical sciences in the scientific field of Structural Engineering and Seismic Design.

2. Earthquake Engineering (Programme – 2)

Upon completion of the master studies in this scientific field, the candidates will acquire the academic title of:

- Master of technical sciences in the scientific field of Earthquake Engineering

In future, the post-graduate lecturing process will be expanded in other directions in accordance with the needs of the country and worldwide.

2.1. Master Studies in the Scientific Field of Structural Engineering and Seismic Design

The main purpose of the master studies in structural engineering and seismic design is to enable education of candidates in the domain of structural engineering in the field of civil

engineering including study of recent methods of analysis, design and evaluation of structural systems exposed to the effect of general traditional and seismic loads as well as other specific types of static and dynamic loads. The studies are modulated in such a way that they cover a wide spectrum of specific disciplines in the field of structural engineering and seismic design. The programme enables coverage of structures of the type of buildings of different structural systems (reinforced concrete, steel, masonry, mixed etc.) as well as a large number of complex engineering structures of different categories (bridges, dams, special structures, infrastructure systems etc.). The programme involves lectures in the field of the most recent general numerical methods for analysis, expertise and design of structures as well as adequate basic education in the field of modern earthquake engineering.

The main educational goals of the master studies in the field of structural engineering are the following:

Production of professional experts capable of continuing their successful professional career in modern industry;

- Production of creative staff that will be able to continue their high education up to the academic title of doctor of technical sciences;
- Qualifying of candidates for creative and development-oriented design activities in the field of structural engineering and seismic design;
- Qualifying of candidates for performance of complex tasks in the field of design and technological improvement of stability and safety of different types of structural systems.

The programme of the post-graduate master studies in the field of structural engineering and seismic design that has been harmonized with the European Credit Transfer System (ECTS) is given in the corresponding tables (1a, 1b and 1c) shown in Appendix B1 (tables with a list of obligatory and optional subjects per semesters).

2.2. Master Studies in the Scientific Field of Earthquake Engineering

The main purpose of the master studies in earthquake engineering is to enable education of candidates in the domain of modern earthquake engineering. The candidates are qualified to apply the latest methods of design and construction of seismically safe structures. The studies are modulated such that they involve a wide spectrum of engineering structures of the type of buildings (reinforced concrete, steel, masonry buildings and alike) as well as complex engineering structures: bridges, dams, infrastructure systems, special structures and alike. The programme includes lectures in the field of modern earthquake engineering with a

special emphasis on modern theoretical concepts and numerical methods for seismic analysis and design of seismically safe structures.

The main educational goals of the master studies in the field of earthquake engineering are the following:

1. Production of professional experts in earthquake engineering capable of continuing their successful professional career in industry, public sector or nongovernmental organizations;
2. Production of creative staff in the field of earthquake engineering that will be capable of continuing their high education to the acquiring of the academic degree of doctor of technical sciences;
3. Qualification of candidates for creative and developmental design activity in the earthquake engineering field;
4. Qualification of candidates in realization of complex tasks in the field of design and improvement of the seismic stability and safety of different types of structural systems.

The programme of the postgraduate master studies in the field of earthquake engineering that has been harmonized with the European Credit Transfer System (ECTS) is given in tables 2a, 2b and 2c shown in Appendix B2 (tables containing the list of obligatory and optional subjects).

3. TIME DURATION OF THE STUDIES

To enable successful harmonization of the time duration of the post graduate master studies organized by IZIIS with the education criteria contained in the Bologna Declaration, it is anticipated that the master studies last three semesters.

The first two semesters are anticipated for attendance and passing of examinations in the anticipated subjects (obligatory and optional), whereas the last (the third) semester is anticipated for elaboration of an independent master thesis in accordance with the previously selected topic.

