ACADEMIC GRADUATE PROGRAMME IN

CIVIL ENGINEERING

Rijeka, May 2014.
STUDY PROGRAMME AND CURRICULUM

ACADEMIC GRADUATE PROGRAMME IN CIVIL ENGINEERING

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1. INTRODUCTION

During the implementation of the Bologna process the Faculty of Civil Engineering of the University of Rijeka plans to reform the current study programmes (academic, vocational and postgraduate programmes) in line with the principles of the Bologna Declaration, namely in accordance with the propositions of the European Credit Transfer System (ECTS). This will be performed in order to promote student mobility in the Integrated European Higher Education Area.

The Faculty of Civil Engineering of the University of Rijeka organized and started carrying out civil engineering studies as an independent institution in 1976. During a forty-four-year activity a total of 1355 Diploma Engineers graduated from the Academic Programme, and 1431 Engineers from the Vocational Programme.

In structuring the new study programmes, the Faculty has followed its experience in educating civil engineering personnel. For the purpose of integrating Croatia into the European Higher Education and Labour Area, the needs of the labour market have been considered, and the demands that will be set on prospective students, the Faculty, its staff and specialists in civil engineering, have been assessed. Consideration has been given to the fact that the Faculty of Civil Engineering in Rijeka is the only higher education institution in the greater area (the Primorsko-goranska County, the Istrian County, and the Lika-Senj County) that educates civil engineering professionals. Due to the present-day intense activity in planning, designing and constructing the infrastructure (transportation systems, housing development, water supply systems, etc.) there is a great need for highly educated professionals in civil engineering.

It is safe to say that the trend toward an intense infrastructure construction will also continue in the years to come (during the process of approach and admission of Croatia to the European Union). In the longer term, the need to plan and design new civil engineering structures will be transformed into the need to manage, maintain and reconstruct the infrastructure systems. Therefore, part of the curriculum has also been adapted to meet this demand.

In the course of structuring the study programmes, the Faculty cooperated closely with the related Faculties of Civil Engineering in Croatia. The study programme at the undergraduate level was brought into tune, in a part of the core curriculum, with the identical programmes of the other Faculties of Civil Engineering in Croatia in order to enable student mobility, primarily, at the national level.

In the course of structuring the undergraduate and graduate programmes, the programmes of respectable foreign institutions that educate professionals of the same profile (the University of Engineering of Prague, the University of Engineering of Munich: Technische Universität München-Studienplan für Studierende des Bauingenieurwesens, Eigenossische Technische Hochschule Zürich-ETH-Abteilung für Bauingenieurwesen in Zürich), were analysed and the recommendations of the association of European Faculties of Civil Engineering (European Civil Engineering Education and Training – EUCEET) were accepted. This was performed through coordination inside the TEMPUS Project «Restructuring and Updating of Civil Engineering Curriculum» (in which the 4 Faculties of Civil Engineering from Croatia, along with international experts and scientists, were, and still are, cooperating).

The Faculty teachers were actively included in structuring the study programmes, and the students were consulted, too. The structure of the study programme was accepted at the Board of the Faculty of Civil Engineering on December 21st 2004.

The scheme adopted according to education cycles is «3+2+3», namely:

- Three-year Undergraduate Programme
- Two-year Graduate Programme
- Three-year Postgraduate Programme.

The graduate programmes are based on all the facts mentioned above. They are organised through the modules of the particular civil engineering branches. As compared to the current branch programmes in the final year of study (Hydraulic, Construction and Transportation Engineering), new scientific and practical knowledge has been applied in a particular academic branch programme by introducing new courses and modifying the curricula of the current courses.

Special consideration has been given to the fact that a certain number of Diploma Engineers and even Engineers in Civil Engineering find employment with, and perform a wide variety of jobs, for local self-government units in all three...
counties covered by the Faculty. Therefore, a new branch of *Urban Engineering* has been included in the programmes. It will train students for the jobs of planning, managing and maintaining the infrastructure systems. Due to the needs and demands noticed in the labor market and science, modules from the branches of *Geotechnical Engineering* and *Engineering Modelling of Structures* have been included, too.

The programmes offer the possibility of combining the modules from two different branches of civil engineering, thus enabling students’ flexibility in creating their own study programmes and choosing from a large number of optional courses.
2. GENERAL INFORMATION

2.1. PROGRAMME NAME
The name of the programme is Academic Graduate Programme in Civil Engineering.

2.2. PARTY MANAGING AND CARRYING OUT STUDY PROGRAMMES
The party that manages and carries out the programme is the Faculty of Civil Engineering of the University of Rijeka with its basic organisation units: the Chair of Hydraulic Engineering, the Chair of Geotechnical Engineering, the Department of Computer Modelling of Materials and Structures, the Chair of Load Bearing Structures, the Chair of Technical Mechanics, the Chair of Transportation Engineering, the Chair of Construction Organization and Technology and Architecture, the Chair of Mathematics, and the Chair of Physics and other sciences.

2.3. PROGRAMME DURATION
The duration of the Academic Graduate Programme is two (2) academic years and the student obtains a minimum of 120 ECTS credits.

2.4. PROGRAMME ENTRANCE REQUIREMENTS
The citizens of the Republic of Croatia and EU member states, foreign citizens and persons without citizenship have the right to apply for enrolment under the same conditions.
A Graduate Study Programme can be enrolled by a candidate who has completed an Academic Undergraduate Programme at the Faculty of Civil Engineering of the University of Rijeka (with a total of 180 ECTS credits) or has completed an Undergraduate Programme at some of the Faculties of Civil Engineering (with which the Faculty of Civil Engineering in Rijeka has an agreement on student mobility), or at a related Faculty of Engineering (with which the Faculty of Civil Engineering in Rijeka has an agreement on student mobility), at which the candidate has obtained 180 ECTS credits.
The selection of candidates for admission to graduate study is performed on the base of their success on the previous level of study (undergraduate) and the length of that previous study.

2.5. COMPETENCES ACQUIRED BY THE STUDENT WITH COMPLETION OF THE STUDY PROGRAMME
With completion of the Academic Graduate Programme the student acquires the basic competences to understand the general phenomena and problems connected with civil engineering and particularly with a specific branch of civil engineering (Geotechnical Engineering, Hydraulic Engineering, Engineering Modelling, Structures, Transportation Engineering and the interdisciplinary area of Urban Engineering).

He is able to apply general knowledge, acquire new knowledge and ideas, and draw conclusions based on science and his profession as well to develop his scientific and applied scientific-research competences. He is qualified for the design, construction and maintenance of civil engineering structures and systems in terms of bearing capacity, stability, safety, environmental protection and cost.

With completion of the Graduate Programme, the student is specially qualified for understanding and solving problems in a specific branch of Civil Engineering.

During his studies, the student learns how to prepare and formulate complex civil engineering solutions in written and oral form. At the same time, he develops the ability to communicate his own ideas, analyses and conclusions, connected with specific civil engineering problems, to the professional and non-professional public. He is able to manage a group of people preparing and executing complex civil engineering projects.

2.6. ACADEMIC TITLE OR DEGREE ACQUIRED ON COMPLETION OF THE PROGRAMME
According to the proposed study programme, the academic title or degree acquired on completion of the Academic Graduate Programme is Master in Civil Engineering
3. PROGRAMME DESCRIPTION

3.1. LIST OF COMPULSORY AND OPTIONAL COURSES

The Academic Graduate Programme is organized so that students enroll part of the common courses in their 1st semester, while the optional part of the programme is dependent on the branch programme that he wants to study. The branch programme courses are organized through the modules of the specific branches of civil engineering:

- Geotechnical Engineering
- Hydraulic Engineering
- Engineering Modelling of Structures
- Structures
- Transportation Engineering
- The interdisciplinary branch of Urban Engineering

The list of Compulsory and optional courses is arranged according to the above-mentioned structure and branches from which the modules are organized.

3.1.1. List of Compulsory and optional courses in 1 semester

List of compulsory courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. M-550</td>
<td>Probability Theory and Statistics</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>2. MK-301</td>
<td>Theory and Technology of Concrete</td>
<td>30+15+15</td>
<td>5.0</td>
</tr>
<tr>
<td>3. OA-450</td>
<td>Project Management</td>
<td>30+15+15</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Optional course – Student selects one of following courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. MK-300</td>
<td>Numerical Modelling</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>MK-316</td>
<td>Programming in Modelling</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

List of optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. H-267</td>
<td>Computational Hydraulics</td>
<td>45+15+0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>(Hydraulic Engineering Module)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. G-217</td>
<td>Engineering Rock Mechanics</td>
<td>30+30+0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>(Modules of Geotechnical Engineering and Urban Engineering)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. P-500</td>
<td>Road Design</td>
<td>20+20+10</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>(Transportation Engineering Module, Urban Engineering Module)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. NK-352</td>
<td>Concrete and Masonry Structures</td>
<td>45+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>(Modules of Structures and Engineering Modelling of Structures)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. TM-400</td>
<td>Theory of Elasticity</td>
<td>35+0+10</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>(Modules of Structures and Engineering Modelling of Structures)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. G-218</td>
<td>Theoretical Soil Mechanics</td>
<td>40+15+20</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>(Geotechnical Engineering Module, Urban Engineering Module)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.1.2. List of compulsory courses and optional courses in modules

#### 3.1.2.1. List of compulsory and optional courses in modules – Modules from the branch programme of Geotechnical Engineering

**List of compulsory courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. G-204</td>
<td>Soil Dynamics</td>
<td>30+15+15</td>
<td>6.0</td>
</tr>
<tr>
<td>14. G-209</td>
<td>Geotechnical Structures</td>
<td>30+10+20</td>
<td>6.0</td>
</tr>
<tr>
<td>15. G-210</td>
<td>Underground Structures and Tunnels</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**List of optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. G-200</td>
<td>Environmental Protection</td>
<td>15+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>18. G-221</td>
<td>Testing and Monitoring in Geotechnical Engineering</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>19. G-214</td>
<td>Reinforcing Soil and Rocks</td>
<td>30+15+15</td>
<td>4.0</td>
</tr>
<tr>
<td>20. G-207</td>
<td>Seepage and Consolidation of Soil</td>
<td>30+15+15</td>
<td>4.0</td>
</tr>
<tr>
<td>21. G-219</td>
<td>Geohazards</td>
<td>20+10+15</td>
<td>4.0</td>
</tr>
<tr>
<td>22. G-220</td>
<td>Geotechnical Engineering in Road Structures</td>
<td>25+20+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

#### 3.1.2.2. List of compulsory and optional courses – Hydraulic Engineering Module

**List of compulsory courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. H-251</td>
<td>Water Supply and Drinking Water Treatment</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>24. H-252</td>
<td>Drainage and Wastewater Treatment</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>25. H-253</td>
<td>Hydraulic Structures</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>26. H-257</td>
<td>Engineering Hydrology</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>27. H-258</td>
<td>Hydraulic Regulations and Meliorations</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**List of optional courses**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>29. H-262</td>
<td>Experimental Hydraulics</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>30. H-255</td>
<td>Water Resources Management</td>
<td>30+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>31. H-256</td>
<td>Karst Hydroystems</td>
<td>30+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>32. H-263</td>
<td>Waste Management</td>
<td>30+10+5</td>
<td>4.0</td>
</tr>
<tr>
<td>33. H-260</td>
<td>Hydraulic Modelling</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>34. H-268</td>
<td>Computational Hydrodynamics</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>35. H-261</td>
<td>Water Power Development</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>
3.1.2.3. List of compulsory and optional courses – Engineering Modelling of Structures Module

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>36. MK-308</td>
<td>Structural Modelling</td>
<td>30+0+30</td>
<td>6.0</td>
</tr>
<tr>
<td>37. MK-303</td>
<td>Operations Research and Linear Programming</td>
<td>30+0+30</td>
<td>6.0</td>
</tr>
<tr>
<td>38. MK-310</td>
<td>Numerical Modelling in Materials Engineering</td>
<td>30+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>39. MK-309</td>
<td>Finite Element Method</td>
<td>30+0+30</td>
<td>6.0</td>
</tr>
<tr>
<td>40. MK-306</td>
<td>Computer Aided Design</td>
<td>30+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>41. MK-302</td>
<td>Inverse Modelling in Structural Evaluation</td>
<td>30+0+30</td>
<td>6.0</td>
</tr>
</tbody>
</table>

List of optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>42. MK-312</td>
<td>Building Physics</td>
<td>20+0+10</td>
<td>2.0</td>
</tr>
<tr>
<td>43. MK-313</td>
<td>Computer Modelling of Geometric Surfaces</td>
<td>30+0+30</td>
<td>4.0</td>
</tr>
<tr>
<td>44. MK-314</td>
<td>Computational Durability Mechanics</td>
<td>30+30+0</td>
<td>5.0</td>
</tr>
<tr>
<td>45. MK-315</td>
<td>System Engineering</td>
<td>15+0+15</td>
<td>4.0</td>
</tr>
</tbody>
</table>

3.1.2.4. List of compulsory and optional courses – Structures Module

List of compulsory courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>46. NK-351</td>
<td>Steel Structures</td>
<td>45+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>47. TM-402</td>
<td>Dynamics of Structures</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>48. NK-357</td>
<td>Timber Structures</td>
<td>45+26+4</td>
<td>6.0</td>
</tr>
<tr>
<td>49. NK-353</td>
<td>Prestressed Concrete</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>50. NK-355</td>
<td>Solid Bridges</td>
<td>30+30+0</td>
<td>5.0</td>
</tr>
<tr>
<td>51. NK-366</td>
<td>Introduction to Composite Structures</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

List of optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>52. TM-401</td>
<td>Theory of Plates and Shells</td>
<td>24+0+6</td>
<td>3.0</td>
</tr>
<tr>
<td>53. TM-405</td>
<td>Theory of Plasticity</td>
<td>24+0+6</td>
<td>3.0</td>
</tr>
<tr>
<td>54. TM-404</td>
<td>Variational Methods</td>
<td>24+0+6</td>
<td>3.0</td>
</tr>
<tr>
<td>55. TM-403</td>
<td>Stability of Structures</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>56. NK-352</td>
<td>Special Chapters of Concrete and Masonry Structures</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>57. OA-463</td>
<td>Design of Buildings</td>
<td>15+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>58. NK-358</td>
<td>Precast Concrete Structures</td>
<td>30+10+5</td>
<td>4.0</td>
</tr>
<tr>
<td>59. NK-361</td>
<td>Earthquake Engineering</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>60. NK-360</td>
<td>Testing of Structures</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
<tr>
<td>61. NK-363</td>
<td>Reliability of Civil Engineering Structures</td>
<td>24+0+6</td>
<td>3.0</td>
</tr>
<tr>
<td>62. NK-359</td>
<td>Special Chapters of Lightweight Structures</td>
<td>30+20+10</td>
<td>5.0</td>
</tr>
<tr>
<td>63. NK-356</td>
<td>Steel Bridges</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>
### 3.1.2.5. List of Compulsory and optional courses – Transportation Engineering Module

#### List of compulsory courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes ((L+E+S))</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>64. P-501</td>
<td>Road Intersections and Crossroads</td>
<td>20+15+15</td>
<td>5.0</td>
</tr>
<tr>
<td>65. P-503</td>
<td>Urban Traffic</td>
<td>30+30+0</td>
<td>6.0</td>
</tr>
<tr>
<td>66. P-516</td>
<td>Traffic Engineering</td>
<td>30+15+15</td>
<td>5.0</td>
</tr>
<tr>
<td>67. P-508</td>
<td>Flexible Pavement Structures</td>
<td>30+15+15</td>
<td>6.0</td>
</tr>
<tr>
<td>68. P-509</td>
<td>Rigid Pavement Structures</td>
<td>25+10+5</td>
<td>4.0</td>
</tr>
<tr>
<td>69. P-510</td>
<td>Roadbed Design</td>
<td>30+20+10</td>
<td>4.0</td>
</tr>
</tbody>
</table>

#### List of optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes ((L+E+S))</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>70. P-512</td>
<td>Railway Design</td>
<td>45+15+0</td>
<td>5.0</td>
</tr>
<tr>
<td>71. P-504</td>
<td>Traffic, Space and Environment</td>
<td>30+0+15</td>
<td>3.0</td>
</tr>
<tr>
<td>72. P-505</td>
<td>Traffic Safety</td>
<td>30+15+0</td>
<td>3.0</td>
</tr>
<tr>
<td>73. P-507</td>
<td>Technology of Traffic Building</td>
<td>30+15+0</td>
<td>3.0</td>
</tr>
<tr>
<td>74. OA-462</td>
<td>Traffic Buildings</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
<tr>
<td>75. P-511</td>
<td>Maintenance and Repair of Roads</td>
<td>30+10+5</td>
<td>3.0</td>
</tr>
<tr>
<td>76. P-513</td>
<td>Airports</td>
<td>20+10+0</td>
<td>3.0</td>
</tr>
<tr>
<td>77. OA-456</td>
<td>Construction Machinery and Equipment</td>
<td>30+30+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

### 3.1.2.6. List of compulsory and optional courses – Urban Engineering Module

#### List of compulsory courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory courses</th>
<th>Hours of active classes ((L+E+S))</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>78. OA-459</td>
<td>Spatial Planning</td>
<td>40+10+10</td>
<td>5.0</td>
</tr>
<tr>
<td>79. P-514</td>
<td>GIS in Municipal Infrastructure Planning</td>
<td>30+15+15</td>
<td>6.0</td>
</tr>
<tr>
<td>80. OA-460</td>
<td>Public Buildings and Spaces</td>
<td>30+0+30</td>
<td>6.0</td>
</tr>
</tbody>
</table>

#### List of optional courses

<table>
<thead>
<tr>
<th>Course code</th>
<th>Optional courses</th>
<th>Hours of active classes ((L+E+S))</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>82. OA-457</td>
<td>Management in Civil Engineering</td>
<td>30+0+15</td>
<td>3.0</td>
</tr>
<tr>
<td>83. OA-455</td>
<td>Investment Policy</td>
<td>30+15+0</td>
<td>5.0</td>
</tr>
<tr>
<td>84. OA-458</td>
<td>Civil Engineering Regulations</td>
<td>30+0+0</td>
<td>4.0</td>
</tr>
<tr>
<td>85. OA-461</td>
<td>Building Maintenance</td>
<td>30+15+0</td>
<td>4.0</td>
</tr>
</tbody>
</table>
3.1.2.7. List of courses - IV semester

<table>
<thead>
<tr>
<th>Course code</th>
<th>Compulsory course</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>86. DIPL.</td>
<td>Final Year Project</td>
<td>30+0+0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

In total, the programme provides 86 courses:
- Compulsory courses: 38
- Optional courses: 46

3.2. COURSE DESCRIPTION
Explanation of ECTS credits, the quality assessment and the courses delivery success are given in chapters 3.2.2. and 3.2.3. for all subjects.

