UNIVERSITY OF RIJEKA
FACULTY OF CIVIL ENGINEERING

GF

ACADEMIC UNDERGRADUATE PROGRAMME IN

CIVIL ENGINEERING

Rijeka, May 2010.

STUDY PROGRAMME AND CURRICULUM

ACADEMIC UNDERGRADUATE PROGRAMME **IN CIVIL ENGINEERING**

Information on the Proposing Party:

FACULTY OF CIVIL ENGINEERING
Viktora Cara Emina 5, 51000 Rijeka, CROATIA
Phone: + 385 51 352 111
Fax: + 385 51 332 816
e-mail: dekanat@gradri.hr
http://www.gradri.hr/

CONTENTS

page

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-year activity a total of **1218 Diploma Engineers** graduated from the Academic Programme, and **1422 Engineers** from the Vocational Programme.

In structuring the new study programmes, the Faculty has followed the past experience in educating civil engineering professionals. 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. Figures show that **there are no unemployed Diploma Engineers and Engineers in Civil Engineering registered with the employment agencies.**
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 curricula, the Faculty cooperated closely with the related Faculties of Civil Engineering in Croatia. The core curriculum at the Undergraduate Programme Level was brought into tune with the related programmes of the other Faculties of Civil Engineering in Croatia in order to enable student mobility, first and foremost, at the national level.

In the course of structuring the undergraduate and graduate programmes, the curricula of respectable foreign institutions that educate professionals of the Engineering of Munich: Technische Universität München-Studienplan für same profile (the University of Engineering of Prague, the University of Studierende des Bauingenieurwesens, Eigenossiche Technische Hochschule Zürich-ETH-Abteilung für Bauingenieurwesen in Zürich), as well as the recommendations of the association of European Faculties of Civil Engineering (European Civil Engineering Education and Training – EUCEET) were analysed. 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 curricula, and the **students** were consulted, too. The structure of the study programme was accepted at the Board of the Faculty of Civil Engineering on 21st December 2004.

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

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

The Academic Undergraduate Programme proposed represents, in its core part, the continuation of the current Academic Graduate Programme. The curriculum is adapted to the standards of the Bologna process and brought up to date in terms of contents and methodology. The Academic Undergraduate Civil Engineering Programme is the necessary first step in the process of educating highly qualified personnel in the civil engineering and other engineering professions.

2 GENERAL INFORMATION

2.1 PROGRAMME NAME

The name of the programme is: **Academic Undergraduate Programme in Civil Engineering.**

2.2 PARTY MANAGING AND CARRYING OUT THE STUDY PROGRAMME

The party that manages and carries out the proposed 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 Undergraduate Programme in Civil Engineering is three (3) academic years, during which students obtain a minimum of 180 ECTS credits.

2.4 PROGRAMME ENTRANCE REQUIREMENTS

The right to apply for enrolment on the Academic Undergraduate Programme has a candidate who has completed secondary schooling or has a comparable qualification of at least four years of schooling, or as defined by special Faculty regulations.
The citizens of the Republic of Croatia have the right to apply for the programme. Foreign citizens and persons without citizenship have the right of enrolment under the same conditions.
The selection of enrolment applicants for the Academic Undergraduate Programme is made on the basis of secondary school marks (overall mark, marks in mathematics and physics) and results of compulsory (Mathematics) and elective (Physics or Chemistry or Informatics) of the state high-school exit exam.

2.5 COMPETENCES ACQUIRED BY THE STUDENT WITH COMPLETION OF THE PROGRAMME

With completion of the *Academic Undergraduate Programme* the student acquires the fundamental competences for the planning and design of structures as well as basic knowledge that enables him/her to attend Graduate and Postgraduate Programmes in Civil Engineering or related fields as well as various programmes of lifelong learning.
During his/her studies the student develops the ability to communicate and inform the interested experts and the public about the problems and solutions connected with the civil engineering profession. He is able, upon analysis, to form an opinion on specific civil engineering issues from the viewpoint of the profession and social usefulness, for example environmental protection.
He is qualified for structural designs in concrete, timber and steelwork and for taking part in planning and designing hydraulic and transportation systems and structures.
He is qualified for independent design of simpler structures or components of complex structures, construction management and supervision of the construction of simpler civil engineering structures and building construction.
The knowledge and competences the student acquires with completion of the Academic Undergraduate Programme are sufficient to attend an Academic Graduate Programme and a Specialisation Programme at the Faculty of Civil Engineering (the proposing party) as well as to attend the same or similar programmes at other Faculties of Civil Engineering in the Republic of Croatia. The acquired fundamental knowledge enables the student to attend graduate programmes of other related engineering programmes.