4. ENROLLMENT CONDITIONS

Candidates to be enrolled in the post graduate master studies should fulfill the following conditions:

They should have a completed corresponding degree of previous professional training (high education) and should fulfill the other conditions defined in the announced competition;

Appropriate degree of previous professional training is considered completed high education with a duration of three to five years, i.e., acquired academic title of “Bachelor”, i.e., the candidate should have 240 equivalent credits acquired through previous education;

If the candidate has less credits from the candidate’s previous study for Bachelor degree, it is necessary that the candidate passes examinations per additional subjects in order to achieve a sufficient number of credits according to the recommendation given by the IZIIS’ Commission for Post-graduate Master and Doctoral Studies (as a body responsible for education) through a resolution made by the Academic Council;

If the candidate has achieved more than the prescribed credits, the candidate could be exempted from passing certain subjects or corresponding parts of subjects upon the candidate’s request and according to the same procedure (resolution made by the Academic Council upon recommendation given by the Commission for Master and Doctoral Studies);

Due to the differences in previous education of candidates coming from different faculties from the home country and abroad, the necessary conditions for enrollment of each candidate are evaluated and defined by the IZIIS’ Commission for Post-graduate Master and Doctoral Studies responsible for education.

5. SELECTION AND ACCEPTANCE OF CANDIDATES

In accordance with the above conditions, selection of candidates is done and confirmed by an official resolution made by the IZIIS’ Academic Council within 20 days from the date of expiry of the term for application. The IZIIS’ Academic Council makes decisions about enrollment of each additionally applied candidate.

The candidates are informed in writing about being selected and accepted for the studies. At the same time, each candidate is individually informed about the specific conditions under which the candidate has been enrolled in the IZIIS’ master studies.

The information contains the following clarifications:

- whether the candidate has been accepted directly without any other conditions;
- whether the candidate should pass additional examinations in order to obtain a sufficient number of additional equivalent credits; and
- whether the candidate has more credits than necessary and could therefore be exempted from passing of certain subjects or parts of subjects.

The candidates could come from Republic of Macedonia, Southeast Europe, developing countries as well as developed countries from Europe and the World. The candidates could also be involved in organized joint studies with other high education

institutions from the home country and abroad if IZIIS participates in the realization of such studies (for example: joint degree studies).

6. SELECTION OF TOPIC, MENTOR AND DEFENSE OF MASTER THESIS

For each enrolled candidate, the Academic Council of IZIIS makes a resolution by which it appoints mentor and accepts theme of the master thesis. The candidate first submits to the IZIIS' Academic Council a request with a proposed theme and possible proposal for appointment of a supervisor. The proposal is considered by the Commission for Post-graduate and Doctoral Studies from the aspect of the current interest in the subject and in line with the originality principle.

Following the harmonization of the proposal in cooperation with the candidate, the IZIIS' Academic Council makes a resolution on acceptance of the theme and appointed mentor of the master thesis.

As a rule, the selection of themes and appointment of mentors of master theses is done in the beginning of the third semester, i.e., earlier, if the candidate has acquired at least 80% of the anticipated credits. If the candidate lags behind with the passing of the examinations, the theme and the mentor of the master thesis are defined as soon as the candidate passes at least 80% of the anticipated subjects.

As a rule, the candidate elaborates the master thesis in the course of the third semester. The candidate submits five copies of the elaborated master thesis to IZIIS. With a resolution, the IZIIS' Academic council appoints a Reviewing Commission composed of at least 3 members and President of the Commission.

The Reviewing Commission submits a reviewing report to be adopted by the Academic Council of IZIIS. After adopting the reviewing report, the Academic Council appoints Commission for Public Defense of the master thesis composed of at least 3 members and specifies the time of the public defense.

The candidate defends the master thesis in public before the Commission at the specified time, in line with the prescribed procedure for public defense of master theses.

Using modern technical tools, the candidate may defend the master thesis in public through an organized video conference or other technique that enables proving the candidate's knowledge of the elaborated master thesis.

After the successful defense of the master thesis, the Commission signs a decision and confers the title of Master of Technical Sciences upon the candidate.