3.2.1. Description of mandatory and optional courses
**Course:** PROBABILITY THEORY AND STATISTICS

<table>
<thead>
<tr>
<th>Course code: MK-550</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of:</td>
<td>lectures: 30  exercises: 30  seminars: 0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Course status:** compulsory

**Course objectives**
- Students will:
  - become familiar with the concepts such as event, probability of an event, random variable, probability distribution, mean and variance of a distribution,
  - learn to use samples to make inferences about the unknown parameters of a distribution,
  - learn to perform statistical tests in order to accept or reject a given probability model.

**Syllabus**
- Factorials, binomial coefficients, permutations and combinations.
- Regression analysis and correlation analysis.
- Markov processes.

**Student obligations**
- Attending at lectures and exercises.
- Preliminary exams.

**Exam**
- Written and oral.

**Assessment**
- 70% during semester, 30% final exam.

**Literature**

**Essential:**
1. Notes taken at the classes.

**Recommended:**
Course: THEORY AND TECHNOLOGY OF CONCRETE

Course code: MK-301

Pre-requisites: The course consists of:
- lectures 30
- exercises 15
- seminars 15

Course status: compulsory

Hours of Active Classes: 60
- lectures: 30
- exercises: 15
- seminars: 15

ECTS: 5.0

Course objectives
To provide fundamental understanding of structures and properties of concrete, and latest advancements in concrete mechanics and technology. Student should have information of concrete constituent materials and their effect on both fresh and hardened concrete properties.

Syllabus
Introduction to Concrete.
- Properties of Fresh Concrete.
- The Structure of Concrete.
- Modeling of Concrete Materials.
- Strength.
- Behaviour of Concrete under Various Stress State.
- Dimensional Stability.
- Durability.
- Fresh Concrete.
- Portland Cement.
- Aggregates.
- Admixtures.
- Proportioning Concrete Mixtures.
- Concrete at Early Ages.
- Progress in Concrete Technology.

Student obligations
Participation in all lectures and scheduled group laboratories.
Submit a final laboratory reports. Participation in preliminary exams and final exam.

Exam
Written exam.

Assessment
70% during semester, 30% final exam.

Literature

Essential:

Recommended:
Course: **PROJECT MANAGEMENT**

<table>
<thead>
<tr>
<th>Course code: OA-450</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60</th>
<th>Lectures: 30</th>
<th>Exercises: 15</th>
<th>Seminars: 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course objectives**
Acquiring basic project management knowledge and skills, especially in construction projects.

**Syllabus**
1. Fundamental knowledge of project management
2. Basics of project management
3. Management in preliminary phases
4. Management in executional phases
5. Construction project manager
6. Team work
7. Risk management in construction projects
8. Change management
9. Human resources management
10. Quality/costs/time management
11. Management of information and communication in construction projects
12. New trends and the future of project management

**Student obligations**
Attending at lectures and exercises, project work, seminars.

**Exam**
Written and oral.

**Assessment**
70% during semester, 30% final exam.

**Literature**
**Essential:**

**Recommended:**
### Course: NUMERICAL MODELLING

<table>
<thead>
<tr>
<th>Course code: MK-300</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30 exercises: 30 seminars: 0</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of: lectures exercises -</td>
<td>ECTS: 6.0</td>
</tr>
</tbody>
</table>

#### Course objectives
Solution of practical engineering problems in engineering modeling.

#### Syllabus
- Introduction into modeling
- Relationship between algorithm and programming language
- Programming in mathematical software (e.g. "Mathcad") and in modeling languages (e.g. "Modelica")
- Polynomial interpolation
- Linear and non-linear equations
- Linear least squares
- Introduction into statistical models (e.g. "kriging")
- Numerical derivation and integration
- Introduction in differential equations
- Introduction in optimisation methods and inverse modelling
- Introduction in evolutionary algorithms and artificial intelligence

#### Student obligations
Written tests and homework assignments

#### Exam
Written.

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**

**Recommended:**
# Programming in Modelling

**Course:** PROGRAMMING IN MODELLING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>MK-316</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>lectures: 30</td>
<td>6.0</td>
</tr>
<tr>
<td>exercises: 30</td>
<td></td>
</tr>
<tr>
<td>seminars: 0</td>
<td></td>
</tr>
</tbody>
</table>

**Course status:** compulsory

**Course objectives**
Introducing students to basics of computer programming and some essential numerical algorithms with application on engineering problems. Brief introduction into various subjects to create an overview of possible applications of computers and modeling on engineering problems.

**Syllabus**
- Introduction into programming
- Introduction to Python:
  - variables, objects, expressions, operators and functions,
  - branching, input and output, testing,
  - classes and objective programming,
  - simple numerical algorithms,
  - dynamic programming,
  - visualization in PyLab.

**Student obligations**
Written tests and homework assignments

**Exam**
Written.

**Assessment**
70% during semester, 30% final exam.

**Literature**

**Essential:**
4. Python tutorial

**Recommended:**
2. Think Python: How to Think Like a Computer Scientist, Allen B. Downey
<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-267</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td></td>
<td>lectures</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>lectures: 45</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>ECTS:</td>
<td>5.0</td>
</tr>
</tbody>
</table>

### Course objectives
The goal is to ensure the acquisition of the methodology for performing hydraulic analysis of fluid flow in engineering systems that are included in the course content. The course program is designed to primarily consider the flow of fluid in circumstances that are commonly encountered in hydraulic engineering. Such a selective approach should provide the elementary knowledge needed to perform some simple but also more advance hydraulic analysis and to upgrade the adopted knowledge in some narrow field of hydraulics during the upcoming professional work and/or scientific research. The course provides the necessary preliminary knowledge required to actively follow the course program of economic aspects and sanitary aspects in the field of hydraulic engineering.

### Syllabus
01. teaching unit: Pipe flow systems (dv/dt=0)
02. teaching unit: Pipe flow systems (dv/dt≈0)
03. teaching unit: Pipe flow systems (dv/dt≠0)
04. teaching unit: Open channel hydraulics (dv/dt=0)
05. teaching unit: Open channel hydraulics (dv/dt≈0)
06. teaching unit: Open channel hydraulics (dv/dt≠0)
07. teaching unit: Groundwater flow (S=1 & dv/dt=0)
08. teaching unit: Groundwater flow (S<1 & dv/dt≈0)
09. teaching unit: Groundwater flow (S<1)
10. teaching unit: Ecohydraulics (pollutant transport in soil)
11. teaching unit: Ecohydraulics (pollutant transport in air)
12. teaching unit: Ecohydraulics (pollutant transport in water)
13. teaching unit: Ocean hydraulics (sea waves)
14. teaching unit: Ocean hydraulics (sea currents)
15. teaching unit: Ocean hydraulics (offshore structures)

### Student obligations
Students are required to regularly attend classes and independently develop 15 course assignments that are given according to the teaching units.

### Exam
Oral exam.

### Assessment
The student will be evaluated and assessed during the semester and the final exam. The total number of points that a student can achieve during the semester is 70 while the final exam gives a total of 30 points. Work throughout the semester will be evaluated and monitored through one-week consultation during which the students will present the results of last week's activities related to the making process of a seminar paper. Regularity in attendance consultation ensures continuity in the student work and the constant supervision and guidance of teachers (mentoring) ensures the quality of studying.

### Literature
**Essential:**

**Recommended:**
### Course: ENGINEERING ROCK MECHANICS

<table>
<thead>
<tr>
<th>Course code: G-217</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of: lectures exercises -</td>
<td>lectures: 30 exercises: 30 seminars: 0</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>ECTS: 5.0</td>
<td></td>
</tr>
</tbody>
</table>

### Course objectives

Introducing the rock mechanics principles in engineering practice. Understanding the rock and rock mass properties and pre-existing boundary conditions. Select the adequate laboratory and in-situ test to obtain the parameter values. Apply the methods of analyses for rock support design (open and underground excavations).

### Syllabus

- Rock mass description and classification
- Tectonic deformation and weathering of rocks
- Index and physical properties of rocks
- Mechanical properties of rock and rock masses: rock strength and failure criteria; constitutive laws; shear strength of discontinuities
- Analysis and design in rock mechanics
- Excavation and stabilization principles
- Instability mechanisms in open and underground excavations
- Stabilization techniques: rock bolts and cables, shotcrete support
- Rock properties testing methods and site characterization
- Stress and stress measurements methods (in situ and induced stress)
- Rock slope stability, modes of failure, 2D and 3D analysis
- Applications of rock mechanics to foundation engineering and tunnelling

### Student obligations

- Attendance to lectures and exercises as defined by the Faculty regulations.
- Two partial exams
- Final exam

### Exam

Written and oral.

### Assessment

70% during semester, 30% final exam.

### Literature

**Essential:**

1. Vrkljan, I., 2001., Inženjerska mehanika stijena (digitalna verzija skripti), Građevinski fakultet u Rijeci

**Recommended:**

2. Miščević, P., 2004., Uvod u inženjersku mehaniku stijena ; Sveučilište u Splitu – Građevinsko arhitektonski fakultet; Split
<table>
<thead>
<tr>
<th>Course:</th>
<th>ROAD DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code:</td>
<td>P-500</td>
</tr>
<tr>
<td>Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>50</td>
</tr>
<tr>
<td>Lectures:</td>
<td>20</td>
</tr>
<tr>
<td>Exercises:</td>
<td>20</td>
</tr>
<tr>
<td>Seminars:</td>
<td>10</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>Exercises</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ECTS:</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Course objectives**

With successfully acquired matter, students are expected to have theoretical and practical knowledge required for road designing. They are trained for computer aided road design by itself.

**Syllabus**

1. Theory of road design:
   - methodology of road design
   - horizontal and vertical alignment of road; cross sections of road
   - stopping sight distance and passing sight distance
   - methods of surfaces determination and mass haul diagrams
   - alternative solutions and selection of optimal solution

2. Computer aided road design (based on road building standards)
   - digital terrain models
   - horizontal and vertical alignment of road designed by computer
   - elaboration of cross-sections
   - calculation of volume of road troop.

**Student obligations**

- attendance lectures, exercises and seminars (more than 70%)
- seminar work
- partial exams
- road project made by computer and its presentation
- accepted project work before the end of term or before specified date

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**
1. Priručnik za računalni program koji se koristi u nastavi
2. Pravilnik o osnovnim uvjetima kojima javne ceste izvan naselja i njihovi elementi moraju udovoljavati sa stajališta sigurnosti prometa (NN br. 110/2001 g.)

**Recommended:**
### Course: CONCRETE AND MASONRY STRUCTURES

<table>
<thead>
<tr>
<th>Course code: NK-352</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 75 lectures: 45 exercises: 30 seminars: 0</th>
<th>ECTS: 6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>lectures</td>
<td>exercises</td>
<td></td>
</tr>
</tbody>
</table>

#### Course objectives
Students will acquire knowledge of the concepts and properties of various structural concrete and masonry structures and independent capability of design. This is the basis for future scientific and professional education in the field of structural concrete and masonry structures and load-bearing structures in general.

#### Syllabus
Concrete structures:
- Design of elements subjected to biaxial bending with or without axial force. Basics of rheology of concrete.
- Expressions for relationships between stress and strain. Stresses caused by shrinkage and long-term load.

Masonry:

#### Student obligations
Course attendance, project work, preliminary exams.

#### Exam
The exam is taken in written form.

#### Assessment
Course attendance, project work, preliminary exams (70%), written exam (30%).

#### Literature
**Essential:**
1. Course materials published on the website of the Faculty

**Recommended:**
### Course: THEORY OF ELASTICITY

<table>
<thead>
<tr>
<th>Course code: TM-400</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 35 exercises: 0 seminars: 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course status: compulsory</th>
<th>The course consists of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lectures - seminars</td>
</tr>
</tbody>
</table>

| ECTS: 4.0 |

<table>
<thead>
<tr>
<th>Course objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction into the basic principles of continuum mechanics, theory of elastic material behavior (strain, stress, constitutive law and compatibility equations), solution of boundary value problems in the framework of elasticity theory, basics of visco-elasticity and material nonlinearities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Syllabus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>Basic principle of continuum mechanics</td>
</tr>
<tr>
<td>Stress measure</td>
</tr>
<tr>
<td>Equilibrium equations</td>
</tr>
<tr>
<td>Strain measure</td>
</tr>
<tr>
<td>Principal stresses and strains</td>
</tr>
<tr>
<td>Stress and strain invariants</td>
</tr>
<tr>
<td>Compatibility equations</td>
</tr>
<tr>
<td>Constitutive law for linear elastic continuum</td>
</tr>
<tr>
<td>Solution of boundary value problems</td>
</tr>
<tr>
<td>Visco-elasticity</td>
</tr>
<tr>
<td>Basics of material nonlinearity</td>
</tr>
<tr>
<td>Examples of analytical solutions for some simple boundary value problems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance of lectures</td>
</tr>
<tr>
<td>Seminar work - condition for the attendance of the exam</td>
</tr>
<tr>
<td>Exam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written and oral.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% during semester, 30% final exam.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Essential:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Recommended:</strong></th>
</tr>
</thead>
</table>
# THEORETICAL SOIL MECHANICS

<table>
<thead>
<tr>
<th>Course code: G-218</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 75 lectures: 40 exercises: 15 seminars: 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 5.0</td>
</tr>
</tbody>
</table>

**Course objectives**

The student is expected to acquire a basis knowledge and understanding of the nonlinear continuum mechanics. Describe a critical state concept in mechanical behaviour of real soils. Explain theoretical behaviour for different models of soils. Provide students learning experience in acceptance of theoretical models in practical aspects of soil behaviour.

**Syllabus**

- Critical state concept and mechanical behaviour of soils
- Non-linear mechanics of continuum and constitutive laws
- Multiphase continuum
- Elasticity and elastoplasticity
- Yield surface and plastic potential, isotropic strengthening models
- Complex soil models: Duncan's and Chang's model, Cam-Clay, variations, multisurface yielding models, kinematic strengthening models
- Ideal plasticity and limit analysis
- Practical problems

**Student obligations**

- Attendance to lectures and exercises
- Preparing a seminar paper.
- Partial exames.
- Final exam.

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
### Course: FOUNDATION ENGINEERING

<table>
<thead>
<tr>
<th>Course code: G-202</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30 exercises: 15 seminars: 15</td>
</tr>
</tbody>
</table>

#### Course status: compulsory

<table>
<thead>
<tr>
<th>The course consists of: lectures exercises seminars</th>
<th>ECTS: 6.0</th>
</tr>
</thead>
</table>

#### Course objectives

The student is expected to acquire a basic knowledge of foundation structures. The main objective of this course is to educate future engineers in foundation of analysis and develop competences in the design of different types of foundations as well as to prepare students for other applied courses.

#### Syllabus

- Shallow foundations, bearing capacity
- Shallow foundations, rigid structures
- Shallow foundations, elastic foundations
- Deep foundations, bearing capacity
- Deep foundations: piles and slurry walls
- Deep foundations, laterally loaded piles
- Deep foundations: caissons, pneumatic caissons and box
- Complex foundation structures
- Dynamically loaded foundations

#### Student obligations

- Lecture course attendance
- Exercise course attendance
- Seminar course attendance

#### Exam

Written and oral.

#### Assessment

70% during semester, 30% final exam.

#### Literature

**Essential:**

**Recommended:**
### Course: SOIL DYNAMICS

<table>
<thead>
<tr>
<th>Course code: G-204</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30  exercises: 15  seminars: 15</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Course status:** compulsory

**The course consists of:**

<table>
<thead>
<tr>
<th>lectures</th>
<th>exercises</th>
<th>seminars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Course objectives:**

This course introduces the student to the fundamentals of soil dynamics, including the behaviour of soils and structures under cyclic and dynamic loading. The course should enable the student to formulate, in a realistic way, the solutions to real engineering problems; either by direct analytical or numerical methods.

**Syllabus**

- Fundamentals of vibration
- Waves in elastic medium
- Properties of dynamically loaded soils
- Foundation and ground vibration
- Earthquake vibration
- Compressibility of soils under dynamic loads
- Liquefaction of soil

**Student obligations**

Course attendance, accepted project work.

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**


**Recommended:**

Course: NUMERICAL MODELLING IN GEOTECHNICAL ENGINEERING

Course code: G-205  
Pre-requisites:  
Hours of Active Classes: 60  
lectures: 15 exercises: 15 seminars: 30

Course status: optional  
The course consists of: lectures exercises seminars  
ECTS: 6.0

Course objectives
Educated future engineers in understanding of the nonlinear continuum mechanics and constitutive application laws in describe of real soil in real problem and their numerical descriptions. The student is expected to acquire a knowledge about available geotechnical software.

Syllabus
Non-linear models of soil and finite element method  
Numerical modelling software: available software programs  
Input parameters  
Critical approach in problem simplification  
Critical approach in analysis of numerical results  
Numerical modelling of complex geotechnical structures: earth structures, anchored retaining structures, excavations etc.  
Rewiew of typical geotechnical problems

Student obligations
Lecture course attendance  
Exercise course attendance  
Seminar course attendance

Exam
Written and oral.

Assessment
70% during semester, 30% final exam.

Literature

Essential:

Recommended:
# GEOTECHNICAL STRUCTURES

<table>
<thead>
<tr>
<th>Course code:</th>
<th>G-209</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Theoretical Soil Mechanics</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures</td>
</tr>
<tr>
<td>ECTS:</td>
<td>6.0</td>
</tr>
</tbody>
</table>

## Course objectives
The student is expected to acquire a basis knowledge of reinforcing of soil and rocks. The main objective of this course is to educate future engineers in basic analysis and develop competences in designs and constructions of different types of soil and rocks reinforcing.

## Syllabus
- Design conditions and design method
- Selection of geotechnical parameters
- Modelling of geotechnical problems
- Selection of geotechnical structure
- Methods of numerical modelling
- Critical approach to analysis of numerical results
- Content of geotechnical design
- Active design approach
- Executing of geotechnical works
- Geotechnical supervising
- Accepting of geotechnical monitoring

## Student obligations
- Lecture course attendance
- Exercise course attendance
- Seminar course attendance

## Exam
- Written and oral.

## Assessment
- 70% during semester, 30% final exam.

## Literature

### Essential:

### Recommended:
<table>
<thead>
<tr>
<th>Course:</th>
<th>UNDERGROUND STRUCTURES AND TUNNELS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course code:</strong></td>
<td>G-210</td>
</tr>
<tr>
<td><strong>Pre-requisites:</strong></td>
<td>Engineering Rock Mechanics</td>
</tr>
<tr>
<td><strong>Hours of Active Classes:</strong></td>
<td>60 lectures: 30 exercises: 30 seminars: 0</td>
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<tr>
<td><strong>Course status:</strong></td>
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<tr>
<td><strong>The course consists of:</strong></td>
<td>lectures exercises</td>
</tr>
<tr>
<td><strong>ECTS:</strong></td>
<td>6.0</td>
</tr>
</tbody>
</table>

### Course objectives
Students should be able to understand and explain the techniques and principles of geotechnical design, monitoring, excavation and ground stabilization as well as select methods appropriate for specific ground conditions and types of underground project.