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 Undergraduate Programme is *Bachelor (baccalaureus) of science in civil engineering (univ. bacc. ing. aedif.)*

3 PROGRAMME DESCRIPTION

3.1 LIST OF MANDATORY AND OPTIONAL COURSES FOR THE PROPOSED UNDERGRADUATE STUDY PROGRAMME IN CIVIL ENGINEERING

List of mandatory courses

	Course code	*Mandatory Course*	*Hours of active classes (L+E+S)*	*ECTS*
1.	M-178	Linear Algebra	30+30+0	6,0
2.	M-183	Mathematical Analysis I	45+45+0	7,5
3.	TM-147	Mechanics I	30+30+0	5,5
4.	M-179	Computers and Information Science	30+25+5	4,0
5.	M-180	Constructive Geometry	45+15+30	6,0
6.	FD-198	Physics	45+15+0	4,5
7.	TM-145	Strength of Materials I	30+30+0	5,5
8.	TM-148	Mechanics II	30+30+0	5,5
9.	P-164	Geodesy	30+15+0	3,5
10.	OA-157	Civil Engineering Structures	30+15+0	4,0
11.	FD-195	The English Language	30+0+30	3,5
12.	FD-196	The German Language	30+0+30	3,5
13.	FD-793	Physical Training and Health Culture	0+30+0	1,0
14.	M-181	Mathematical Analysis II	45+45+0	7,5
15.	TM-146	Strength of Materials II	30+30+0	5,5
16.	G-104	Applied Geology	30+5+0	3,0
17.	TM-150	Structural Mechanics I	45+30+0	6,5
18.	MK-123	Structure and Characteristics of Materials	30+0+0	2,5
19.	H-117	Hydrology	30+15+0	3,0
20.	G-106	Soil and Rock Mechanics	45+20+10	5,5
21.	TM-149	Structural Mechanics II	45+30+0	6,5
22.	H-115	Fluid Mechanics	30+30+0	5,5
23.	P-165	Introduction to Road Design	30+30+0	4,5
24.	MK-124	Engineering Materials	30+30+0	5,0
25.	NK-135	Basics of Concrete Structures	45+30+0	6,0
26.	NK-136	Introduction to Steel Structures	30+30+0	5,0
27.	H-118	Introduction to Hydraulic Engineering	30+30+0	5,0
28.	OA-147	Construction Management and Technology	45+30+0	6,0
29.	G-107	Geotechnical Engineering	45+30+0	6,0
30.	OA-148	Construction Economics	30+15+0	4,0
31.	OA-149	Fieldwork	0+30+0	3,0
32.	ZR-PRED	Final Year Project	0+0+30	5,0

List of Optional Courses

	Course Code	*Optional Course*	*Hours of Active Classes (L+E+S)*	*ECTS*
33.	M-182	Engineering Geometry	10+0+20	3,0
34.	M-184	Computer Applications	10+10+10	3,0
35.	M-177	Introduction to Programming	10+20+0	3,0
36.	FD-193	Communication Skills*	15+15+0	2,0
37.	FD-199	Introduction to Language Culture	15+15+0	2,0
38.	OA-154	Construction History	15+0+15	2,0
39.	FD-197	Building and Constructing English	10+10+5	2,0
40.	OA-144	Introduction to Spatial Planning	30+0+15	3,0
41.	OA-143	Building Design	15+30+0	3,0
42.	MK-122	Introduiction to Building Physics	20+0+10	2,0
43.	G-105	Environmental Protection	10+0+20	2,0
44.	OA-155	Management in Civil Engineering	30+0+15	3,0
45.	OA-156	Civil Engineering Regulations	30+0+0	3,0
46.	NK-134	Bridges	30+15+15	5,0
47.	NK-137	Introduction to Timber Structures	30+30+0	5,0
48.	H-119	Introduction to Coastal Engineering	30+30+0	5,0
49.	H-114	Water Resources and Systems	30+0+30	5,0
50.	P-166	Traffic Planning and Design	30+30+0	5,0
51.	P-163	Railway Design	45+15+0	5,0