7. REALIZATION OF THE TEACHING PROCESS

Depending on the number and the composition of applied candidates, the educational process can be carried out in three ways as follows:

1. through group lectures in a classroom;
2. through individual teaching or mentorship, and
3. through other modern type of distance learning as are video conferences, Internet and alike.

The decision on the mode of performance of the educational process is made by the Academic Council of IZIIS.

The curriculum of each subject shows the contents that are elaborated and studied through lectures, literature, exercises, seminar papers and alike.

The subjects of the post-graduate master studies are attended and passed in the course of the first two semesters. Generally, the anticipated subjects per majors are divided into two groups which are the following:

1. Obligatory subjects (Group-1)
2. Optional subjects (Group-2)

Upon successful termination of the lecturing process anticipated for the first semester (acquired signatures), the candidate is entitled to pass the anticipated obligatory and optional subjects from the first semester.

Generally, the teaching process is anticipated to be flexible with the main purpose of enabling of as successful as possible transfer of the necessary knowledge. Particular attention is paid to the present actual needs arising from the globalization of education as well as the actual conditions and potentials of different regions in the world for the purpose of assisting the candidates to the best possible extent in realizing their high education for the degree of master of technical science as successfully as possible.

8. CURRICULA

The curriculum of each scientific field (major) in which the post-graduate master studies are organized at IZIIS is defined separately, respecting the basic principle of duration of the studies to a total of 3 semestres and the condition that the necessary number of credits acquired by the candidate through passing the examinations be at least 60, in line with the European Credit Transfer System (ECTS).

The final curriculum for each scientific field in which IZIIS organizes post-graduate master studies is defined by the IZIIS' Academic Council.

For each major of master studies organized by IZIIS, the curricula per subjects and contents have been harmonized with the European Credit Transfer System (ECTS).

9. NECESSARY NUMBER OF CREDITS

The student (the candidate) of the IZIIS' post-graduate master studies leading to the academic degree of master of technical sciences must sign on and pass all the obligatory subjects anticipated with the curriculum and a certain number of optional subjects in order to acquire a total amount of minimum 60 credits from passed examinations.

In addition to the condition given above, the student should apply for, elaborate and publicly defend a master thesis in accordance with the IZIIS' procedure for elaboration and public defense of master theses.

With the elaboration and public defense of the master thesis, the candidate acquires additional 30 credits.

In accordance with the above presented criteria, in order to acquire the academic degree of master of technical sciences at IZIIS, the student must acquire a total amount of at least 90 credits.

10. ENROLLMENT IN SUBSEQUENT SEMESTRES

The candidate is enrolled in a subsequent semester based on:

1. Certified previous semester;
2. Paid tuition fee for the next semester (if financing or co-financing of the candidate's enrollment in post-graduate lecturing process is not solved otherwise)

Certain non-passed or non-certified subjects from the previous semester are not a hindrance for enrollment in the next semester.

The condition for enrollment of candidates in the first semester at IZIIS is:

1. To be accepted for post-graduate master studies at IZIIS, the candidate should have an acquired sufficient number of credits (at least 240) from the candidate's previous education;
2. The candidate should fulfill the other conditions prescribed with the competition;
3. The candidate should pay the tuition fee anticipated for the organization of the lecturing process in the course of the first semester for the concrete academic year.

The conditions for enrollment of the candidates in the third (the last) semester of master studies at IZIIS are;

1. Certified previous semester;

2. Paid tuition fee for organization of the activities anticipated for the third semester, elaboration of the master thesis under the supervision of the mentor and public defense of the master thesis.

The amount of the tuition fee for each semester of studies at IZIIS is defined by the Academic Council through a resolution made by the IZIIS' Council.