### Syllabus
- Classification of rock masses
- Stress around the underground excavations
- Underground excavation failure mechanisms
- Analysis of structurally controlled instability
- Support design for overstressed rock (convergence-confinement method)
- Stabilization techniques: rock bolts and cables, shotcrete support
- Tunnel boring machines
- Blasting in underground excavation
- Ventilation of the tunnel
- Drainage and tunnel sealing system
- Uses of underground space
- Disposal of radioactive & other wastes (overview)
- Instrumentation during tunnelling

### Student obligations
- Attendance to lectures and exercises (on faculty and on site).
- Preparing and delivering a program from exercises.

### Exam
- Written and oral.

### Assessment
- 70% during semester, 30% final exam.

### Literature
**Essential:**

**Recommended:**
<table>
<thead>
<tr>
<th>Course</th>
<th>SLOPE STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course code:</strong></td>
<td>G-222</td>
</tr>
<tr>
<td><strong>Pre-requisites:</strong></td>
<td></td>
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<tr>
<td><strong>Course status:</strong></td>
<td>compulsory</td>
</tr>
<tr>
<td><strong>Hours of Active Classes:</strong></td>
<td>60 lectures: 30 exercises: 25 seminars: 5</td>
</tr>
<tr>
<td><strong>ECTS:</strong></td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Course objectives**

The student is expected to acquire a basic knowledge of soil and rocks slope stability. Ability to identify, formulate and solve engineering problems, accept competences for adequate approach to analyse and learn experiences in field of slope stability problems. The student is expected to acquire a knowledge of the methods of slope stability analysis.

**Syllabus**

- Principles and definitions
- Landslide types and processes
- Investigation works
- Measuring and observations
- Strength of soil and rock mass
- Soil slope stability analysis
- Rock slope stability analysis
- Stabilization of soil slopes
- Stabilization of rock slopes
- Earth structures
- Applied software for stability analysis
- Special cases and materials

**Student obligations**

- Attendance to lectures and exercises (on Faculty and on site).
- Preparing a seminar paper.
- Partial exams.
- Final exam.

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
Course: ENVIRONMENTAL PROTECTION

Course code: G-200
Pre-requisites: 

Hours of Active Classes: 45
- lectures: 15
- exercises: 0
- seminars: 30

Course status: optional

The course consists of:
- lectures
- seminars

ECTS: 4.0

Course objectives
Preparing students for basic understanding of global ecosystem, importance of biological diversity and biogeochemical cycles, basic principles of environmental protection and possible negative impact of construction works. Students will be prepared for supplementary courses: Geohazards, Traffic and environment and Waste management.

Syllabus
Basic principles of environmental protection,
Biological diversity and biogeochemical cycles
Global ecosystem: interaction of geosphere, hydrosphere, atmosphere, biosphere.
Human activity and environmental change
Climatic changes
Air pollution and
Pollution of surface water and groundwater
Pollution of seas and oceans
Pollution of soil
Construction works and environmental protection
Nature protection in Republic of Croatia
Environmental protection in Republic of Croatia
Planning for sustainable future

Student obligations
Course attendance
One seminar during term of course

Exam
Written and oral.

Assessment
70% during semester, 30% final exam.

Literature

Essential:

Recommended:
<table>
<thead>
<tr>
<th>Course code: G-221</th>
<th>Hours of Active Classes: 60</th>
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<tbody>
<tr>
<td>Pre-requisites:</td>
<td>lectures: 30 exercises: 30</td>
</tr>
<tr>
<td>Course status:</td>
<td>seminars: 0</td>
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<tr>
<td>optional</td>
<td>ECTS: 4.0</td>
</tr>
<tr>
<td>The course consists of: lectures exercises -</td>
<td></td>
</tr>
</tbody>
</table>

**Course objectives**

Introducing the laboratory and in-situ testing methods of soil and rock in geotechnical practice. Describing the role of geotechnical instrumentation during the construction and operation phases of civil engineering projects, including embankments, dams, excavated and natural slopes, underground excavations, driving piles, and drilled shafts.

**Syllabus**

- Laboratory and in-situ testing of soils, rock and rock masses
- Application of geophysical methods to the solution of geotechnical, geo-environmental and earthquake engineering problems
- Planing monitoring programs
- Monitoring methods and recommends instruments (monitoring groundwater pressure, deformations, total stress in soil, stress change in rock, temperature, stress and strain in structural members)
- Introducing the Eurocode 7 (ENV 1997-1:1994)
- General guidelines on the execution of monitoring programs
- Examples of instrumentation

**Student obligations**

- Attendance to lectures and exercises as defined by the Faculty regulations.
- Preliminary exams
- Final exam

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**
1. Vrkljan, I., 2001., Inženjerska mehanika stijena (digitalna verzija skripti). Građevinski fakultet u Rijeci

**Recommended:**
# REINFORCING SOIL AND ROCKS

<table>
<thead>
<tr>
<th>Course code:</th>
<th>G-214</th>
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<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>lectures</td>
</tr>
<tr>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>Course status:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>optional</td>
<td>4.0</td>
</tr>
</tbody>
</table>

## Course objectives
The student is expected to acquire a basis knowledge of reinforcing of soil and rocks. The main objective of this course is to educate future engineers in basic analysis and develop competences in designs and constructions of different types of soil and rocks reinforcing.

## Syllabus
- Design conditions and method selection
- Consolidation of soil, preparatory loading and drainage
- Deep compaction (vibroflotation, dynamic compaction)
- Reinforced embankments and geosynthetics
- Grouting of soil and rocks
- Reinforced soil and rocks (anchors and bolts)
- Stability and stress-strain analysis
- Design of reinforcing of soil and rocks
- Probe fields
- Technical conditions and regulations

## Student obligations
- Lecture course attendance
- Exercise course attendance
- Seminar course attendance

## Exam
Written and oral.

## Assessment
70% during semester, 30% final exam.

## Literature
### Essential:

### Recommended:
### Course: SEEPAGE AND CONSOLIDATION OF SOIL

<table>
<thead>
<tr>
<th>Course code: G-207</th>
<th>Pre-requisites: Theoretical Soil Mechanics</th>
<th>Hours of Active Classes: 60 lectures: 30 exercises: 15 seminars: 15</th>
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<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 4.0</td>
</tr>
</tbody>
</table>

#### Course objectives
This course is concerned with the flow of water in incompressible and compressible soil strata. The course should enable the student to formulate, in a realistic way, the solutions to real engineering problems; either by direct analytical or numerical methods.

#### Syllabus
- Water in soils: capillarity, shrinkage, swelling, frost action
- Effective stresses in soil
- Water flow through soil: permeability, flow nets, seepage force, critical hydraulic gradient
- Measurements of permeability
- Control of seepage and filters
- Consolidation process
- Oedometer testing
- Preconsolidation pressure
- Time rate of consolidation
- Consolidation settlement calculations

#### Student obligations
Course attendance.

#### Exam
Written and oral.

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**

**Recommended:**
<table>
<thead>
<tr>
<th>Course:</th>
<th>GEOHAZARDS</th>
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<tbody>
<tr>
<td>Course code:</td>
<td>G-219</td>
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<tr>
<td>Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
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<tr>
<td>Lectures:</td>
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<td>The course consists of:</td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>Exercises</td>
</tr>
<tr>
<td>Course objectives</td>
<td>Basic understanding a connection between endodynamics and exodynamics of the Earth and geohazard phenomena, Assessment, mitigation and avoidance of geohazard, and also the influences of land-use planning and constructions works for the changing of hazard and risk level. Students will be prepared for supplementary courses in geotechnics and hydrotechnics.</td>
</tr>
<tr>
<td>Syllabus</td>
<td>Introduction: hazard and risk</td>
</tr>
<tr>
<td></td>
<td>Huge natural disaster</td>
</tr>
<tr>
<td></td>
<td>Volcanic and seismic activity</td>
</tr>
<tr>
<td></td>
<td>River erosion, accumulation and floods</td>
</tr>
<tr>
<td></td>
<td>Marine erosion and accumulation</td>
</tr>
<tr>
<td></td>
<td>Soil erosion and mass movements</td>
</tr>
<tr>
<td></td>
<td>Hazard mapping and monitoring</td>
</tr>
<tr>
<td></td>
<td>Assessment, mitigation and avoidance of geohazard</td>
</tr>
<tr>
<td>Student obligations</td>
<td>Course attendance in accordance to University/Faculty regulations.</td>
</tr>
<tr>
<td></td>
<td>Completed and accepted seminar paper.</td>
</tr>
<tr>
<td></td>
<td>Preliminary exams.</td>
</tr>
<tr>
<td></td>
<td>Final exam</td>
</tr>
<tr>
<td>Exam</td>
<td>Written and oral.</td>
</tr>
<tr>
<td>Assessment</td>
<td>70% during semester, 30% final exam.</td>
</tr>
<tr>
<td>Literature</td>
<td>Essential:</td>
</tr>
<tr>
<td></td>
<td>Recommended:</td>
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</table>
### Course: GEOTECHNICAL ENGINEERING IN ROAD STRUCTURES

<table>
<thead>
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<th>Course code: G-220</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of: lectures exercises -</td>
<td>lectures: 25 exercises: 20 seminars: 0</td>
</tr>
<tr>
<td>Course status:</td>
<td></td>
<td>ECTS: 4.0</td>
</tr>
<tr>
<td>optional</td>
<td></td>
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</tr>
</tbody>
</table>

**Course objectives**
The student is expected to acquire a basis knowledge of geotechnical problems in road structures. The main objective of this course is to educate future engineers in basic geotechnical problems during road construction and expected to acquire a knowledge of the methods and processes in this field of civil engineering.

**Syllabus**
- Geotechnical investigations for road structures
- Classifications of soils and rocks in road constructions
- Soil compaction
- Earth structures
- Retaining constructions
- Slope stability
- Erosion protections
- Earth structures
- Drainage constructions
- Geotechnical aspect of pavements constructions
- Geotechnical aspect in tunneling

**Student obligations**
- Course attendance in accordance to University/Faculty regulations.
- Preliminary exams.
- Final exam

**Exam**
- Written and oral.

**Assessment**
- 70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
### Course: WATER SUPPLY AND DRINKING WATER TREATMENT

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-251</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Computational Hydraulics</td>
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<tr>
<td>Hours of Active Classes:</td>
<td>60 lectures: 30 exercises: 30 seminars: 0</td>
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<td>The course consists of:</td>
<td>lectures exercises -</td>
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<td>ECTS:</td>
<td>6.0</td>
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</tbody>
</table>

#### Course objectives
- To provide that students during the course acquire the knowledge needed for solving complex engineering problems in the field of water supply and drinking water treatment.
- To develop students ability for independent realization of complex tasks in the field of water supply and drinking water treatment.

#### Syllabus

#### Student obligations
- Course attendance in accordance to University/Faculty regulations.
- Completed and accepted project work before the end of the term.
- Preliminary exams.

#### Exam
Written.

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**

**Recommended:**
### Course: DRAINAGE AND WASTEWATER TREATMENT

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-252</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Computational Hydraulics</td>
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<tr>
<td>Hours of Active Classes:</td>
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<td>Seminars:</td>
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<td>Course status:</td>
<td>compulsory</td>
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<tr>
<td>The course consists of:</td>
<td>lectures exercises -</td>
</tr>
<tr>
<td>ECTS:</td>
<td>6.0</td>
</tr>
</tbody>
</table>

### Course objectives
To provide that students during the course acquire the knowledge needed for solving complex engineering problems in the field of drainage and sewage systems and wastewater treatment.
To develop students ability for independent realization of complex tasks in the field of drainage and sewage systems and wastewater treatments.

### Syllabus

### Student obligations
- Course attendance in accordance to University/Faculty regulations.
- Completed and accepted project work before the end of the term.
- Preliminary exams.

### Exam
Written.

### Assessment
70% during semester, 30% final exam.

### Literature
**Essential:**
3. Karleuša, B.: Teaching material from the course web-page

**Recommended:**
Course: HYDRAULIC STRUCTURES

Course code: H-253

Pre-requisites:

Hours of Active Classes: 60
lectures: 30  exercises: 30  seminars: 0

Course status: compulsory

The course consists of:

ECTS: 6.0

Course objectives

To provide that students during the course adopt the basic knowledge of hydrology and hydraulics, water supply and sewage systems, river regulations and hydraulic land reclamations and improvements.

To present students the connections between natural water resources and hydrotehnic solutions.

Syllabus

Definitions, goals and tasks of hydrotechnics.
Basics of hydrology (hydrologic cycle, hydrometeorology, characteristics of catchment areas, hydrometrics).
Basics of hydraulics (hydromechanics, pressure flow, open channel flow, flow over spillways and under gates, hydraulic jump, underground flow).
Basics of water supply systems (types of water supply systems, categories of water use, water sources and water catchment, pumping stations, water treatment, water reservoirs and tanks, water supply nets).
Basics of sewage systems (types of sewage systems, types of wastewaters, sewerage nets, structures, wastewater treatment, disposal of wastewater).
Basics of applied hydraulics (morphology of river beds, river regulations, hydraulic land reclamations and improvements, pedology, crop rotation).

Student obligations

– Course attendance in accordance to University/Faculty regulations.
– Writing and presenting a paper.
– Preliminary exams.

Exam

Written.

Assessment

70% during semester, 30% final exam.

Literature

Essential:
4. Karleuša, B.: Teaching material from the course web page

Recommended:
**Course:** ENGINEERING HYDROLOGY

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-257</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Hours of Active Classes:</td>
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<tr>
<td>The course consists of:</td>
<td>lectures exercises -</td>
</tr>
<tr>
<td>ECTS:</td>
<td>6.0</td>
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</table>

**Course objectives**
To provide that students during the course adopt basic knowledges and concepts of discharge processes and models
To present students the insights to stochastic and time series
Enabling students for independent performing of basic regional hydrologic analyses

**Syllabus**

**Student obligations**
- Attendance to lectures and exercises as defined by the faculty regulations.
- Attendance to exercises with computer use in hydrologic analyzes.
- Preparing and delivering of a program from exercises (application of statistic and parametric methods in hydrologic calculations)
- Preliminary exams.

**Exam**
Written and oral.

**Assessment**
70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
**Course:** HYDRAULIC REGULATIONS AND MELIORATIONS

<table>
<thead>
<tr>
<th>Course code:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Computational Hydraulics</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
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<tr>
<td>The course consists of:</td>
<td>lectures exercises -</td>
</tr>
<tr>
<td>ECTS:</td>
<td>6.0</td>
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</tbody>
</table>

**Course objectives**

To provide that during the course students adopt elements of engineers foreseeing, conclusion making and hydrotechnical tasks solving from the domain of regulation and melioration constructions. Enabling students for independent solving of tasks and calculations from the domain of river bed regulation and melioration.

**Syllabus**


**Student obligations**

- Attendance to lectures and exercises as defined by the faculty regulations.
- Preparing and delivering of a program from exercises (designing of the solution for water flow regulation and/or melioration)
- Preliminary exams.

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
### Course: COASTAL ENGINEERING

<table>
<thead>
<tr>
<th>Course code: H-259</th>
<th>Pre-requisites: The course consists of:</th>
<th>Hours of Active Classes: 60 lectures: 30 exercises: 15 seminars: 15</th>
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<tbody>
<tr>
<td>Course status: compulsory</td>
<td>lectures exercises seminars</td>
<td>ECTS: 6.0</td>
</tr>
</tbody>
</table>

#### Course objectives
To develop specific competences in statistical methods in coastal engineering field, determining the design conditions, geotechnical aspects of construction in coastal zone, dynamic impacts of waves on coastal and off-shore structures, structured coastal structures, properties and behaviour of building materials exposed to sea conditions.

#### Syllabus
- Statistical methods in coastal engineering
- Foundations, consolidation and settlement in coastal zone
- Natural sediment scour and structure-induced sediment scour
- Dynamic impact of waves on vertical walls, piles and plates in the sea
- Elastic submarine sea lines (pipelines) - design and sizing calculations
- Structured coastal structures - design and sizing calculations
- Properties and behaviour of building materials exposed to sea conditions

#### Student obligations
course attendance, exercise/project work preparation, seminar work preparation, preliminary exam

#### Exam
Written and oral.

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**

**Recommended:**
**Course:** EXPERIMENTAL HYDRAULICS

**Course code:** H-262  
**Pre-requisites:**  
**Hours of Active Classes:** 60  
lectures: 30  
exercises: 30  
seminars: 0

**Course status:** optional

**The course consists of:**  
lectures  
exercises  

**ECTS:** 4.0

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**Course objectives**

To ensure that in the upcoming professional work and/or research activities the students can actively participate in all phases of experimental research, the goal of the course is to ensure the basics knowledge of experimental mechanics related to the scientific field/discipline of hydraulics. Specifically, according to the traditional approach in presenting the material in experimental methods in engineering, the course content is designed to avoid selective approach in laboratory testing of hydrodynamic processes. Namely, opposed to the above, the course content was written with the intention to give the basic principles of experimental research in the sections of experimental hydraulics. In this way, the acquired knowledge and creative approach in reviewing engineering problems should create competencies for laboratory testing of various hydraulic systems.

---

**Syllabus**

01. teaching unit: Experimental mechanics  
02. teaching unit: Statistical analysis of experimental data  
03. teaching unit: Regression and correlation analysis  
04. teaching unit: Vaschy-Buckinghamov pi theorem  
05. teaching unit: Experimental design  
06. teaching unit: Physical models  
07. teaching unit: 3D printing  
08. teaching unit: Flow visualization  
09. teaching unit: Signal acquisition  
10. teaching unit: Fourier analysis  
11. teaching unit: Signal conversion  
12. teaching unit: Signal conditioning  
13. teaching unit: Measuring tensors quantity of 0. order  
14. teaching unit: Measuring tensors quantity of 1. order  
15. teaching unit: Measuring tensors quantity of 2. order

---

**Student obligations**

Students are required to regularly attend classes and independently write a seminar. However, depending on the number of enrolled students, seminars are made individually or in a group of 3-5 students. The seminar includes a design of experiment (virtual experiment) and depending on the current availability of laboratory space the designed experiment may be conducted.

---

**Exam**

Oral exam.

---

**Assessment**

The student will be evaluated and assessed during the semester and the final exam. The total number of points that a student can achieve during the semester is 70 (assessed activities indicated in Table 1.8) while the final exam gives a total of 30 points. Work throughout the semester will be evaluated and monitored through one-week consultation during which the students will present the results of last week's activities related to the making process of a seminar paper. Regularity in attendance consultation ensures continuity in the student work and the constant supervision and guidance of teachers (mentoring) ensures the quality of studying.