* Courses attended at Faculty of Philosophy University of Rijeka

3.2 COURSE DESCRIPTION

3.2.1 Description of mandatory and optional courses

Student assessment

Note (1) – Article 43 of Decision of Amendments of Regulations on Studies from May 3rd 2005 (Class: 003-01/05-01/07, Reg. No.: 2170-57-01-05-8) from November 6th 2007
Assessment within the European Credit Transfer System

(1) Student accomplishment in each course is assessed with ECTS grading scale in percentage from 0 to 100%, whereat for the passing grade at the undergraduate studies a student must not score less than 40% and at graduate studies less than 50%.
(2) Student evaluation and assessment for each course (module) is during classes and at the final exam as follows:
   - total percentage of student accomplishment during classes (attendance, partial exams, preliminary exams and other activities defined by the study program) makes up to 70% of the grade and
   - total percentage of student accomplishment at the final exam makes up to 30% of the grade.

Note (2) – Article 43a, paragraph 3 of Decision of Amendments of Regulations on Studies from May 3rd 2005 (Class: 003-01/05-01/07, Reg. No.: 2170-57-01-05-8) from November 6th 2007

(3) The students attending courses where a numerical grade is not awarded, as defined by the study program, are given by the professors the allotment “all the requirements met” if they have scored 40 or

more credits at the university undergraduate studies or 50 or more credits at university postgraduate studies.

- Enrollment into courses taught in the second and the subsequent study years is defined by Article 34 of Amendments of Regulations on Studies of University of Rijeka or by study prerequisites pursuant to article e.3.2.1 of this study program.

Course:	**LINEAR ALGEBRA**

Course code: M-178	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 6,0

Course objectives	Students will: - become familiar with the concepts such as scalar product, vector product, matrix, inverse matrix, determinant, linear independence, eigenvalue, and eigenvector, - learn to solve linear systems by the Gauss elimination method, - deepen their knowledge about conic sections and quadratic surfaces.
Syllabus	The concept of a vector. Magnitude and direction. Addition and subtraction of vectors. Multiplication by a scalar. Coordinate systems in 2D and 3D. Left-handed and right-handed coordinate systems. The angle between two vectors. The scalar product. Projection of a vector onto another vector. The vector product. The scalar triple product. The definition of a matrix. Examples of matrices. The transpose. Addition of matrices. Multiplication by a scalar. Multiplication of matrices. Inverse of a matrix. The determinant. Properties of determinants. The determinant of a product. The adjoint and inverse matrices. Linear independence of rows (or columns) of a matrix. Rank of a matrix. Elementary row operations. Reduced form of a matrix. Computation of the inverse by the Gauss-Jordan elimination. Linear systems. Gauss elimination. Cramer's rule. Homogeneous linear systems. The characteristic polynomial. Eigenvalues and eigenvectors of a matrix. Quadratic forms. Transformation to principal axes. Conic sections and quadratic surfaces.
Student obligations	Attending lectures and exercises.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Notes taken at the classes. 2. Elezović, N.: Linearna algebra, 2. izdanje, Element, Zagreb, 1999. **Recommended:** 1. Jordan, D.W. and Smith, P.: Mathematical Techniques, 3rd edition, Oxford University Press, Oxford, 2002. 2. Došlić, T.; Sandrić, N.: Matematika 1, skripta, Građevinski fakultet, Sveučilište u Zagrebu, 2007. 3. Elezović, N.; Aglić, A.: Linearna algebra - zbirka zadataka, 3. izdanje, Element, Zagreb, 2003. 1. Devidé, V.: Riješeni zadaci iz više matematike s kratkim repetitorijem definicija i teorema, Svezak 1, Školska knjiga, Zagreb, 1989.