11. TITLE TO TAKING EXAMINATIONS

The candidate is entitled to take an examination per individual subject provided that the candidate has fulfilled the following conditions:

1. The candidate has to have the signature of the lecturer in the subject in his student's booklet;
2. The candidate has to have all the obligations referring to that subject fulfilled;
3. The candidate has to have all the examinations anticipated for the previous semester passed.

The lecturer in the subject may relax the condition stated under item 3 of the previous paragraph in case the non-passed examinations do not greatly affect the mastering of the curriculum of the lecturer's subject.

12. CONDITIONS FOR TAKING EXAMINATIONS

The student has the right to take examination in each subject three times at the most. In case of failure, the student loses the right to further study and enrollment in semester.

The student can renew the right to post-graduate studies at IZIIS by enrollment in the post-graduate studies again through a resolution made by the IZIIS' Academic Council.

13. MODE OF TAKING EXAMINATIONS

Examinations at the IZIIS' master studies are taken before the lecturer in the corresponding subject in one of the following ways:

- Written examination only;
- Oral examination in combination with a written concept of the response;
- Combined examination (written, oral, elaboration of seminar paper and alike).

The success achieved at the examinations is evaluated by grades ranging from 5 (negative grade) to 10 (the highest positive grade). The final grade is established in line with the conditions from the curriculum referring to the particular subject.

14. COMPLAINT TO ACQUIRED GRADE

If the student is not satisfied with the mode of taking the examination or the grade obtained, he has the right to lodge a complaint to the IZIIS' Academic Council within seven (7) days. If the complaint is justified, the Academic Council shall establish a Commission for the taking of the exam.

15. TERMS OF STUDY

The students of IZIIS' master studies shall pass the examinations anticipated with the curricula within two (2) years from the time they have acquired the right to passing the examinations, i.e., from the time of termination of the lectures in the corresponding subject.

Upon submittal of a student's request providing a corresponding rationale, the IZIIS' Academic Council may extend the term for passing of an exam.

16. ACQUIRING ACADEMIC DEGREE OF MASTER OF TECHNICAL SCIENCES IN SCIENTIFIC FIELDS

The academic degree of master of technical sciences in the corresponding scientific field at IZIIS is conferred to a student through accomplishment of a certain curriculum whose contents are validated by credits, including the elaborated master thesis.

The curricula of the postgraduate master studies are accomplished with a total of 90 acquired credits (60 credits from passing of the obligatory and optional subjects and 30 credits from the elaborated and publicly defended master thesis).

The master thesis is the result of an independent work of the student by which the student proves that the student has mastered an adequate fund of scientific knowledge and has contributed to gaining of new scientific knowledge.

The candidate elaborates the master thesis under the supervision of the candidate's previously appointed mentor.

The mode and the procedure of public defense of the master thesis are carried out according to a defined procedure.

17. MASTER STUDIES IN INTERNATIONAL FRAMES

The master studies at IZIIS have a long tradition of over 40 years. The lecturing process within these studies is continuously carried out in English language. Having in mind the originally established very high basic criteria, the master studies at IZIIS have a long tradition and are highly respected in all the countries worldwide.

The realized long term and permanent international tradition of the master studies has widely contributed to the reputation of IZIIS. The candidates, who have accomplished master studies at IZIIS have widely been accepted in the world in realizing their next step of education for the degree of doctor of technical sciences.

Having in mind the long international tradition of the master studies at IZIIS. education of candidates from all interested countries in the region, Europe and the World is anticipated for the next period.

18. FINANCING OF THE MASTER STUDIES

The education for the academic degree of master of technical sciences in a specified scientific field is financed, in principle, in a number of ways for concrete candidates. These are the following:

1. Total or partial financing of successful candidates directly by governments or governmental institutions of interested countries;
2. International fellowships from different sources awarded to successful candidates;
3. Financing of individual candidates by the industry, for the needs of concrete companies.
4. Financing of candidates from available European and world funds (through different prescribed instruments and programmes);
5. Self-financing of interested candidates from different regions and countries from Europe and worldwide.