---

**Literature**

**Essential:**

**Recommended:**
# Course: WATER RESOURCES MANAGEMENT

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-255</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60&lt;br&gt;lectures: 30&lt;br&gt;exercises: 0&lt;br&gt;seminars: 30</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures - seminars</td>
</tr>
<tr>
<td>ECTS:</td>
<td>4.0</td>
</tr>
</tbody>
</table>

## Course objectives
- Introducing students to the complexity and multidisciplinary of water management problematic.
- Introducing students to different aspects of water manifestations in nature and in constructed system.
- Develop students' skills for solving problems in the field of water resources management and planning.

## Syllabus
- Basic concepts of water management: history, integral approach, sustainable development.
- Water resources. Catchment area as basic unit for water resources management.
- Natural water resources characteristics: surface waters and underground waters, sea, transitional waters.
- Water demands. Water resources and demands balance.
- Water resources use, conserving water resources and flood protection.
- Types and characteristics of water management structures. Reservoirs as the most complex multipurpose structures. Man influence in changing water regime.
- Water's role in socio-economic systems. Ecological components of hydrotechnical solutions.
- Water resources management: basics, goals and objectives, criteria and measures, methodology of generating alternative water management solutions and decision making.
- Use of simulation and optimization methods in decision making. Information support.
- Water resources management modelling.
- Legislative regulations. Water management plans.

## Student obligations
- Course attendance in accordance to University/Faculty regulations.
- Writing and presenting a paper.
- Preliminary exam.

## Exam
Written. 70% during semester, 30% final exam.

## Assessment

## Literature
### Essential:
6. Rubinić, J.: Teaching material from the course web page.

### Recommended:
<table>
<thead>
<tr>
<th><strong>Course:</strong></th>
<th><strong>KARST HYDROSYSTEMS</strong></th>
</tr>
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<tbody>
<tr>
<td><strong>Course code:</strong></td>
<td>H-256</td>
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<tr>
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<tr>
<td><strong>Hours of Active Classes:</strong></td>
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<tr>
<td><strong>Course status:</strong></td>
<td>optional</td>
</tr>
<tr>
<td><strong>ECTS:</strong></td>
<td>4.0</td>
</tr>
</tbody>
</table>

| **Course objectives** | - Providing basic knowledges regarding karst surroundings and patterns of the appearance and movements of water in them. Development of capabilities for the recognition of particularities of water managemental characteristics in karst  
- Enabling students for independent solving of basic tasks from the domain of planning and utilising of water from karst |
| **Syllabus** | - Geological basis of karst. Basic principles of water movement in karst. Karst hydrology.  
- Principles of salinization of coastal karst springs and aquifers.  
- Dynamics of underground waters in karst aquifers. Analyzes of water level fluctuations.  
- Specificities of water use in karst. Water capture from karst springs and aquifers.  
- Water bed regulations in karst. Accumulations in karst.  
- Water protection in karst. Hydrological elements of determination of zones of sanitary protection in karst. Karst water management |
| **Student obligations** | - Attendance to lectures and exercises as defined by the faculty regulations.  
- Attendance to the field courses.  
- Preparing and delivering of a paper from seminars  
- Preliminary exams. |
| **Exam** | Written. |
| **Assessment** | 70% during semester, 30% final exam. |

**Essential:**

**Recommended:**
**Course:** WASTE MANAGEMENT

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-263</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>45 lectures: 30 exercises: 10 seminars: 5</td>
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<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures exercises seminars ECTS: 4.0</td>
</tr>
</tbody>
</table>

**Course objectives**

Introducing students to basic knowledge and understanding of the problems of waste in modern society, problems of waste management, methods of reduce, reuse and recycle of waste, problems of land and water contaminations by waste, understanding engineering problems in design and construction of sanitary landfills.

**Syllabus**

- Modern civilization and waste problems
- Types of waste
- Domestic waste
- Hazardous waste
- Radioactive waste
- Problems of land and water contaminations
- Integrated waste management (reduce, reuse and recycle)
- Design and construction of sanitary landfills
- Monitoring of leachate and gas
- Legislative regulations
- The role of public in waste management

**Student obligations**

- Attendance to lectures and exercises as defined by the faculty regulations.
- Attendance to the field courses.
- Preparing and delivering of a paper from seminars and presentation
- Preliminary exams.

**Exam**

Written.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
## Course: HYDRAULIC MODELLING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-260</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
</tr>
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<tbody>
<tr>
<td>Course status:</td>
<td>optional</td>
<td>The course consists of:</td>
<td>lectures: 30</td>
<td>exercises: 30</td>
</tr>
</tbody>
</table>

### Course objectives
To provide that during the course students adopt elements of engineers foreseeing, conclusion making and tasks solving from the domain of hydrotechnical modeling. Enabling students for independent realisation of tasks from the domain of hydrotechnical modeling.

### Syllabus
- Movements equations. Dominant forces. Stationary and non-stationary processes.
- Border layer. Models of border layer description.
- Methods of fluid movement modeling. The significance for hydrotechnical objects planning.
- Types and choice of the model.
- Hybrid models. Remote and close field of modeling.
- Other types of modeling.
- Biphasic models. Liquid phases. Mixed phases. Substance carrying through.
- Correlation analysis model-nature.

### Student obligations
- Attendance to lectures and exercises as defined by the faculty regulations.
- Attendance to laboratory exercises.
- Preparing and delivering of a program from exercises.
- Preliminary exams.

### Exam
Written and oral.

### Assessment
70% during semester, 30% final exam.

### Literature
#### Essential:

#### Recommended:
<table>
<thead>
<tr>
<th>Course:</th>
<th>COMPUTATIONAL HYDRODYNAMICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code:</td>
<td>H-268</td>
</tr>
<tr>
<td>Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60 lectures: 30 exercises: 30 seminars: 0</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures exercises -</td>
</tr>
<tr>
<td>ECTS:</td>
<td>4.0</td>
</tr>
<tr>
<td>Course objectives</td>
<td>The main objective of the course is to prepare students to use advanced software packages for modeling of turbulent fluid flow (primarily liquids). To this end, the course contains selected theoretical aspects of turbulent flows and the basics of the method of numerical analysis of flow.</td>
</tr>
</tbody>
</table>
| Syllabus | 01. teaching unit: Computational fluid dynamics  
02. teaching unit: Navier–Stokes equations  
03. teaching unit: Turbulence modeling  
04. teaching unit: Equation for pressure field  
05. teaching unit: Finite-difference methods  
06. teaching unit: Theoretical basis of numerical methods  
07. teaching unit: Discretization of Diffusion Equations  
08. teaching unit: Discretization of Convection Equations  
09. teaching unit: Fundamentals of the finite element method  
10. teaching unit: Fundamentals of the finite volume method  
11. teaching unit: Solving system of equations  
12. teaching unit: Domain discretization  
13. teaching unit: Defining the boundary and initial conditions  
14. teaching unit: Visualization and validation of results  
15. teaching unit: Modeling of fluid-structure interaction |
| Student obligations | Students are required to regularly attend classes and independently develop the course assignments that are given according to the teaching units. |
| Exam | Oral exam. |
| Assessment | The student will be evaluated and assessed during the semester and the final exam. The total number of points that a student can achieve during the semester is 70 while the final exam gives a total of 30 points. Work throughout the semester will be evaluated and monitored through one-week consultation during which the students will present the results of last week’s activities related to the making process of a seminar paper. Regularity in attendance consultation ensures continuity in the student work and the constant supervision and guidance of teachers (mentoring) ensures the quality of studying. |
| Literature | Essential:  
Recommended:  
Course: | WATER POWER DEVELOPMENT  
---|---
Course code: H-261  
Pre-requisites: Hydraulic structures  
Course status: optional  
The course consists of: lectures exercises seminars  
Hours of Active Classes: 60 lectures: 30 exercises: 30 seminars: 0  
ECTS: 4.0

**Course objectives**

To introduce students to the basic principles of water power use, hydropower plants and equipment, and the environmental impact of this structures. To develop student's problem solving skills in the area of water power development and use.

**Syllabus**


**Student obligations**

- Course attendance in accordance to University/Faculty regulations.
- Completed and accepted project work before the end of the term.
- Preliminary exams.

**Exam**

Written.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
2. Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments; Vol 1-3; New York, American Society of Civil Engineers, 1989.
<table>
<thead>
<tr>
<th>Course</th>
<th>STRUCTURAL MODELLING</th>
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<tbody>
<tr>
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<td>MK-308</td>
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<tr>
<td>Pre-requisites:</td>
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</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>lectures: 30 exercises: 0 seminars: 30</td>
</tr>
<tr>
<td>Course status:</td>
<td>compulsory</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>- lectures</td>
</tr>
<tr>
<td>ECTS:</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Course objectives**

Enabling student to independently solve practical engineering problems from the field of the course.

**Syllabus**

Introduction. Modelling with bar elements, modeling of walls, plates and shells, modeling of dynamical loadings, stability analysis, soil-structure interaction, modeling of prestressing, building phases and special loadings, structural details and stress concentration.

**Student obligations**

- Attendance to lectures and seminars as defined by the Faculty regulations.
- Preparation and delivery of programming assignments on computer.

**Exam**

Written.

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
<table>
<thead>
<tr>
<th>Course code: MK-303</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 30</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of:</td>
<td>ECTS: 6.0</td>
</tr>
<tr>
<td>lectures</td>
<td>-</td>
<td>seminars</td>
</tr>
</tbody>
</table>

Course objectives

The main goal of the course is to help students in making decisions through linear and nonlinear programming.

Syllabus

- Linear programming.
- The Simplex Method.
- Duality and sensitivity.
- Integer Programming.
- The transportation algorithm.
- Inventory models.
- Forecasting. Nonlinear programming.
- Multivariable optimization with and without constraints.
- Network Analysis.
- Dynamic programming.
- Decision theory.
- Markovian processes.

Student obligation

Students are obliged to attend lessons.

Exam

Exam exists in seminar form.

Assessment

70% during semester, 30% final exam.

Literature

**Essential:**


**Recommended:**

<table>
<thead>
<tr>
<th>Course code:</th>
<th>MK-310</th>
<th>Course status:</th>
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</tr>
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<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60 lectures: 30 exercises: 0 seminars: 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECTS:</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course objectives</td>
<td>Familiarize the student with numerical simulation in materials engineering using traditional numerical methods (finite differences and finite elements) and stochastic method (cellular automata).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student obligations</td>
<td>Participation in all lectures and exercises. Submit and give presentation of the project work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam</td>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>80% preparation of programming assignments, 20% presentation of programming assignments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course:</td>
<td>FINITE ELEMENT METHOD</td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
<td></td>
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<tr>
<td>Course code:</td>
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<td></td>
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<tr>
<td>Pre-requisites:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course status: compulsory</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
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<td></td>
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<tr>
<td>lectures: 30</td>
<td>seminars: 30</td>
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<tr>
<td>The course consists of:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>lectures - seminars</td>
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<tr>
<td>ECTS:</td>
<td>6.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course objectives</td>
<td>Enabling student to independently solve practical engineering problems from the field of the course.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syllabus</td>
<td>Introduction. Finite elements based on displacement theory, bar finite elements, triangle finite elements, quadrilateral and isoparametric finite elements, finite elements for axisymmetric problems, for plates and shells. Finite elements in dynamic analysis, in partial differential equations and equations of fluid dynamics.</td>
<td></td>
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</tr>
<tr>
<td>Student obligations</td>
<td>Course attendance, preparation of programming assignments on computer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam</td>
<td>Written.</td>
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</tr>
<tr>
<td>Assessment</td>
<td>70% during semester, 30% final exam.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature</td>
<td>Essential:</td>
<td></td>
<td></td>
</tr>
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<td>Recommended:</td>
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</table>
# COMPUTER AIDED DESIGN

<table>
<thead>
<tr>
<th>Course code: MK-306</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60 lectures: 30 exercises: 0 seminars: 30</th>
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</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures -, seminars</td>
<td>ECTS: 4.0</td>
</tr>
</tbody>
</table>

## Course objectives
Enabling student to independently solve practical engineering problems from the field of the course.

## Syllabus
- Introduction.
- Application of software in civil engineering with examples.
- Drawing in CAD programs using programming.
- GIS.

## Student obligations
Course attendance, preparation of programming assignments on computer.

## Exam
Written.

## Assessment
70% during semester, 30% final exam.

## Literature
**Essential:**
3. DesignCAD 3000 user manual.

**Recommended:**
<table>
<thead>
<tr>
<th>Course:</th>
<th>INVERSE MODELLING IN STRUCTURAL EVALUATION</th>
</tr>
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<tbody>
<tr>
<td>Course code:</td>
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<td>Pre-requisites:</td>
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<td></td>
<td>lectures: 30</td>
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<tr>
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<td>exercises: 0</td>
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<td>lectures - seminars</td>
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<td>ECTS:</td>
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<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Enabling student to independently solve practical engineering problems from the field of the course.</th>
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<tbody>
<tr>
<td>Student obligations</td>
<td>Course attendance, preparation of programming assignments on computer.</td>
</tr>
<tr>
<td>Exam</td>
<td>Written.</td>
</tr>
<tr>
<td>Assessment</td>
<td>70% during semester, 30% final exam.</td>
</tr>
<tr>
<td>Course:</td>
<td>BUILDING PHYSICS</td>
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<tr>
<td>ECTS:</td>
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**Course objectives**
Enabling student to independently solve practical engineering problems from the field of the course.

**Syllabus**
- Introduction.
- Modelling of fundamental equations in diffusion and heat transfer.
- Modelling of Helmholtz wave equation.
- Computer programs for Assessment of heat and sound resistance in buildings.

**Student obligations**
Course attendance, preparation of programming assignments on computer.

**Exam**
Written.

**Assessment**
70% during semester, 30% final exam.

**Literature**
**Essential:**

**Recommended:**
### COMPUTER MODELLING OF GEOMETRIC SURFACES

<table>
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<tr>
<th>Course code:</th>
<th>MK-313</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
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<td>optional</td>
<td>The course consists of:</td>
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<td>ECTS: 4</td>
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<tr>
<td>Lectures</td>
<td>-</td>
<td>seminars</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

#### Course objectives
Students will learn higher order surfaces, their properties and possibilities for their constructive elaboration, using CAD. Students will creatively apply surfaces in buildings.

#### Syllabus
- Constructive processing of surfaces using CAD. Helical surfaces with the application. Conoid higher order with the application. Realistic modelling techniques, animations, light, materials.

#### Student obligations
- Course attendance
- Accepted project work before the end of the term
- Seminars

#### Exam
- Written exam,
- Oral exam

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**
1. Babić; Gorjanc; Sliepčević; Szirovicza: Konstruktivna geometrija, IGH, Zagreb, 2004.
2. Pletenac, Lidija: Geometrijsko modeliranje u CAD-u, repetitorij.
3. Priručnik za software DesignCAD (na računalu u "help"-u)

**Recommended:**
6. Časopisi i zbornici
<table>
<thead>
<tr>
<th>Course:</th>
<th>COMPUTATIONAL DURABILITY MECHANICS</th>
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</thead>
<tbody>
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<td>MK-314</td>
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<tr>
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<td>Seminars:</td>
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<td>The course consists of:</td>
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<tr>
<td>Lectures</td>
<td>Exercises</td>
</tr>
<tr>
<td>ECTS:</td>
<td>5.0</td>
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<tr>
<td>Course objectives</td>
<td>To introduce students to a number of causes and mechanisms and their interaction in the process of degradation of concrete and concrete structures, taking into account the effect of the environment as well as other loads.</td>
</tr>
<tr>
<td>Syllabus</td>
<td>Introduction. The mechanisms of concrete degradation. Elements of the model for durability mechanics: Rate of chemical reactions, heat generation, humidity, transport of moisture and heat, interaction between transport of moisture and heat, transport of ions, volume changes, change of strength</td>
</tr>
<tr>
<td>Student obligations</td>
<td>Making a computer program and presentation</td>
</tr>
<tr>
<td>Exam</td>
<td>Not include the final exam - 100% during the course</td>
</tr>
<tr>
<td>Assessment</td>
<td>Not include the final exam - 100% during the course</td>
</tr>
<tr>
<td>Recommended:</td>
<td></td>
</tr>
</tbody>
</table>

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55
# SYSTEM ENGINEERING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>MK-315</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Numerical Modeling</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>30 lectures: 15 exercises: 0 seminars: 15</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures seminars</td>
</tr>
<tr>
<td>ECTS:</td>
<td>4.0</td>
</tr>
</tbody>
</table>

## Course objectives
Solution of engineering problems that have more than one goal, considering constraints in finding problem solutions, use of computers in solving engineering problems.

## Syllabus
Introduction into systems, programing and computer algorithms in system engineering:
- unconstrained optimization,
- optimization with constraints,
- linear programming,
- nonlinear programming,
- dynamic programming,
- network analysis,
- economical aspects in engineering,
- decision analysis and knowledge basis,
- queuing theory.

## Student obligations
Active participation in the course activities, computer homework and assignments, quizzes.

## Exam
Not include the final exam - 100% during the course

## Assessment
Not include the final exam - 100% during the course

## Literature
**Essential:**
1. Kožar, Ivica: Autorska skripta,
2. DOAJ – Directory of Open Access Journals

**Recommended:**
1. Setscholars – The Open Access Journals
# STEEL STRUCTURES

**Course**: STEEL STRUCTURES  
**Course code**: NK-351  
**Pre-requisites**:  
**Hours of Active Classes**: 75 lectures: 45  
**Course status**: optional  
**Exercises**: 30  
**Seminars**: 0  

**ECTS**: 6.0

**Course Objectives**
Acquired knowledge of working concepts and properties of various bearing steel structures enable the competency in independent designing of steel structures. It is also a background for further practical and scientific education in the field of steel structures and structural engineering in general.

**Syllabus**

**Student obligations**
1. Working out of the detailed project of steel structure (disposition draft, static model of structure, resistance and stability of the entire structure and its elements, joint design and drafts).
2. Continuous assessment (partial exames).

**Exam**
Written exam

**Assessment**
70% during semester, 30% final exam

**Literature**
**Essential:**
5. Separati predavanja nastavnika i auditornih vježbi.

**Recommended:**
<table>
<thead>
<tr>
<th>Course:</th>
<th><strong>DYNAMICS OF STRUCTURES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course code:</strong></td>
<td>TM-402</td>
</tr>
<tr>
<td><strong>Pre-requisites:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hours of Active Classes:</strong></td>
<td>45 lectures: 30 exercises: 15 seminars: 0</td>
</tr>
<tr>
<td><strong>Course status:</strong></td>
<td>optional</td>
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<tr>
<td><strong>The course consists of:</strong></td>
<td>lectures exercises -</td>
</tr>
<tr>
<td><strong>ECTS:</strong></td>
<td>4.0</td>
</tr>
</tbody>
</table>

**Course objectives**

The student is expected to acquire a basic knowledge and understanding of the methods of Dynamics of Structures for implementation in Earthquake Engineering, Concrete Structures, Bridges.

**Syllabus**

Single-degree-of- freedom systems: equations of motion and solutions for free and forced undamped and damped oscillations; Response to harmonic and periodic excitations; Vibration isolation; Response to ground motion; Lumped -mass and continuous-mass systems; Duhamel's integral; Multi-degree-of-freedom systems: equation of motions and solution methods (matrix approach); Orthogonality of modes; Shear buildings; Normal coordinates; Modal analysis; The solution of modal equation using Laplace transforms.