Course:	**MATHEMATICAL ANALYSIS I**

Course code: M-183	**Pre-requisites:**	**Hours of Active Classes:** 90 lectures: 45 exercises: 45 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 7,5

Course objectives	Students will revise their knowledge of high-school mathematics, and will learn: - to compute limits, derivatives, integrals and Taylor series, - to use derivatives and integrals to: sketch a graph of a function, compute the area of a plane figure, compute the volume and area of a solid of revolution, compute the length of a graph, - to approximate functions by means of Taylor (and some other) polynomials.
Syllabus	Basic notions about sets, relations, functions and operations. Natural numbers, integers, rational, real and complex numbers. Sequence, limit of a sequence. The number e. Number line, coordinate systems. Definitions and properties of polynomials, rational functions, trigonometric and area functions, exponential and logarithmic functions as well as hyperbolic and area functions. Limit and continuity of a function. The derivative. Rules of differentiation. Sketching a graph of a function: asymptote, minimum, maximum, point of inflection, intervals of increase and decrease, intervals of upward concavity and downward concavity. Numerical solution of equations. Functions of two variables. Partial derivatives. Extrema and restricted extrema. The antiderivative. The indefinite integral and its properties. Systematic techniques for integration. The definite integral, its properties and applications. Improper integrals. Numerical integration. Series of numbers. Convergence. The Taylor series and the Fourier series.
Student obligations	Attending lectures and exercises.
Exam	The exam is taken in a written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Notes taken at the classes. 2. Javor, P.: Matematička analiza 1, Element, Zagreb, 1995. **Recommended:** 1. Štambuk, Lj.: Matematika 1, Tehnički fakultet, Sveučilište u Rijeci, Rijeka, 2002. 2. H. Anton, Calculus - A New Horizon, 6th edition, John Wiley and Sons, Inc., New York, 1999. 3. Demidovič, B. P. i suradnici: Zadaci i riješeni primjeri iz matematičke analize za tehničke fakultete, Golden marketing - Tehnička knjiga, Zagreb, 2003. 4. Bronštejn, I. N. i suradnici: Matematički priručnik, Golden marketing - Tehnička knjiga, Zagreb, 2004.

Course:	**MECHANICS I**

Course code: TM-147	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5,5

Course objectives	1. To understand the laws of rigid-body statics under the action of 2D and 3D central and general force systems. 2. To learn how to apply these laws in order to determine the reactions and cross-sectional forces and moments in simple beam-like structures. 3. To acquire the necessary skills for the courses Mechanics 2 and Strength of Materials.
Syllabus	Basic concepts of Mechanics. Vectors and vector spaces. 2D and 3D central force systems. Equilibrium of the central force system; equilibrium of the material particle. 2D and 3D general force systems. The moment of force. Parallel forces. Force couple. Reduction of a system to the force and moment at a given point. Equilibrium of the general force system; equilibrium of a rigid body. Basic types of structures. Supports and reactions. Trusses and forces in truss members. Beams. Constant distributed load. Cross-sectional forces and their diagrams. Statically determinate and indeterminate systems. Beams and frames with hinges and diagrams of cross-sectional forces in such structures. Relations between the cross-sectional forces and the maximum bending moment. Coulomb´s friction. Introduction to the principle of virtual work.
Student obligations	Understanding of the course material is periodically checked via three preliminary exams, the results of which are being added to the results of the written exam. Attendance at the preliminary exams is not mandatory.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Andrejev, V.: Mehanika -- 1. dio: Statika, Tehnička knjiga, Zagreb, 1968. 2. Damić, V.: Statika, Hrvatska sveučilišna naklada, Zagreb, 1999 (953-169-045 6) **Recommended:** 1. Beer, F.P.; Johnston, E.R., Jr.: Vector Mechanics for Engineers – Statics, McGraw-Hill, Singapore , 1990 (0-07-100454-8) 2. Pytel, A.; Kiusalaas, J.: Engineering Mechanics – Statics, Harper Collins, New York, 1996 (0-673-99870-3) 3. McLean, W.G.; Nelson, E.W.: Engineering Mechanics (Schaum's Outline Series), McGraw-Hill, New York, 1962 (07-044812-4) 4. Stanek, M.; Turk, G.: Statika I, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Ljubljana, 1996 (961-6167-07-3)