The amount of the financial resources for attendance and accomplishment of the master studies at IZIIS is defined based on a resolution made by the IZIIS' Council for each concrete academic year. Generally, IZIIS is interested in accepting students from all the continents. Starting with this main principle, the necessary financial resources have been optimized and reduced to a realistic level for the purpose of enabling enrollment of students from as greater number of world countries of different economic development as possible.

19. POSSIBILITY FOR CONTINUATION OF STUDIES TO ACQUIRING OF THE ACADEMIC DEGREE OF DOCTOR OF TECHNICAL SCIENCES

The master studies at IZIIS have been coordinated with the latest trends in organization of educational processes in Europe. Adequate harmonization with the Bologna Declaration has also been provided in the domains of both time duration of the studies and introducing of the European Credit Transfer System (ECTS).

The prescribed regular time duration of the IZIIS' master studies is three semesters.

In addition, a suitable continuity of education as an exceptionally attractive benefit for the candidates enrolled in the IZIIS' master studies has also been provided. Namely, the students who will successfully accomplish the IZIIS' master studies acquire the right to continue their education directly through studies leading to the academic degree of doctor of technical sciences.

The process of education of the candidates for the degree of doctor of technical sciences has also been optimized and lasts a total of three (3) years. There is a separate programme for education of the candidates towards acquiring the academic degree of doctor of technical sciences.

20. FLEXIBILITY OF STUDIES AND INCLUDING OF THE LATEST SCIENTIFIC ACHIEVEMENTS

During the past 40 years, IZIIS has created a high lecturing potential. Most of the professors have been on a longer or shorter stay at the most renowned universities worldwide. Certain professors have acquired the highest academic degree of doctor of technical sciences at the most renowned world universities located in the most developed countries in the World.

Through continuous publication of scientific papers and participation in many World and European scientific meetings like European and World conferences and congresses, scientific symposia, special workshops and alike, the lecturing-scientific staff of IZIIS have permanently been active in the domain of scientific-research activities and have been at the focus of the latest scientific achievements in the World.

In addition to this, with its long year active participation in numerous successfully accomplished scientific-research projects, IZIIS has collaborated with a large number of scientists from the most renowned centres in Europe and the World creating the possibility for application of own original and creative approach to organization of educative activities widely referred to as "IZIIS' creative education".

Finally, what makes IZIIS very proud is that, in the course of the past 40 (forty) years of master studies, a large number of eminent scientists and professors from the most successful and recognized universities worldwide have participated in these studies as visiting professors.

Appendix – A:
**LIST OF PROFESSORS, ASSOCIATE PROFESSORS, ASSISTANT PROFESSORS
AND SCIENTIFIC COLLABORATORS – LECTURERS AT THE POST GRADUATE
(MASTER), DOCTORAL AND POST-DOCTORAL STUDIES AT IZIIS**

Appendix - B1:
REVIEW OF CURRICULUM:
**LIST OF OBLIGATORY AND OPTIONAL SUBJECTS OF THE IZIIS' MASTER
STUDIES IN STRUCTURAL ENGINEERING AND
SEISMIC DESIGN (Programme-1)**

Appendix - B2:
REVIEW OF CURRICULUM:
**LIST OF OBLIGATORY AND OPTIONAL SUBJECTS OF THE IZIIS MASTER
STUDIES IN EARTHQUAKE ENGINEERING (Programme-2)**

APPENDIX - C1:
**DESCRIPTION OF CURRICULUM PER OBLIGATORY AND OPTIONAL
SUBJECTS WITHIN THE IZIIS' MASTER STUDIES IN STRUCTURAL
ENGINEERING AND SEISMIC DESIGN (Programme-1)**

APPENDIX - C2:
**DESCRIPTION OF CURRICULUM PER OBLIGATORY AND OPTIONAL
SUBJECTS WITHIN THE IZIIS' MASTER STUDIES IN EARTHQUAKE
ENGINEERING (Programme-2)**