**Student obligations**

Obligatory attendance to the course.

**Exam**

Written exam

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**


**Recommended:**

### TIMBER STRUCTURES

**Course:** TIMBER STRUCTURES  
**Course code:** NK-357  
**Pre-requisites:**  
**Hours of Active Classes:** 75 lectures: 45, exercises: 26, seminars: 4  
**Course status:** compulsory  
**The course consists of:** lectures, exercises, seminars  
**ECTS:** 6.0

### Course Objectives

Acquired knowledge of working concepts and properties of various bearing structures of wood and wood-based materials enable the competency in independent designing of timber structures. It is also a background for further practical and scientific education in the field of timber structural engineering and structural engineering in general.

### Syllabus


### Student Obligations

Working out of the detailed project of spatial timber structure (disposition draft, static model of structure, resistance and stability of the entire structure and its elements, joint design and drafts). Second signature conditions are a successful programme and a short seminar paper elaboration (chosen section of the lectures) accompanied by a public presentation with teacher-student discussion.

### Exam

Written.

### Assessment

70% during semester, 30% final exam.

### Literature

**Essential:**
2. Separati s predavanja/auditornih vježbi (za dijelove gradiva koji nisu obuhvaćeni udžbenikom)

**Recommended:**

---

**Course:** PRESTRESSED CONCRETE
<table>
<thead>
<tr>
<th>Course code:</th>
<th>NK-353</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>45 lectures: 30 exercises: 15 seminars: 0</th>
<th>ECTS:</th>
<th>4.0</th>
</tr>
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<tbody>
<tr>
<td>Course status:</td>
<td>compulsory</td>
<td>The course consists of:</td>
<td>lectures exercises</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course objectives</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Acquired knowledge of working concepts and properties of various bearing structures of concrete enable the competency in independent designing of prestressed concrete structures. It is also a background for further practical and scientific education in the field of prestressed concrete structures and structural engineering in general.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Syllabus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student obligations</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical elaboration of practices contents: working out of the major project of prestressed structure in a space concept (disposition, static structure model, resistance and stability of structure elements and the entire. Working out of programmes is adjusted to a firmly set auditor (40%) and constructive practices (60%). Second signature conditions are a successful programme.</td>
<td></td>
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<tr>
<td>Exam</td>
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<tr>
<td></td>
<td>Written and oral exam.</td>
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</tr>
<tr>
<td>Assessment</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>70% during semester, 30% final exam.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature</td>
<td>Essential:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Recommended:</td>
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</table>
### Course: SOLID BRIDGES

<table>
<thead>
<tr>
<th>Course code: NK-355</th>
<th>Pre-requisites: Concrete and Masonry Structures</th>
<th>Hours of Active Classes: 60 hours</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of: lectures exercises -</td>
<td>ECTS: 5</td>
</tr>
</tbody>
</table>

#### Course objectives
Design of different concrete bridges structures, (spanning structure, their supports and equipment: bearings, expansion joints, ...). Acquire the knowledge necessary to participate in the design of concrete bridges as a basis for future scientific and practical education in the field of concrete bridges.

#### Syllabus
- Lectures: Bridges and their mayor components: slabs, beams, boxes, frames, arches, suspension and cable-stayed bridges.
- Methods of analysis – superstructures and substructures.
- Numerical and finite element techniques and solutions i static, dynamic, seismic, wind and blast effects.
- Precast segmental box griders.
- Precast full-length box griders.
- Incrementally launched box gridr bridges.
- Practices: Auditor demonstration of characteristic systems according to the types and building technology.

#### Student obligations
Designing and handover of program task on the terms set out in the Implementation Programme. Attendance of lectures in accordance with the Regulations on studying. Attendance at preliminary exams.

#### Exam
Written.

#### Assessment
70% during semester, 30% final exam.

#### Literature
**Essential:**
1. Separati s predavanja i auditornih vježbi

**Recommended:**
<table>
<thead>
<tr>
<th>Course</th>
<th>INTRODUCTION TO COMPOSITE STRUCTURES</th>
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<tbody>
<tr>
<td><strong>Course code:</strong></td>
<td>NK-354</td>
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<tr>
<td><strong>Pre-requisites:</strong></td>
<td>Steel structures</td>
</tr>
<tr>
<td><strong>Course status:</strong></td>
<td>optional</td>
</tr>
<tr>
<td><strong>The course consists of:</strong></td>
<td>lectures exercises seminars</td>
</tr>
<tr>
<td><strong>Hours of Active Classes:</strong></td>
<td>45 lectures: 30 exercises: 15 seminars: 0</td>
</tr>
<tr>
<td><strong>ECTS:</strong></td>
<td>4.0</td>
</tr>
</tbody>
</table>

### Course objectives
Become familiar with the concepts and characteristics of interlock of structural systems made of materials with different physical and mechanical properties. Acquire the basic knowledge and competence in the field of design and construction of composite structures. Create a knowledge base as a foundation for continuing professional and scientific education in this area.

### Syllabus

### Student obligations
Attendance to lectures and exercises, continuous assessment (colloquiums) and exam.

### Exam
Written exam, max 30% of the grade of the course.

### Assessment
70% during semester, 30% final exam.

### Literature
**Essential:**
3. Separati s predavanja i auditornih vježbi

**Recommended:**
1. EN 1994-1-1 - Spregnute konstrukcije od čelika i betona
3. Specijalističke Internet stranice
<table>
<thead>
<tr>
<th>Course:</th>
<th>THEORY OF PLATES AND SHELLS</th>
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<table>
<thead>
<tr>
<th>Course code:</th>
<th>TM-401</th>
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<tbody>
<tr>
<td>Pre-requisites:</td>
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<td>Hours of Active Classes:</td>
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<td>lectures:</td>
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<td>exercises:</td>
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<tr>
<td>seminars:</td>
<td>6</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
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<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Seminars</td>
<td></td>
</tr>
<tr>
<td>ECTS:</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Course objectives
1. To understand the basic mechanical properties of different 2D structures: walls, membranes, plates, and shells.
2. To learn the fundamental principles of the two main theories of plates including their analytical and approximate solutions.
3. To acquire some preliminary skills for the course Finite-element method.

### Syllabus
1. Introduction to the theory of 2D structures.
2. Geometry of curved spaces.
3. Different 2D structures and their governing equations: walls, membranes, plates, and shells.
5. Mindlin-Reissner’s theory of plates.
6. Closed-form solution and the solutions using the finite-difference method and the finite-element method.
7. Dynamics of plates and the finite element solution with an example.
10. Energy formulations and the principle of virtual work in 2D structures.

### Student obligations
Understanding of the course material is periodically checked through seminars, the results of which are being added to the results of the written exam.

### Exam
none

### Assessment
100% during semester.

### Literature
**Essential:**

**Recommended:**
# THEORY OF PLASTICITY

<table>
<thead>
<tr>
<th>Course code:</th>
<th>TM-405</th>
</tr>
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<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
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<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>Lectures:</td>
<td>Lectures:</td>
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<tr>
<td>Exercises:</td>
<td>Seminars:</td>
</tr>
<tr>
<td>Seminars:</td>
<td>3.0</td>
</tr>
</tbody>
</table>

## Course objectives
Basic principles of continuum mechanics, introduction into basic principles of theory of incremental plasticity (failure surface, plastic potential, principle of maximal dissipation, flow rule, hardening and softening rule), modeling of different materials (metallic and quasi-brittle), numerical aspects of theory of incremental plasticity in finite elements.

## Syllabus
- Introduction
- Historical aspect of the plasticity theory
- Basic of continuum mechanics
- Basic principles of theory of incremental plasticity
- Failure surface
- Plastic potential
- Principle of maximum dissipation
- Flow rule
- Hardening and softening rule
- Modeling of hardening materials (metallic materials)
- Modeling of softening materials (quasi-brittle materials)
- Numerical aspect of the plasticity theory in finite elements
- Examples

## Student obligations
- Attendance of lectures
- Seminar work – condition for the attendance to the exam
- Exam

## Exam
Written and oral.

## Assessment
70% during semester, 30% final exam.

## Literature
**Essential:**

**Recommended:**
<table>
<thead>
<tr>
<th>Course code: TM-404</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures - seminars</td>
<td>lectures: 24 exercises: 0 seminars: 6</td>
</tr>
<tr>
<td>Course objectives</td>
<td>ECTS: 3.0</td>
<td></td>
</tr>
<tr>
<td>1. To understand the basic energy principles and to learn how to apply them to simple problems of statics of deformable bodies and analytical dynamics.</td>
<td></td>
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</tr>
<tr>
<td>2. To understand the essence of the energy-based approximate methods and the variational formulation of the finite-element method.</td>
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</tr>
<tr>
<td>3. To acquire some preliminary skills for the course Finite-element method.</td>
<td></td>
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</tr>
<tr>
<td>Syllabus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Introduction to the principle of virtual work and the principle of stationary total potential energy.</td>
<td></td>
<td></td>
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<tr>
<td>2. Relationship between the equilibrium equations and the energy principles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Application of the principle of virtual work to trusses and frameworks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Rayleigh-Ritz method with emphasis on beam structures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Galerkin’s method.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Application of the Rayleigh-Ritz method to buckling of beams.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Introduction to the finite-element method using the principle of virtual work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Shape functions for triangular wall elements. Stiffness matrix and load vector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Energy methods and principle of virtual work in dynamics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student obligations</td>
<td>Understanding of the course material is periodically checked through seminars, the results of which are being added to the results of the written exam.</td>
<td></td>
</tr>
<tr>
<td>Exam</td>
<td>none</td>
<td></td>
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<tr>
<td>Assessment</td>
<td>100% during semester.</td>
<td></td>
</tr>
<tr>
<td>Literature</td>
<td>Essential:</td>
<td></td>
</tr>
<tr>
<td>Recommended:</td>
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</table>
## Course: STABILITY OF STRUCTURES

<table>
<thead>
<tr>
<th>Course code: TM-403</th>
<th>Pre-requisites: The course consists of: lectures exercises seminars: 0</th>
<th>Hours of Active Classes: 45 lectures: 30 exercises: 15 seminars: 0</th>
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</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>ECTS: 4.0</td>
<td></td>
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</tbody>
</table>

### Course objectives

The student is expected to acquire a basic knowledge and understanding of the methods of Stability of Structures for implementation in Concrete Structures, Timber Structures, Bridges.

### Syllabus

- Static, dynamic and energy criterion of stability; Definition of critical loading and analytical formulation of critical loading, Eigenvalues; Orthogonality; Basic assumptions and basic equations of the second order theory; The second order theory and stability of prismatic and tapered members; Implementation od matrix approach and finite difference method;
- The second order theory and stability of system of members (plane frames) using the slope-deflection method;
- Stability of plate elements;

### Student obligations

Obligatory attendance to the course.

### Exam

Written exam

### Assessment

70% during semester, 30% final exam.

### Literature

**Essential:**


**Recommended:**

Course: SPECIAL CHAPTERS OF CONCRETE AND MASONRY STRUCTURES

<table>
<thead>
<tr>
<th>Course code: NK-352</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of:</td>
<td>lectures: 30 exercises: 15 seminars: 0</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>lectures</td>
<td>exercises</td>
</tr>
</tbody>
</table>

ECTS: 4.0

Course objectives
Students will acquire new and improve their already acquired knowledge about the rules of structural design, calculation and building of concrete and masonry structures so as to be able to independently design and participate in the design of reinforced concrete and masonry structures of all degrees of complexity. The acquired knowledge is also the basis for future technical and scientific education in the field of structural concrete construction and load-bearing structures in general.

Syllabus

Student obligations
Course attendance, seminars, preliminary exams.

Exam
The exam is taken in written form.

Assessment
Course attendance, seminars and preliminary exams (70%), written exam (30%).

Literature

Essential:
1. Course materials published on the website of the Faculty

Recommended:
### Course: DESIGN OF BUILDINGS

<table>
<thead>
<tr>
<th>Course code: OA-463</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
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<tbody>
<tr>
<td></td>
<td>The course consists of:</td>
<td>lectures: 15 exercises: 30 seminars: 0</td>
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<tr>
<td>Course status:</td>
<td>lectures exercises</td>
<td>ECTS: 4.0</td>
</tr>
<tr>
<td>optional</td>
<td>optional</td>
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</tr>
</tbody>
</table>

**Course objectives**
- Inform students about the methodology of planning and qualify them for reading and elaborating the planning documentation.

**Syllabus**
- Elements of historical development. Theoretical basis for evaluating an architectural work.
- Approach to planning, analysis of a location, programme, orientation, physics of a building.
- From a regional plan to an executional project.
- Technical conditions of building, standards, regulations, fire and conservation protection, safety at work.
- Function, construction, design for residential and public buildings.
- Staircases and elevators, installations, heating, cooling and ventilation.
- Modern facades and roof frames.
- Construction as the basis of formation - public buildings for special purposes, halls, big sheds, stadiums, theatres, airports.

**Student obligations**
- Course attendance
- Visits to building-sites and theme exhibitions
- Project work: Based on the assigned general design, a part of the executional project of a small public building or a part of it.

**Exam**
- none

**Assessment**
- 70% during semester, 30% final exam.

**Literature**

**Essential:**
2. Proizvodni programi građevinske opreme
3. Planovi i projekti izvedenih rješenja.

**Recommended:**
1. G. Knežević, I. Kordiš: Stambene i javne zgrade, tehnička knjiga, Zagreb
6. I. Tonković: Priča o građenju, Tehnička knjiga, Zagreb
## Course: PRECAST CONCRETE STRUCTURES

<table>
<thead>
<tr>
<th>Course code</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NK-358</td>
<td>The course consists of: lectures exercises</td>
<td>45 lectures: 30 exercises: 10 seminars: 5</td>
<td>4.0</td>
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</table>

<table>
<thead>
<tr>
<th>Course status</th>
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</thead>
<tbody>
<tr>
<td>optional</td>
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</tbody>
</table>

**Course objectives**

Acquired knowledge of working concepts and properties of various bearing structures of concrete enable the competency in independent designing of precast concrete structures. It is also a background for further practical and scientific education in the field of precast concrete structures and structural engineering in general.

**Syllabus**

Lectures:
- What is precast concrete.
- Materials used in precast structures.
- Precast frame analysis. Precast concrete floors.
- Precast concrete beams.
- Columns and shear Walls.
- Horizontal floor diaphragms.
- Joint and connections.
- Beam and column connections.
- Ties in precast concrete structures.

Practices:
- Auditor demonstration of characteristic systems according to the types and building technology.

**Student obligations**

Practical elaboration of practices contents: working out of the major project of precast concrete structure in a space concept (disposition, static structure model, resistance and stability of structure elements and the entire. Working out of programmes is adjusted to a firmly set auditor (40%) and constructive practices (60%). Second signature conditions are a successful programme.

**Exam**

Written.

**Assessment**

70% during semester, 30% final exam

**Literature**

**Essential:**
1. Lecture and practice notes.

**Recommended:**
2. Floor Connections – Precast Concrete Connection Details, Beton – Verlag, Düsseldorf, 1981.
# EARTHQUAKE ENGINEERING

## Course:
**Course code:** NK-361
**Course status:** optional

## Pre-requisites:
The course consists of:
- lectures: 30
- exercises: 15
- seminars: 0

## Hours of Active Classes:
- ECTS: 4.0

## Course objectives
Ability to identify, formulate and solve engineering problems in the field of earthquake resistant analysis and design of concrete and steel structures.

## Syllabus
Response of structures to ground motion; Response spectrum; Base shear coefficient; Seismic modal analysis of multi-degree-of-freedom systems using spectral theory; Matrix approach of seismic modal analysis; Soil-structure interaction; Earthquake response and design of multistorey buildings; Eurocode 8: seismic zonation, definition of earthquake loading on buildings using spectral approach; Combination of loading after Eurocode 1 and Eurocode 8: seismic combination; Specific rules for design and construction of reinforced concrete and steel structures; United States International Building Code IBC2000: implementation in Croatia.

## Student obligations
Course attendance according to Faculty regulations. Preliminary exams.

## Exam
Written

## Assessment
70% during semester, 30% final exam

## Literature
### Essential:

### Recommended:
# Course: TESTING OF STRUCTURES

| Course code: | NK-360 |
| Pre-requisites: | |
| Hours of Active Classes: | 45 lectures: 30 exercises: 15 seminars: 0 |
| Course status: | optional |
| The course consists of: | lectures exercises - |
| ECTS: | 4.0 |

## Course objectives
Qualifying of students in the field of measurement and measuring technics and direct applied in testing of civil engineering structures. Intoduction with methods of measuring and corresponding norms and standards in the field of quality control during the building and exploitation of civil engineering structures.

## Syllabus

## Student obligations
Continuously obligatory attendance to lecture and exercises. On the exercises, the students have to acquire the data of measuring of every exercise. After it, data has to be analysed and compared with the theoretical values and made a report.

## Exam
Written

## Assessment
70% during semester, 30% final exam.

## Literature
### Essential:
1. Separates with complete lectures

### Recommended:
# Course: RELIABILITY OF CIVIL ENGINEERING STRUCTURES

<table>
<thead>
<tr>
<th>Course code:</th>
<th>NK-363</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td></td>
<td>lectures</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>seminars</td>
</tr>
<tr>
<td>Course status: optional</td>
<td>ECTS: 3.0</td>
</tr>
</tbody>
</table>

## Course objectives
The student is expected to acquire a basic knowledge and understanding the meaning and application of reliability engineering in the field of civil engineering structures.

## Syllabus

## Student obligations
1. Continuous assessment (preliminary exames).
2. Working out of a seminar (chosen section of the lectures and recommended topics) and public presentation with teacher-student discussion.

## Exam
Written exam, max 30% of the grade of the course.

## Assessment
70% during semester; 30% final exam

## Literature
### Essential:
3. Separati s predavanja

### Recommended:
### Course: SPECIAL CHAPTERS OF LIGHTWEIGHT STRUCTURES

<table>
<thead>
<tr>
<th>Course code:</th>
<th>NK-367</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>Timber Structures, Steel Structures</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60 lectures: 30 exercises: 20 seminars: 10</td>
</tr>
<tr>
<td>Course status:</td>
<td>optional</td>
</tr>
<tr>
<td>The course consists of:</td>
<td>lectures exercises seminars</td>
</tr>
<tr>
<td>ECTS:</td>
<td>5.0</td>
</tr>
</tbody>
</table>

#### Course objectives

Acquisition of the basic knowledge and competence on spatial concepts of lightweight structures, the application of theoretical basis in modeling procedures and analysis of such systems, the design and technology of the execution of various spatial systems made of wood and/or metals, as well as the design and execution of aluminum structures and curtain walls. Created knowledge serves as a background for a further practical and scientific education in these fields.