Course:	**COMPUTERS AND INFORMATION SCIENCE**

Course code: M-179	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 25 seminars: 5
Course status: mandatory	**The course consists of:** lectures exercises seminars	ECTS: 4,5

Course objectives	The course gives a systematic overview of some important fields of computer and information science, students gain the ability to use networked computers autonomously as the tools to solve engineering problems
Syllabus	- history of computers - computer architechture - computer operating systems - definition, basic functions, comparision of operating systems, computer networks - computer communications and network services - local and global networks, Internet - Universal software tools in Windows environment (text processor, spread sheet, presentation software) - programming languages - machine languages, assemblers, high level languages, compilers, algorithm, program documentation, HTML, JAVA - software packages for engineers - computers in civil engineering: present state of and future trends Exercises: practical work on computers, the examples relating to the teaching materials are presented
Student obligations	- attendance at the course as defined by the Faculty regulations - accepted computer assignments until specified date and one seminar work
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. course materials presented on the web site www.gradri.hr/~informatika 2. the relevant web site addresses presented on the course web site 3. Grundler, Darko: Primijenjeno računalstvo, Graphis, Zagreb, 2000 4. Čerić, V.;Varga, M. i dr.: Poslovno računarstvo, Znak, Zagreb 1998. **Recommended:** 1. Blissmer, Robert H.: Introducing computers. John Wiley & Sons, Inc., 1996

Course:	**CONSTRUCTIVE GEOMETRY**

Course code: M-180	**Pre-requisites:**	**Hours of Active Classes:** 90 lectures: 45 exercises: 15 seminars: 30
Course status: mandatory	**The course consists of:** lectures excercises seminars	**ECTS:** 6

Course objectives	- to develop space perception ability - to learn fundamental principles of computer graphics in 3D and descriptive geometry - to develop constructive problem solving skills in 3D and representing in projections - to introduce geometrical thinking and creative approach to the use of CAD in 3D - to acquire fundamental principles of geometric computer modelling
Syllabus	- introduction to visual communication; basic elements in geometry and graphics - Monge's-projection and descriptive geometry; use in CAD-systems - additional views in classic and CAD technology: metric and position-problem solving, the use of 3D computer graphic - geometric transformations - conics - properties and use - rotating 2D objects (plane figure) in 3D space (use of afine transformation and CAD) - geometric forms of solids; regular polyhedra, 3D- primitives in CAD - irregular solids. Tangent plane. - axonometry, use in CAD - solid -cutting plane. Intersections of line and solid. - basic of solid-intersections and Boolean operations on 3D primitives - terrains
Student obligations	- course attendance - active collaboration- seminars - accepted project work before the end of the term
Exam	- written exam, (possible in the form of preliminary exams, during the term) - oral exam. Part of the exam can be taken using the computer.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Pletenac, Lidija: Konstruktivna geometrija u CAD-u, elektronički udžbenik-skripta 2. Niče, dr. Vilko: Deskriptivna geometrija I i II, Školska knjiga, Zagreb, 1992. 3. Babić; Gorjanc; Sliepčević; Szirovicza: Konstruktivna geometrija, IGH, Zagreb, 2000. 4. Internet stranice http://master.grad.hr/nastava/geometrija/ http://gradri.hr/~pletenac/ **Recommended:** 1. Brauner, Kickinger: Geometrija u graditeljstvu, Školska knjiga, Zagreb, 1980. (prevele Kurilj, Hajsig) 2. Giering, Dr. Osvald; Seybold, Dr. Hans: Konstruktive Ingenieurgeometrie, Carl Hanser Verlag, München, Wien, 1987. 3. Hohenberg, Fritz: Konstruktive Geometrie in der Technik, Wien,1961. 4. Pal, Imre: Nacrtna geometrija u anaglifskim slikama, Tehnička knjiga, Zagreb,1966. (preveo Dr. Niče) 5. Priručnik za DesignCAD (on line)