#### Syllabus

- **Geodesic domes:** geometry, structural system, sheeting, connections and joint details, assembly, modeling.
- **Pneumatic structures:** pneumatic balloons and cushions, pneumatic beams, arches and discs, modeling.
- **Lightweight membrane structures:** structural types, ways of membrane stabilization, supporting and modeling.
- **Synergetic Structures:** behaviour principles at overtaking of external actions, control systems (load-bearing capacity and stability regulation) and monitoring.
- **Tensile integrity systems:** light spatial structures, integrated systems of tension and compression elements.

#### Student obligations

According to the curriculum and the implementation programme of the course — preparation, presentation and discussion of seminar paper, preparation and presentation of the programme task (preliminary project level), written partial tests, written final exam.

#### Exam

Written

#### Assessment

70% during semester; 30% final exam

#### Literature

**Essential:**
1. Žagar, Z. Drvene konstrukcije I i II, Pretei d.o.o., Zagreb, 2002./03.
2. Lecture notes.

**Recommended:**
4. Internet pages
Course: **STEEL BRIDGES**

<table>
<thead>
<tr>
<th>Course code: NK-356</th>
<th>Pre-requisites: Steel Structures</th>
<th>Hours of Active Classes: 45 lectures: 30 exercises: 15 seminars: 0</th>
</tr>
</thead>
</table>

**Course status:** compulsory  
**The course consists of:**  
lectures - seminars  
**ECTS:** 4.0

**Course objectives**  
Acquired knowledge of working concepts and properties of various bearing systems enable the competency in designing of steel bridges. It is also a background for further practical and scientific education in the field of bridges and structural engineering in general.

**Syllabus**  

**Student obligations**  
Project work. Preliminary exames.

**Exam**  
Written.

**Assessment**  
70% during semester, 30% final exam

**Literature**  
**Essential:**  

**Recommended:**  
2. Specijalističke Internet stranice
<table>
<thead>
<tr>
<th>Course</th>
<th>ROAD INTERSECTIONS AND CROSSROADS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code:</td>
<td>P-501</td>
</tr>
<tr>
<td>Pre-requisites:</td>
<td>Road Design</td>
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<tr>
<td>Hours of Active Classes:</td>
<td>50</td>
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<tr>
<td>Lectures:</td>
<td>20</td>
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<tr>
<td>Exercises:</td>
<td>15</td>
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<tr>
<td>Seminars:</td>
<td>15</td>
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<tr>
<td>The course consists of:</td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
</tr>
<tr>
<td>Seminars</td>
<td></td>
</tr>
<tr>
<td>ECTS:</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Course objectives**
The main objective of this course is to educate future engineers to identify, formulate and solve engineering problems in the field of road intersections and crossroads.

**Syllabus**
Crossroads (grade junctions):
- types ("classic" and roundabouts), characteristics, design elements, capacity determination, traffic signs and road marking

Intersections (up-grade - grade separated junctions and interchanges):
- types, characteristics, design elements, capacity determination, traffic signs and road marking

Other crossings:
- with railways, rivers, channels and other engineering structures

**Student obligations**
Course attendance (more than 70%).
Preliminary exams.
Three individual seminar works ("classic" crossroads, roundabout, intersection)
The project of concrete example (made in groups) on idea level.

**Exam**
Written and oral.

**Assessment**
70% during semester, 30% final exam.

**Literature**
**Essential:**
1. Pravilnik za projektovanje putova (u pripremi)
2. A. Klemenčić: Oblikovanje cestovnih čvorišta izvan razine, Građevinski institut Zagreb, 1982
3. T. Tollazzi: Kružna raskrižja (hrvatska verzija - u tisku)
4. NORMA U.C4.050 Površinska raskrižja
5. Pravilnik o uvjetima za projektiranje i izgradnju priključaka i prilaza na javnu cestu (NN 119/07)

**Recommended:**
1. Richtlinien für die Anlage von Landstraßen (RAL) - Planfrei Knotenpunkte (RAL-K-2), 1996
2. Richtlinien für die Anlage von Landstraßen (RAL) - Plan Knotenpunkte (RAL-K-1), 1995
## Course: URBAN TRAFFIC

<table>
<thead>
<tr>
<th>Course code: P-503</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of:</td>
<td>60 lectures: 30 exercises: 30 seminars: 0</td>
</tr>
<tr>
<td>Course status: compulsory</td>
<td>lectures exercises</td>
<td></td>
</tr>
</tbody>
</table>

| ECTS: | 6.0 |

### Course objectives
By adopting the subject material, student acquires basic knowledge about designing city roads and intersections, different aspects of urban transport and their laws. Student is able to independently design elements of city traffic areas (parking lots, etc.) and create smaller traffic studies.

### Syllabus
- City and traffic, Traffic Planning in the city
- Traffic projects
- Categorisation of city roads
- Design elements of city roads: cross section, horizontal situation, longitudinal profile
- City intersections: types, design, traffic flow
- Unmotorised traffic in the cities: pedestrians, cyclists
- Parking areas
- The role and importance of public transportation
- Types of public transport

### Student obligations
- activities at the class
- assignments
- program
- seminar work
- preparation of a field assignment

### Exam
none

### Assessment
- activities at the class: 12%
- seminar work: 8%
- field assignment: 10%
- program: 30+10%
- Final Knowledge verification: 30%

According to the Regulation of the Studies of the University of Rijeka and the Regulation on the valuation of and evaluation of students' work at the Faculty of Civil Engineering, University of Rijeka

### Literature

**Essential:**
1. Notes from lectures

**Recommended:**
1. Scientific and technical articles from journal Modern traffic and other information available on the web
Course: **TRAFFIC ENGINEERING**

<table>
<thead>
<tr>
<th>Course code:</th>
<th>P-516</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60</th>
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<tbody>
<tr>
<td></td>
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<td>lectures: 30 exercises: 15 seminars: 15</td>
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<td>Course status:</td>
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<tr>
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<td>lectures exercises seminars</td>
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<tr>
<td>ECTS:</td>
<td>5.0</td>
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</tr>
</tbody>
</table>

**Course objectives**
- Introducing with the relation between transport offers and demands, techniques of flow management on highways and intersections
- Definitions between possible solutions and finding optimisations
- Character of traffic planning and Modal split

**Syllabus**

1. The problem of traffic; relationship between traffic supply and demand.
4. Traffic on sections of roads. Safety, capacity (level of service), economy, the ambience. Sizing of roads.
5. Conflicts of traffic flows. Intersections and junctions. The principles of traffic regulation. Traffic characteristics of types of intersections; design of the intersection.
6. Standard traffic signalisation; horizontal, vertical, dynamic. Signal light; mode; Phase Plan in time and space. Traffic lights coordination; line, network.
7. Signboards and non-standard traffic signs; transport equipment.
8. Stationing of the vehicle; relevant vehicle; parking plan, technology of the parking lot.

**Student obligations**
- Project work
- Individual assignments
- Seminar paper
- Written exam

**Exam**
- Written.

**Assessment**
- 70% during semester, 30% final exam-

**Literature**

**Essential:**
2. Padjen, J.: Prostorno-prometno planiranje, Informator Zagreb

**Recommended:**
1. Građevni godišnjak '96; Legac., I.: Planerske i prometnotehni
2. Ceste i mostovi, Časopis Društva za ceste Via Vita
3. Suvremeni promet – journal
## Course: **FLEXIBLE PAVEMENT STRUCTURES**

<table>
<thead>
<tr>
<th>Course code: P-508</th>
<th>Pre-requisites: Road Design</th>
<th>Hours of Active Classes: 60 lectures: 30 exercises: 15 seminars: 15</th>
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</thead>
<tbody>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 6.0</td>
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</tbody>
</table>

### Course objectives
Development of skills for the analysis of pavement structure and pavement design methodology taking into consideration their advantages as well as disadvantages. It is particularly important that students recognize relationship between the pavement design options and subsequent needs of maintenance and pavement management.

### Syllabus
Introduction. Principles of structural pavement design: empirical and theoretical approach. Environment (moisture, temperature, wind). Soil freezing under the pavement structures. Relation between pavement design options and road management system. Cross section, shoulders and drainage. Traffic and axle loading. Surface course. Pavement foundation. Pavement materials: basic components; unbound materials; aggregates; bitumen; bound materials; hydraulic and bituminous binders; geosynthetics. Design of new pavement structures: data required for designing (traffic, climatic and environmental data, parameters describing the pavement foundation, materials for pavement courses); design and calculation of various types of pavement structures (flexible pavement, composite pavement, inverse pavement, cement-concrete pavement) provided with illustration of a pavement design example; check of pavement structure against the frost action. Pavement rehabilitation. Pavement surface characteristics.

### Student obligations
Course and exercises attendance. Elaboration and delivery of programmes with the pavement structure calculation. Seminar-work on road materials - laboratory testing of materials characteristics.

### Exam
Written and oral exam.

### Assessment
70% during semester, 30% final exam.

### Literature
**Essential:**

**Recommended:**
**Course:** RIGID PAVEMENT STRUCTURES

<table>
<thead>
<tr>
<th>Course code: P-509</th>
<th>Pre-requisites: Theory and Technology of Concrete</th>
<th>Hours of Active Classes: 40 lectures: 25 exercises: 10 seminars: 5</th>
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<tbody>
<tr>
<td>Course status: compulsory</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 4.0</td>
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</table>

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>The course provides students with a broad overview of rigid-concrete road design and construction and understanding of mechanistic behavior of rigid pavements.</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Syllabus</th>
<th>Concrete road history</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subgrades and subbase materials</td>
</tr>
<tr>
<td></td>
<td>Types of concrete pavements</td>
</tr>
<tr>
<td></td>
<td>Traffic loading</td>
</tr>
<tr>
<td></td>
<td>Stress and strain calculation for traffic and thermal loading</td>
</tr>
<tr>
<td></td>
<td>Concrete pavements for highways</td>
</tr>
<tr>
<td></td>
<td>Concrete industrial pavements</td>
</tr>
<tr>
<td></td>
<td>Basics of airport pavements, methods for calculation</td>
</tr>
<tr>
<td></td>
<td>Building of concrete pavements</td>
</tr>
<tr>
<td></td>
<td>Distresses and maintenance of concrete pavements</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student obligations</th>
<th>accepted project work until specified date, oral preliminary exam</th>
</tr>
</thead>
</table>

Exam Written and oral exam

Assessment 70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
Course: ROADBED DESIGN

Course code: P-510  Pre-requisites: Road Design  Hours of Active Classes: 60  lectures: 30  exercises: 20  seminars: 10
Course status: compulsory  The course consists of: lectures  exercises  seminars  ECTS: 5.0

Course objectives
The student is expected to develop problem solving skills in the area of roadbed structures design and to be able to calculate associated earthworks, produce and analyse mass haul diagrams.

Syllabus
- Cross sections of roads, railways, airports
- Concrete road history
- Preliminary researches (hydrological, geological, geotechnical researches)
- Soil classifications for roads
- Drainage issues in road design
- Frost action
- Preliminary works in road building process
- Design and building of cuts
- Design and building of embankments
- Technics for reinforcement of low-bearing soils
- Geotextiles in road building: design and construction
- Cut and fill balance, mass haul diagrams

Student obligations
- accepted project work and seminar before the end of the term or before specified date
- attendance to the construction site visits

Exam
Written and oral exam

Assessment
70% during semester, 30% final exam.

Literature
Essential:
   - Knjiga I: Opće odredbe i pripremni radovi
   - Knjiga II: Zemljani radovi, odvodnja, potporni i obložni zidovi
   - Knjiga III: Kolnička konstrukcija

Recommended:
<table>
<thead>
<tr>
<th>Course</th>
<th>RAILWAY DESIGN</th>
</tr>
</thead>
</table>

### Course Details

- **Course Code:** P-512
- **Pre-requisites:**
- **Hours of Active Classes:** 60 lectures: 45 exercises: 15 seminars: 0
- **Course status:** optional
- **ECTS:** 5.0

### Course Objectives
With successfully acquired matter, student is expected to have basic knowledge about track bed structure and track substructure; student is qualified to design the same.

### Syllabus
- Railway like a mean of transportation
- Historic overview of railway and development
- Classification of railway lines and trains
- Cross section of railway
- Track bed structure and track substructure
- Track construction, rails and sleepers
- Calculation of stresses; dimensioning of rails, sleepers, ballast and formation level
- Railway line design
- Rail route design, null-line alignment, technical elements
- Railway project elements: situation, longitudinal section, cross sections, technical description
- Railway maintaining and reconstruction
- Railway stations
- Track device: switch, turntable, rail expansion joint

### Student Obligations
- accepted project work before specified date

### Exam
- Written and oral exam

### Assessment
- 70% during semester, 30% final exam.

### Literature

**Essential:**
1. Marušić, D., Projektiranje i građenje željezničkih pruga, GF Split, Split, 1994
2. Pollak, B., Željeznički gornji stroj, FGZ, Zagreb, 1982

**Recommended:**
# Course: TRAFFIC, SPACE AND ENVIRONMENT

<table>
<thead>
<tr>
<th>Course code:</th>
<th>P-504</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
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<tr>
<td>Lectures:</td>
<td>Seminars:</td>
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<tr>
<td>30</td>
<td>15</td>
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<tr>
<td>45</td>
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</tbody>
</table>

**Course status:** optional

**Course objectives:** To introduce students to the essential aspects of the various and complex influences between transport infrastructure, space, and environmental impacts. Furthermore, students should be able to objectively evaluate the different starting points and arguments in the integrated decision-making process on the future spatial units, in accordance with the principles of sustainable development.

**Syllabus:** Plans, programs, strategic documents regarding traffic, space and environmental impact: features, types, components, development methodology, adoption and implementation. Laws, regulations (conventions), institutions (organizations), public participation and other entities in the drafting and implementation of plans and other important documents: the level of municipalities, regions, countries, international level - especially the European Union. Processing of some important topics related to the mutual impact of traffic, space and the environment: traffic infrastructure or design of traffic networks in relation to the character and objects of spatial planning - policy instruments of spatial planning, transportation (mobility) and the impact on the environment while respecting the principles of sustainable development - economy, social and other issues. Dealing with specific thematic areas. Review and examples of using evaluation methods in the evaluation of alternatives and plans.

**Student obligations:** The participation of students in all aspects of teaching including the preparation and presentation of a seminar paper.

**Exam:** The exam is written and oral.

**Assessment:** 70% during semester, 30% final exam.

**Literature**

**Essential:**
1. Reference material made of a lecturer.
   - Documents and other sources and laws (international conventions) regarding transportation planning and related infrastructure, space, and sustainable development and environmental protection:
     - International: UN, EU, OECD and other international organizations,
     - On the national level (strategies, plans, status reports, etc.), - Zagreb: OG
     - At the level of regional and local governments (programs, plans, decisions, etc.) - Official Gazette of the county and others

**Recommended:**
**Course**: TRAFFIC SAFETY

<table>
<thead>
<tr>
<th>Course code: P-505</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30 exercises: 15</td>
</tr>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises -</td>
<td>seminars: 0</td>
</tr>
<tr>
<td></td>
<td>ECTS: 3.0</td>
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</table>

**Course objectives**

Main objectives of this course are: introducing the students with the system of safety in global sense, processing the relevant numerical application in analysis the traffic safety on roads, introducing the actual methods of controlling and regulating technique in all the traffic modes.

**Syllabus**

- Development and tasks of the traffic technique
- Elements of the traffic safety (correlation man-vehicle-communication)
- Traffic-technical elements of the street and road network
- Dynamics of moving the vehicle (numerical application)
- Capacity of the road communication and nodes
- Management controlling systems in all the traffic modes
- Intelligent traffic systems

**Student obligations**

Accepted project work before specified date

**Exam**

Written and oral exam

**Assessment**

70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
<table>
<thead>
<tr>
<th>Course:</th>
<th>TECHNOLOGY OF TRAFFIC BUILDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course code:</td>
<td>P-507</td>
</tr>
<tr>
<td>Pre-requisites:</td>
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</tr>
<tr>
<td>Hours of Active Classes:</td>
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<tr>
<td>Course status:</td>
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</tr>
<tr>
<td>The course consists of:</td>
<td>lectures  exercises  -  ECTS: 3.0</td>
</tr>
<tr>
<td>Course objectives</td>
<td>Traffic objects planning in space/city, traffic design, interior traffic technology and work on dimensions subjects and spaces  Definitions of possible solutions and optimal solution traffic technology in traffic objects</td>
</tr>
<tr>
<td>Syllabus</td>
<td>Traffic approach to traffic objects  Traffic objects: garages, parking buildings, service objects, terminals of public transport  Main principle of planning and location elements  Traffic and traffic forecast; traffic demands  Functional aspects  Types; possible solutions  Traffic objects - Main principles of its design  Dimension work and capacities  Subjects in traffic equipment  Traffic technology and way of use</td>
</tr>
<tr>
<td>Student obligations</td>
<td>Aktiv comments and opinions on lectures.  Seminar work. Solutions of traffic technology on special traffic object. Work in groups. Presentation of work.  Exam in writing form.</td>
</tr>
<tr>
<td>Exam</td>
<td>Written and oral exam</td>
</tr>
<tr>
<td>Assessment</td>
<td>70% during semester, 30% final exam.</td>
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</table>
## Course:
**TRAFFIC BUILDINGS**

<table>
<thead>
<tr>
<th>Course code: OA-462</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60 lectures: 30 exercises: 30 seminars: 0</th>
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<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises</td>
<td>ECTS: 4.0</td>
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</table>

### Course objectives
Inform students about the methodology of planning and qualify them for reading and possibly elaborating the planning documentation.

### Syllabus
A city and traffic, historical review of the development, traffic buildings in an urban environment and outside of it.
From a regional plan to an executional project.
Individual and collective garages, public garage-parking facilities, ramped and mechanized.
Petrol stations, typology, function, construction, formation.
Service centres, function, construction, formation.
Public transportation stations, taxi stations.
Bus stations and terminals.
Train stations and terminals.
Truck terminals.
Construction as the basis of formation in planning airport buildings.
Waterfront- ferry terminals.

### Student obligations
Course attendance
Visits to building-sites and theme exhibitions
Project work: Based on the general design of a concrete assignment, a segment of a traffic building, part of the general design and executional project should be elaborated.

### Exam
Written and oral exam

### Assessment
70% during semester, 30% final exam.

### Literature
**Essential:**
3. Production-programmes for building equipment.
4. Plans and projects of executional solutions.

**Recommended:**
## Course: MAINTENANCE AND REPAIR OF ROADS

<table>
<thead>
<tr>
<th>Course code: P-511</th>
<th>Pre-requisites: Road Design</th>
<th>Hours of Active Classes: 45 (lectures: 30, exercises: 10, seminars: 5)</th>
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</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 3.0</td>
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</tbody>
</table>

### Course objectives
The main objective of this course is to educate future engineers about the systematic road maintenance and repair, because those activities are of particular importance for comfortable, economical and safer road transportation. Students will be learned about fundamental facts on technical principles of maintenance, repair and rehabilitation of roads.

### Syllabus

### Student obligations
Course and exercises attendance. Elaboration and delivery of programmes with the pavement structure calculation. Seminar - work on visual-sensitive assessment of road condition as well as application of the distress identification manual.

### Exam
Written exam. Oral exam. Passing the written exam is a precondition for taking the oral exam.

### Assessment
70% during semester, 30% final exam.

### Literature
**Essential:**
1. Šršen, M.: Road Maintenance (orig. in Croatian), Građevni godišnjak, HSGI, Zagreb, 2000

**Recommended:**
2. Babić, B. i Horvat, Z.: Construction and Maintenance of Pavemnet Structures, University of Zagreb, 1984
3. Schweizer Norm, Beilage, SN 640 925, Schadenkatalog, VSS, Zurich, 1991
### Course: AIRPORTS

<table>
<thead>
<tr>
<th>Course code: P-513</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
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<tbody>
<tr>
<td>optional</td>
<td>The course consists of: lectures exercises -</td>
<td>30 lectures: 20 exercises: 10 seminars: 0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Course objectives

The student is expected to develop problem solving skills in the area of projecting airport traffic areas and designing airport pavements.

### Syllabus

- History of landing and aviation
- Airport system
- Airport classification and reference code
- Airport layout plan: components and geometry
- Signing and lighting of airports
- Obstacle free zone
- Traffic loading on airport pavements, Airplane classification
- Flexible pavement design methods for airports
- Rigid pavement design methods for airports
- Maintenance and reconstruction of airports

### Student obligations

Accepted project work untill specified date, oral preliminary exam

### Exam

Written exam. Oral exam. Passing the written exam is a precondition for taking the oral exam.

### Assessment

70% during semester, 30% final exam.

### Literature

**Essential:**
3. http://www.icao.int/

**Recommended:**
<table>
<thead>
<tr>
<th>Course Code:</th>
<th>OA-456</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course:</td>
<td>CONSTRUCTION MACHINERY AND EQUIPMENT</td>
</tr>
<tr>
<td>Pre-requisites:</td>
<td></td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>60</td>
</tr>
<tr>
<td>Lectures:</td>
<td>30</td>
</tr>
<tr>
<td>Exercises:</td>
<td>30</td>
</tr>
<tr>
<td>Seminars:</td>
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<tr>
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</tr>
<tr>
<td>ECTS:</td>
<td>4.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>The objective of this course is acquiring the knowledge required to plan machine work costs and time, as well as to plan machine work.</th>
</tr>
</thead>
</table>

| Syllabus | 1. Choice and work planning of construction machines  
2. The efficiency of construction machines and the means of transport  
3. Costs of machine work in construction  
4. Reliability and effectiveness  
5. Construction machines in use conditions |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|

| Student obligations | Course attendance.  
Project work |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>Exam</th>
<th>Written and oral exam.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>70% during semester, 30% final exam.</th>
</tr>
</thead>
</table>

| Literature | **Essential:**  
2. www.grad.hr-djelatnici-dr.sci. Zdravko Linarić-Dokumenti raspoloživi za download-  
   - Učinak građevinskih strojeva  
   - Troškovi strojnog rada u građenju  
   - Izbor strojeva i planiranje strojnog rada u građenju |

|--------------|-----------------------------------------------------------------------------------------------------------------------------------|
Course: **SPATIAL PLANNING**

<table>
<thead>
<tr>
<th>Course code: OA-459</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 60 lectures: 40 exercises: 10 seminars: 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course status: optional</td>
<td>The course consists of: lectures exercises seminars</td>
<td>ECTS: 5.0</td>
</tr>
</tbody>
</table>

Course objectives: Enable students to appropriately, from the position of civil engineers, can work on solving spatial planning problems and related issues and participate in the development of spatial planning documentation.

**Syllabus**

- Basic concepts, definitions, terminology and the genesis of urban planning, spatial planning and space design.
- Spatial Plans: characteristics, types, components, methodology of development, adoption and implementation. The laws and regulations and institutions involved in the process of adoption and implementation of plans.
- The history of cities and urban planning. Geographical, functional and other factors in the development and life of cities and regions.
- Analysis, planning (protection and restoration) of contents in the area: housing, labor, industry, leisure and free spaces, greenery and parks, transportation and other infrastructure systems, tourism, nature, agriculture and rural areas, cultural and historical heritage, centers etc.
- Methods and techniques for planning and decision making: theory and implementation.
- International aspects of space planning, especially in the European Union.
- Basic social, economic and environmental components of spatial planning.
- Examples of finished spatial plans, discussion.

**Student obligations**

Course attendance, preparation of seminar paper /project work.

**Exam**

Written and oral.

**Assessment**

70% during semester, 30% final exam

**Literature**

**Essential:**
1. Priručni materijal za kolegij izrađen od nositelja kolegija.
5. Zakoni i propisi u svezi prostornog planiranja i prostornog uređenja i građenja. - Zagreb: Narodne novine RH.

**Recommended:**
8. Prostorno-planska dokumentacija (općina, grad, županija, makroregija, država, Europska unija).
**Course:** GIS IN MUNICIPAL INFRASTRUCTURE PLANNING

<table>
<thead>
<tr>
<th>Course code:</th>
<th>P-514</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes:</th>
<th>ECTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>60</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lectures: 30 exercises: 15 seminars: 15</td>
<td></td>
</tr>
</tbody>
</table>

**Course status:** optional

- **Course consists of:**
  - lectures
  - exercises
  - seminars

**Course objectives:**
- Learning the concept of GIS and its application.
- Preparation of students to deal with the basic tasks of database management of municipal infrastructure using GIS.
- Preparation for solving planning tasks in the field of municipal infrastructure using GIS.

**Syllabus:**
- The theory of spatial data modeling. Systems for managing databases. Base communal data.
- Geographic Information Systems (GIS): history, types of systems and types of data, components.
- Spatial data. Vector (point, line, polygon) and raster data.
- Modeling database, types of logical models. Relational and object-oriented data models.
- Software for spatial data processing: introduction and application.
- The role of digital surveying plan in creation of land-information system.
- Application of GIS in planning and management of communal infrastructure. Themed registers of urban utility facilities: roads, water, sewage, public, industrial and residential buildings, power lines.
- Analysis of the data in the GIS.
- Connection with other databases and presentation of spatial basis.

**Student obligations:**
- Course attendance according to Faculty regulations.
- Preparation and delivery of assignments from exercises.
- Preparation and delivery of seminar work.

**Exam:**
- Written and oral.

**Assessment:**
- 70% during semester and 30% final exam.

**Literature:**

**Essential:**
1. pripremni materijali za predavanja i vježbe
2. web stranice s materijalima - uputama za korištenje pojedinih programa

**Recommended:**
# Course: PUBLIC BUILDINGS AND SPACES

<table>
<thead>
<tr>
<th>Course code:</th>
<th>OA-460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
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<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>lectures: 30</td>
<td>6</td>
</tr>
<tr>
<td>exercises: 0</td>
<td></td>
</tr>
<tr>
<td>seminars: 30</td>
<td></td>
</tr>
</tbody>
</table>

**Course status:** compulsory

## Course objectives
Inform students about the methodology of planning and qualify them for reading and possibly elaborating the planning documentation.

## Syllabus
- Arranging pedestrian zones in an urban environment, historical review.
- Streets and squares, business and trade pedestrian zones, shop-windows, terraces, eaves. Traffic solutions.
- Parking areas and public garages. Public transportation stations.
- Traffic buildings, bus and train stations, terminals.
- Markets, trade-centres, public toilets.
- Green areas and recreational zones, playgrounds, walks and parks.
- Sports grounds and halls.
- Petrol stations in an urban environment and outside of it, info-centres.
- Sound insulation of street noise and traffic corridors.
- Arranging public zones outside of an urban environment, roads, bridges, tunnels and their ancillary facilities.

## Student obligations
- Course attendance.
- Visits to building-sites and theme exhibitions.
- Project work: Based on the general design of a concrete assignment, a part of the general design and executional project for a public zone renovation should be elaborated.

## Exam
Written and oral exam.

## Assessment
70% during semester, 30% final exam.

## Literature
### Essential:
2. O. Magaš: Skice za predavanja, skripte.
3. Production-programmes for building equipment.
4. Plans and projects of executional solutions.

### Recommended:
1. časopisi: ORIS, Čovjek i prostor, Arhitektura, Architectural design, Domus, Detail i drugi
5. Nove realizacije, izvor: internet
**Course:** URBAN WATER SYSTEMS

<table>
<thead>
<tr>
<th>Course code:</th>
<th>H-254</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>Lectures: 30</td>
<td>60</td>
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<tr>
<td>Exercises: 15</td>
<td></td>
</tr>
<tr>
<td>Seminars: 15</td>
<td></td>
</tr>
<tr>
<td>Compulsory Status:</td>
<td></td>
</tr>
</tbody>
</table>

**Course objectives**
- Introducing students to the urban water management problematic.
- Developing students' methodological approach to analysing quantities and qualities of water in urban areas in the context of satisfying all water demands.
- Developing students' skills in solving problems in urban systems planning and management.

**Syllabus**
- Dynamics of the hydrologic cycle in urban areas.
- Water demands - categorisation of demands by quantities and quality standards.
- External and rain water - high water problems and solving strategies. Structural and nonstructural protection solutions.
- Revitalisation of waterways in urban areas. Aquatic systems as urban recreation attraction.
- Ground waters in urban areas and construction problems related to them. Methods of evaluation of recipient's capacity for wastewater disposal. Water quality modelling. Sea as a part of urban area and recipient for wastewater disposal.
- Coastal and underwater structures. Ports, marines, coastal communications.
- Urban waters and spatial planning. Legislative regulations.

**Student obligations**
- Course attendance in accordance to University/Faculty regulations.
- Writing and presenting a paper.

**Exam**
- Written exam.

**Assessment**
- 70% during semester, 30% final exam.

**Literature**

**Essential:**

**Recommended:**
**Course:** MANAGEMENT IN CIVIL ENGINEERING

<table>
<thead>
<tr>
<th>Course code: OA-457</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>The course consists of: lectures - seminars</td>
<td>lectures: 30 exercises: 0 seminars: 15</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course status: compulsory</th>
<th>ECTS: 5.0</th>
</tr>
</thead>
</table>

**Course objectives:** The main objective of course is acquiring basic knowledge of civil engineering companies business.

**Syllabus**

1. Company concept, types and objects
2. Investment characteristics and elements
3. Building companies reproduction process results
5. General management thesis
6. Management role and significance in building companies business
7. Company business policy forming
8. Basis of market business. Law of supply and demand
9. Products planning and developing
10. Prices policy
11. Elasticity in consumption
12. Business decision-making. Methods of decision making
13. Business communication and control system

**Student obligations**

Attendance to the course according to the Faculty regulations
Activity in class.

**Exam**

Written and oral exam.

**Assessment**

Preliminary exams, seminars (70%), written exam (30%).

**Literature**

**Essential:**

**Recommended:**
**Course:** INVESTMENT POLICY

<table>
<thead>
<tr>
<th>Course code: OA-455</th>
<th>Pre-requisites:</th>
<th>Hours of Active Classes: 45</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: 30 exercises: 15 seminars: 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course status: compulsory</th>
<th>The course consists of: lectures exercises -</th>
<th>ECTS: 5.0</th>
</tr>
</thead>
</table>

**Course objectives**
The objective of this course is to acquire basic knowledge from the area of company investment policy.

**Syllabus**
- Company investment policy
- Investment program, factors and analysis of conditions
- Investment decision
- Financing sources
- Investment dynamics
- Cost analysis
- Calculations in market business. Relation between calculation and risk in the processes of construction.
- Cost planning. Cost control.
- Investment efficiency. Investment project evaluation.
- Cost-benefit analysis.

**Student obligations**
- Attendance at the course according to the Faculty regulations
- Active participation in lectures and exercises
- Producing an autonomous work as a pre-requisite for taking the exam

**Exam**
Written and oral exam.

**Assessment**
Preliminary exams, course attendance (70%), written exam (30%).

**Literature**
**Essential:**

**Recommended:**
Course: **CIVIL ENGINEERING REGULATIONS**

<table>
<thead>
<tr>
<th>Course code:</th>
<th>OA-458</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites:</td>
<td>The course consists of:</td>
</tr>
<tr>
<td>Hours of Active Classes:</td>
<td>ECTS:</td>
</tr>
<tr>
<td>lectures: 30</td>
<td>4.0</td>
</tr>
<tr>
<td>exercises: 0</td>
<td></td>
</tr>
<tr>
<td>seminars: 0</td>
<td></td>
</tr>
</tbody>
</table>

**Course status:** optional

**Course objectives:** The aim of the course is to provide the students, future civil engineers, with the knowledge of basic legal notions, categories, institutes and law relationships in civil engineering in a broader sense.

**Syllabus:**

- Introduction to law: notions, categories, institutes, legal relationships.
- Regulations on civil engineering.
- Commercial companies in the industry of construction materials, projects and construction.
- Relationship with the State.
- Procedures. Control. Inspections.
- Individual legal acts.
- Court procedures.

**Student obligations:** Seminar paper, preliminary exam, exam

**Exam:** Written and oral exam.

**Assessment:** 70% during semester, 30% final exam.

**Literature:**

**Essential:**

**Recommended:**
1. Zakon o obveznim odnosima; Zakon o vlasništvu i drugim stvarnim pravima; Zakon o radu; Zakon o zaštiti na radu; Pravilnici po Zakonu o gradnji.
<table>
<thead>
<tr>
<th>Course code:</th>
<th>OA-461</th>
<th>Pre-requisites:</th>
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<tbody>
<tr>
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<tr>
<td></td>
<td></td>
<td>lectures</td>
<td>exercises</td>
<td>-</td>
</tr>
<tr>
<td>Course objectives</td>
<td>Acquiring knowledge required to manage building maintenance.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syllabus</td>
<td>Introduction to building maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance management regulations</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Regular maintenance, reconstructions and repairs</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Life cycle costs and classification of maintenance costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction process and Construction maintenance</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Construction maintenance management</td>
<td></td>
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<tr>
<td></td>
<td>Maintenance management project</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Planning and organization of maintenance works</td>
<td></td>
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<tr>
<td></td>
<td>Maintenance of listed buildings</td>
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<tr>
<td></td>
<td>Models for setting priorities in building maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IT support for decision making in setting priorities in building maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student obligations</td>
<td>Accepted project work before exam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam</td>
<td>Written and oral exam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>70% during semester, 30% final exam.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literature</td>
<td>Essential:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. internal course materials</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Recommended:</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>1. B., Swallow, P., Building Maintance Management</td>
<td></td>
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</tbody>
</table>
Course: **FINAL YEAR PROJECT**

<table>
<thead>
<tr>
<th>Course code: DIPL</th>
<th>Pre-requisites: The exam can be undertaken only after all other course exams have been passed</th>
<th>Hours of Active Classes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lectures: exercises: seminars:</td>
</tr>
<tr>
<td>Course status:</td>
<td>The course consists of:</td>
<td>ECTS: 30.0</td>
</tr>
<tr>
<td>mandatory</td>
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<td></td>
</tr>
</tbody>
</table>

**Course objectives**

A successfully passed final thesis exam is proof that the student has been taught throughout the studies to independently analyze, research, solve and present a solution of a complex civil engineering problem. The student is capable of producing the final thesis by respecting the positive technical regulations and scientific knowledge in a specific civil engineering field.

**Syllabus**

The student writes the graduation thesis during the planned 120 hours of active teaching at the Faculty and a total effort of maximum 30 ECTS credits. The graduate thesis can be both a practical and a theoretical topic related by its contents to civil engineering and to the offered courses. The student chooses the graduation thesis topic and the committee for awarding the graduation thesis gives consent during the III. semester or at the latest by the beginning of the IV. semester of the academic year in question. A part of the graduation thesis can be carried out as a field work - practical teaching (a total of up to 15 ECTS credits).

The graduation thesis can be based on:

- creating a civil engineering structure or construction computer model
- numerical modeling of materials and processes in materials
- an analysis of a more complex mechanical problem which requires additional theoretical processing and presentation of an analytical or a numerical solution procedure
- static and dynamic analysis (calculation) of concrete, metal and wooden structures
- creating studies related to water management
- an analysis of geotechnical structure project solutions
- a project and project analysis related to urban areas (transportation projects, spatial and spatial planning studies, water management structures in urban areas)
- other topics related to design, analysis and construction of more complex civil engineering structures and systems.

When writing the graduation thesis the student actively cooperates with his teacher-mentor who, as a rule, is the holder of the course whose contents are related to the selected topic. A teacher-co-mentor can also participate in advising the student in writing the graduation thesis if required.

**Student obligations**

The student must submit the written graduation thesis (in the draft version) to the teacher-mentor as a prerequisite for obtaining the second signature. The student must submit the final thesis (in the final written version) to the teacher and the student administration office (2 copies) 7 (seven) work days prior to the approximate thesis presentation date. The thesis presentation dates are published by the student administration office within the exam date window.

**Exam**

The exam is conducted in the oral form, as a public thesis presentation. The oral exam is assessed by the committee of at least three members-teachers, one of who is the mentor. If required, the committee can ask the candidate questions related to the graduation thesis.

**Assessment**

75% graduation thesis + 25% presentation

**Literature**

**Essential:** Depending on the subject

**Recommended:** Depending on the subject
3.2.2. Explanation of ETCS credits

The number of hours of active classes for all the proposed courses has been calculated on the basis of the assumed average duration of one term of 15 (fifteen) weeks (the average duration of the academic year is 30 weeks). The programme includes three regular examination periods of 4 (four) weeks each. The proposed duration of the academic year is a total of 42 working weeks: 2x15 weeks of classes and 3x4 weeks of examination periods.

During the academic year the student gains a minimum of 60 ECTS credits for all the proposed programmes.

In view of the above mentioned, the calculation of the number of hours that make one ECTS credit would be: 1 ECTS = 42 (weeks) x 40 (working hours per week) / 60 ECTS = 1.680 hours / 60 ECTS = 28 hours.

1 ECTS CREDIT is equivalent to 28 hours of the student's study load

The number of ECTS credits allocated to the particular courses has been calculated on the basis of the complexity of the course teaching material (syllabus) and the general and specific obligations the student has to fulfill in connection with the course:

- the general obligations include an estimate of: the time needed to attend classes, tutorials, prepare exams, take exams, as well as of the quantity of literature he uses to prepare the exam.
- specific obligations include an estimate of the time needed for: preliminary exams, project work, seminar work, laboratory practice, fieldwork, visiting construction sites etc.

The course load coefficient is determined in proportion to the course share in the workload of the particular term so that the student gains 30 ECTS credits per term.

3.2.3. Quality assurance procedures and course (module) performance indicators

The performance of all the courses will be continuously monitored by different procedures of evaluation and self-evaluation of teachers and students.

The evaluation of the teachers and teaching activities will be carried out by the course lecturers (teachers) and will be organized by the Faculty body responsible for monitoring and identifying actions needed for the improvement of quality of the programme.

Different procedures and methods for monitoring and evaluating the quality of the teaching activities and the course performance will be used:

- conducting research and opinion polls among students on all the aspects of teaching:
  - regular course delivery and organization of the teaching process
  - literature
  - methods for improvement of teaching
  - exams
  - syllabus and methodology of delivery
  - student / teacher relations and collaboration
  - work load – ETCS CREDITS
- publishing the results of research and opinion polls
- analysing the exam results (pass rate, transparency, objectivity and the like).

The quality of the teaching performance of the particular courses will be evaluated twice during the term: for the first time 3-4 weeks after the beginning of the classes and for the second time during the last week the classes are taken.

The results of the first evaluation may improve the teaching activities in the current term.

All research and questionnaires will be conducted on forms prepared in advance, in which the teachers will be able to adapt the questions to the course curriculum, methodology and other specific demands that the course has to meet.

The course lecturer will, independently and/or in coordination with the responsible persons at the Faculty, work out the plan of measure.
3.3. STRUCTURE OF STUDIES, DYNAMICS OF STUDIES, STUDENT OBLIGATIONS

3.3.1. Structure of studies (by semesters)

The graduate study curriculum consists of compulsory and optional part. The student creates the study program by selecting the modules from a specific civil engineering field. By selecting the modules from the same or two different civil engineering fields the student selects course of studies – the specialization within the civil engineering branch.

In the I. semester the student enrolls into four (4) compulsory courses and two (2) optional ones. The selection of the courses is determined by the selected modules.

The courses organized through modules are attended by the student during the II. and the III. semester while the IV. semester is dedicated to writing the graduation thesis and, if required, practical teaching classes. (See Table in Appendix).

The modules consist of compulsory and optional part and each module enabled the student to acquire a minimum of 30 ECTS credits. All modules offer 3 obligatory and several elective courses.

<table>
<thead>
<tr>
<th>I Semester</th>
<th>II Semester</th>
<th>III Semester</th>
<th>IV Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common graduate study programme:</td>
<td>COMPULSORY COURSES 1. MODUL</td>
<td>COMPULSORY AND OPTIONAL COURSES 2. MODUL</td>
<td>FINAL YEAR PROJECT (15-30 ECTS)</td>
</tr>
<tr>
<td>2 (two) optional courses depending from enrolled module - branch</td>
<td>30 ECTS</td>
<td>30 ECTS</td>
<td>30 ECTS</td>
</tr>
</tbody>
</table>

POSSIBLE MODULE COMBINATIONS AND COURSE OF STUDY CREATION

For module creation see the attached table.

Scheme: Possible combinations of modules

```
Geotechnical Engineering 1
Hydraulic Engineering 1
Engineering Modelling of Structures 1
Structures 1
Transportation Engineering 1
Urban Engineering 1

Geotechnical Engineering 2
Hydraulic Engineering 2
Engineering Modelling of Structures 2
Structures 2
Transportation Engineering 2
Urban Engineering 2
```
By enrolling into two modules of the same field of study the student enrolls into the particular branch of study as follows:
- branch Geotechnical Engineering,
- branch Hydraulic Engineering,
- branch Engineering Modelling of Structures,
- branch Structures,
- branch Transportation Engineering,
- branch Urban Engineering.

The student can also enroll into modules of two different fields of study and thereby enroll into one of the following branches of study:
- Geotechnical Engineering – Hydraulic Engineering,
- Geotechnical Engineering – Transportation Engineering,
- Hydraulic Engineering – Urban Engineering,
- Structures – Engineering Modelling of Structures,
- Structures – Geotechnical Engineering,
- Engineering Modelling of Structures – Geotechnical Engineering,
- Transportation Engineering – Urban Engineering.

The structure of modules with compulsory and optional courses is shown in 3.3.1.2.

### 3.3.1.1. Common part of the study programme

#### I Semester

<table>
<thead>
<tr>
<th>Compulsory courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Probability Theory and Statistics</td>
<td>30+30+0</td>
<td>4</td>
</tr>
<tr>
<td>2. Theory and Technology of Concrete</td>
<td>30+15+15</td>
<td>5</td>
</tr>
<tr>
<td>3. Project Management</td>
<td>30+15+15</td>
<td>5</td>
</tr>
</tbody>
</table>

Optional courses of group I - Student selects one of the following two courses:

4. Numerical Modelling                   | 30+30+0                         | 6    |
5. Programming in Modelling              | 30+30+0                         | 6    |

### OPTIONAL – COMPULSORY COURSES 1. SEMESTER:

Student selects 2 courses depending the branch or module combinations.

<table>
<thead>
<tr>
<th>Optional courses</th>
<th>Hours of active classes (L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computational Hydraulics</td>
<td>45+15+0</td>
<td>5</td>
</tr>
<tr>
<td>2. Engineering Rock Mechanics</td>
<td>30+30+0</td>
<td>5</td>
</tr>
<tr>
<td>3. Road Design</td>
<td>20+20+10</td>
<td>5</td>
</tr>
<tr>
<td>4. Concrete and Masonry Structures</td>
<td>45+30+0</td>
<td>6</td>
</tr>
<tr>
<td>5. Theory of Elasticity</td>
<td>35+0+10</td>
<td>4</td>
</tr>
<tr>
<td>6. Theoretical Soil Mechanics</td>
<td>40+15+20</td>
<td>5</td>
</tr>
</tbody>
</table>
By enrolling into a branch of study the student is to enroll into the optional course as follows:
- Structures / Engineering Modelling of Structures: Concrete and Masonry Structures, Theory of Elasticity
- Hydraulic Engineering: Computational Hydraulics, Engineering Rock Mechanics
- Geotechnical Engineering: Theoretical Soil Mechanics, Engineering Rock Mechanics
- Transportation Engineering: Road Design, Engineering Rock Mechanics
- Urban Engineering: Road Design, Computational Hydraulics, Theoretical Soil Mechanics

If the student has enrolled the branch consisting of 2 modules, he selects the first of the offered courses of the particular module as the optional ones. By enrolling into the module he is required to enroll into one of the optional courses of each module as follows:
- Structures / Engineering Modelling of Structures: Concrete and Masonry Structures
- Hydraulic Engineering: Computational Hydraulics
- Geotechnical Engineering: Theoretical Soil Mechanics
- Transportation Engineering: Road Design
- Urban Engineering: Engineering Rock Mechanics

### 3.3.1.2. Course structure by modules

The student acquires a minimum of 30 ECTS credits per semester. The list of all offered modules and courses which includes ECTS credit distribution is shown below.

Besides the courses which are closely related to the particular module field, optional courses of other modules – fields of civil engineering are offered in each module in order to offer the students the possibility of a flexible study program creation.

In consultation with the Vice Dean for teaching and students and course lecturer a student can be an exception permitted to, in the quota of optional courses, enroll and take the exam of a course on graduate studies outside the courses offered on the branch / module if it is justified. In this case, students get ECTS points within the planned 120 credits.

The Committee for academic evaluation and validation of the study period may permit to a student, during the study, the enrollment of optional courses on the other faculties/departments of the University of Rijeka within the list of University common courses up to 6 ECTS.
# Module – Branch Geotechnical Engineering

## Geotechnical Engineering Module 1: Geotechnical Engineering Module 2:

<table>
<thead>
<tr>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Soil Dynamics</td>
<td>30+15+15</td>
<td>6</td>
<td>2. Underground Structures and Tunnels</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>Engineering</td>
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<td></td>
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<td></td>
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<td>TOTAL</td>
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<table>
<thead>
<tr>
<th>OPTIONAL COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
<th>OPTIONAL COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Environmental Protection</td>
<td>15+0+30</td>
<td>4</td>
<td>1. Seepage and Consolidation of Soil</td>
<td>30+15+15</td>
<td>4</td>
</tr>
<tr>
<td>2. Testing and Monitoring in Geotechnical</td>
<td>30+30+0</td>
<td>4</td>
<td>2. Geohazards</td>
<td>20+10+15</td>
<td>4</td>
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<tr>
<td>Engineering</td>
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<tr>
<td>3. Reinforcing Soil and Rocks</td>
<td>30+15+15</td>
<td>4</td>
<td>3. Geotechnical Engineering in Road</td>
<td>25+20+0</td>
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<tr>
<td>Structures</td>
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<td></td>
<td>Structures</td>
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<td></td>
</tr>
<tr>
<td>5. Operations Research and Linear</td>
<td>30+0+30</td>
<td>6</td>
<td>5. Earthquake Engineering*</td>
<td>30+15+0</td>
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<td>Programming *</td>
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</tr>
<tr>
<td>6. Hydraulic Structures*</td>
<td>30+30+0</td>
<td>6</td>
<td>6. Civil Engineering Regulations*</td>
<td>30+0+0</td>
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<tr>
<td>*Optional courses of other fields (modules)</td>
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# Module – Branch Hydraulic Engineering

## Hydraulic Engineering Module 1: Hydraulic Engineering Module 2:

<table>
<thead>
<tr>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
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</thead>
<tbody>
<tr>
<td>1. Water Supply and Drinking Water Treatment</td>
<td>30+30+0</td>
<td>6</td>
<td>1. Engineering Hydrology</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>2. Drainage and Wastewater Treatment</td>
<td>30+30+0</td>
<td>6</td>
<td>2. Hydraulic Regulations and Meliorations</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>3. Hydraulic Structures</td>
<td>30+30+0</td>
<td>6</td>
<td>3. Coastal Engineering</td>
<td>30+15+15</td>
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<table>
<thead>
<tr>
<th>OPTIONAL COURSES</th>
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<th>ECTS</th>
<th>OPTIONAL COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experimental Hydraulics</td>
<td>30+30+0</td>
<td>4</td>
<td>1. Hydraulic Modelling</td>
<td>30+30+0</td>
<td>4</td>
</tr>
<tr>
<td>2. Water Resources Management</td>
<td>30+0+30</td>
<td>4</td>
<td>2. Computational Hydrodynamics</td>
<td>30+30+0</td>
<td>4</td>
</tr>
<tr>
<td>3. Karst Hydrosystems</td>
<td>30+0+30</td>
<td>4</td>
<td>3. Water Power Development</td>
<td>30+30+0</td>
<td>4</td>
</tr>
<tr>
<td>4. Waste Management</td>
<td>30+10+5</td>
<td>4</td>
<td>4. Seepage and Consolidation of Soil*</td>
<td>30+15+15</td>
<td>4</td>
</tr>
<tr>
<td>5. Operations Research and Linear</td>
<td>30+0+30</td>
<td>6</td>
<td>5. Underground Structures and Tunnels*</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Geohazards*</td>
<td>15+10+20</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. Civil Engineering Regulations*</td>
<td>30+0+0</td>
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*Optional courses of other fields (modules)
### Module – Branch Engineering Modelling of Structures Module

**Engineering Modelling of Structures Module 1:**

<table>
<thead>
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<th>COMPULSORY COURSES</th>
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<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structural Modelling</td>
<td>30+0+30</td>
<td>6</td>
</tr>
<tr>
<td>2. Operations Research and Linear Programming</td>
<td>30+0+30</td>
<td>6</td>
</tr>
<tr>
<td>3. Numerical Modelling in Materials Engineering</td>
<td>30+0+30</td>
<td>4</td>
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</table>

**OPTIONAL COURSES**

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</tr>
</thead>
<tbody>
<tr>
<td>1. Building Physics</td>
<td>20+0+10</td>
<td>2</td>
</tr>
<tr>
<td>2. Dynamics of Structures*</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>3. Stability of Structures*</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>4. Variational Methods*</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>5. Theory of Plates and Shells*</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>6. Theory of Plasticity*</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>7. Testing of Structures*</td>
<td>30+15+0</td>
<td>4</td>
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**TOTAL**

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<tbody>
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**OPTIONAL COURSES**

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<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Theory of Plates and Shells</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>2. Theory of Plasticity</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>3. Variational Methods</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>4. Stability of Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>5. Special Chapters of Concrete and Masonry Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>6. Testing of Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>7. Design of Buildings</td>
<td>15+30+0</td>
<td>4</td>
</tr>
<tr>
<td>8. Foundation Engineering*</td>
<td>30+15+15</td>
<td>6</td>
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</tbody>
</table>

**TOTAL**

<p>| | | |</p>
<table>
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</thead>
<tbody>
<tr>
<td></td>
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<td>14</td>
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</table>

*Optional courses of other fields (modules)

### Module – Branch Structures

**Structures Module 1:**

<table>
<thead>
<tr>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Steel Structures</td>
<td>45+30+0</td>
<td>6</td>
</tr>
<tr>
<td>2. Dynamics of Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>3. Timber Structures</td>
<td>45+26+4</td>
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**OPTIONAL COURSES**

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<table>
<thead>
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<tbody>
<tr>
<td>1. Theory of Plates and Shells</td>
<td>24+0+6</td>
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<tr>
<td>2. Theory of Plasticity</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>3. Variational Methods</td>
<td>24+0+6</td>
<td>3</td>
</tr>
<tr>
<td>4. Stability of Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>5. Special Chapters of Concrete and Masonry Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>6. Testing of Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>7. Design of Buildings</td>
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</tr>
<tr>
<td>8. Foundation Engineering*</td>
<td>30+15+15</td>
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**TOTAL**

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<tbody>
<tr>
<td></td>
<td></td>
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**OPTIONAL COURSES**

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<tbody>
<tr>
<td>1. Theory of Plates and Shells</td>
<td>24+0+6</td>
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<tr>
<td>2. Theory of Plasticity</td>
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<td>3. Variational Methods</td>
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<tr>
<td>4. Stability of Structures</td>
<td>30+15+0</td>
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<td>5. Special Chapters of Concrete and Masonry Structures</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>6. Testing of Structures</td>
<td>30+15+0</td>
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<tr>
<td>7. Design of Buildings</td>
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</tr>
<tr>
<td>8. Foundation Engineering*</td>
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**TOTAL**

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</thead>
<tbody>
<tr>
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*Optional courses of other fields (modules)
### MODULE – BRANCH TRANSPORTATION ENGINEERING

**Transportation Engineering Module 1:**

**TRAFFIC AND ROAD DESIGN**

<table>
<thead>
<tr>
<th>COMPULSORY COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Road Intersections and Crossroads</td>
<td>20+15+15</td>
<td>5</td>
</tr>
<tr>
<td>2. Urban Traffic</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>3. Traffic Engineering</td>
<td>30+15+15</td>
<td>5</td>
</tr>
<tr>
<td><strong>OPTIONAL COURSES</strong></td>
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<td>14</td>
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### COMPULSORY COURSES

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<th>COMPULSORY COURSES</th>
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<tbody>
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<td>1. Flexible Pavement Structures</td>
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</tr>
<tr>
<td>2. Rigid Pavement Structures</td>
<td>25+10+5</td>
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<td>3. Roadbed Design</td>
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*Optional courses of other fields (modules)  
** Courses students can enroll at the Faculty of Maritime Studies University of Rijeka

### MODULE – BRANCH URBAN ENGINEERING – Interdisciplinary module

**Urban Engineering Module 1:**

<table>
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<tbody>
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<td>1. Spatial Planning</td>
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<td>2. Waste Management**</td>
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<td>4</td>
</tr>
<tr>
<td>3. Urban Traffic**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
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<td>15</td>
</tr>
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### COMPULSORY COURSES

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<th>ECTS</th>
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</thead>
<tbody>
<tr>
<td>1. GIS in Municipal Infrastructure Planning</td>
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<td>6</td>
</tr>
<tr>
<td>2. Public Buildings and Spaces</td>
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</tr>
<tr>
<td>3. Urban Water Systems</td>
<td>30+15+15</td>
<td>6</td>
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*Optional courses of other fields (modules)  
** Courses students can enroll at the Faculty of Maritime Studies University of Rijeka

**Urban Engineering Module 2:**

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<td>1. Civil Engineering Regulations</td>
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<tr>
<td>2. Investment Policy</td>
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</tr>
<tr>
<td>3. Foundation Engineering**</td>
<td>30+15+15</td>
<td>6</td>
</tr>
<tr>
<td>4. Traffic Engineering**</td>
<td>30+15+15</td>
<td>5</td>
</tr>
<tr>
<td>5. Traffic Buildings**</td>
<td>30+30+0</td>
<td>5</td>
</tr>
<tr>
<td>6. Traffic, Space and Environment **</td>
<td>30+0+15</td>
<td>3</td>
</tr>
<tr>
<td>7. Road Intersections and Crossroads **</td>
<td>20+15+15</td>
<td>5</td>
</tr>
<tr>
<td>8. Water Supply and Drinking Water Treatment**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>9. Water Resources Management**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>10. Operations Research and Linear Programming**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>11. Drainage and Wastewater Treatment**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

**OPTIONAL COURSES**

<table>
<thead>
<tr>
<th>OPTION COURSES</th>
<th>(L+E+S)</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Civil Engineering Regulations</td>
<td>30+0+0</td>
<td>4</td>
</tr>
<tr>
<td>2. Building Maintenance</td>
<td>30+15+0</td>
<td>4</td>
</tr>
<tr>
<td>3. Geotechnical Structures*</td>
<td>30+10+20</td>
<td>6</td>
</tr>
<tr>
<td>4. Underground Structures**</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>5. Geohazards**</td>
<td>20+10+15</td>
<td>4</td>
</tr>
<tr>
<td>6. Engineering Hydrology</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>7. Hydraulic Regulations and Meliorations*</td>
<td>30+30+0</td>
<td>6</td>
</tr>
<tr>
<td>8. Maintenance and Repair of Roads</td>
<td>30+10+5</td>
<td>3</td>
</tr>
<tr>
<td>10. Coastal Engineering</td>
<td>30+15+15</td>
<td>6</td>
</tr>
</tbody>
</table>

*Optional courses of other fields (modules)  
** Courses students can enroll at the Faculty of Maritime Studies University of Rijeka
**Compulsory courses of other fields (modules)**

**Optional courses of other fields (modules)**

The student that selects the modul Urban Engineering can select courses up to 5 ECTS load at the graduate studies of the Faculty of Economics branch Economy of Sustainable Development and Economy of Public Sector.

### IV Semester

In the final (IV) semester student prepares the Final Year Project:

<table>
<thead>
<tr>
<th>COURSE</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FIELD WORK – practical teaching</td>
<td>0-15</td>
</tr>
<tr>
<td>2. FINAL YEAR PROJECT</td>
<td>15-30</td>
</tr>
</tbody>
</table>

Writing the thesis during the semester with the individual cooperation with the mentor who, as a rule, is the holder of the course whose contents are related to the selected topic. Field work - practical teaching can be planned as a part of creating the graduation thesis – final year project. Student load with field work - practical teaching can be up to 15 ECTS credits.

During the studies the student can enroll into any course which is taught at the graduate studies if he assesses that enrolling into additional courses will not interfere with study dynamics. All successfully completed additional courses will be entered into student diploma supplement.