Course:	**PHYSICS**

Course code: FD-198	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 45 exercises: 15 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 4,5

Course objectives	The main goal of the course is to help understanding in basic physical laws.
Syllabus	Idea of space and time. Basic forces in nature. Mechanical oscillations. Harmonic, damped and enforced oscillator. Internal energy and heat. Thermodynamical laws. Entropy. Surface phenomena. Capillarity. Diffusion. Elastic waves. Sounds. Solid deformation. Elastic and plastic properties. Hook´s law. Torsion. Electric and magnetic interaction. Electromagnetic waves and nature of light. Law of heat radiation. Periodic system of elements. Radioactivity. Molecular forces. Crystal lattice.
Student obligations	Students are obliged to attend lessons.
Exam	Exam is in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Kilić, S.: Fizika I, Fakultet građevinskih znanosti u Splitu, 1986. 2. Cindro, N.: Fizika II, Školska knjiga, Zagreb, 1984. **Recommended:** 1. Cindro, N. Fizika I, Školska knjiga, Zagreb, 1981.

Course:	**STRENGTH OF MATERIALS I**

Course code: TM-145	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5,5

Course objectives	1. To understand the physical meaning of stresses and strains and their role in uniaxial and simple states of equilibrium and kinematics of deformable media. 2. To learn how to solve such problems in mechanics of deformable media where uniaxial or simple stress states take place. 3. To acquire necessary skills for the courses Strength of Materials 2, Structural Mechanics 1, Materials 1, Steel Structures, Concrete Structures and Timber Structures.
Syllabus	Uniaxial stress-strain state. Linear elasticity. Governing equations of elasticity (equilibrium, kinematic, constitutive). Bar problems. Pure bending. Geometric properties of cross-sections. Force-induced bending. 3D bending. Bending due to axial force. Bernoulli´s theory of beams. Differential equation of deformation of a bent beam. Beam on elastic foundation. Mohr's analogy. Pure shear. Design of bolts and rivets. Pure torsion. Statically indeterminate torsion problems. Introduction to geometric non-linearity. Stability of equilibrium states. Buckling. Introduction to material non-linearity. Elastic-plastic bending.
Student obligations	Understanding of the course material is periodically checked via preliminary exams, the results of which are added to the results of the written exam.
Exam	Written.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Šimić, V. Otpornost materijala 1 i 2, Školska knjiga, Zagreb, 1992, 2002 2. Brnić, J, Turkalj, G. Nauka o čvrstoći 1 i 2, Tehnički fakultet Sveučilišta u Rijeci, 2004, 2006 **Recommended:** 1. Alfirević, I. Nauka o čvrstoći I, Tehnička knjiga, Zagreb, 1995 2. Bazjanac, D. Nauka o čvrstoći, Tehnička knjiga, Zagreb, 1973 3. Rašković, D. Otpornost materijala, Građevinska knjiga, Beograd, 1985 4. Timošenko, S. Otpornost materijala 1 i 2, Građevinska knjiga, Beograd, 1972, 1966 5. Brčić, V. Otpornost materijala, Građevinska knjiga, Beograd, 1982 6. Stanek, M.; Turk, G.: Osnove mehanike trdnih teles, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Ljubljana, 2003 7. Beer, F.P, Johnston, E.R. Mechanics of materials, McGraw-Hill, London, 1992 8. Benham, P.P, Crawford, R.J. Mechanics of engineering materials, Longman, Harlow, 1988

Course:	**MECHANICS II**

Course code: TM-148	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5,5

Course objectives	1. To understand Newton´s laws of dynamics in cases of motion of particles and rigid bodies. 2. To learn fundamental principles of Lagrange´s analytical dynamics. 3. To learn how to apply these principles to simple problems of engineering dynamics and theory of oscillation. 4. To acquire necessary skills as a pre-requisite for the course Hydromechanics.
Syllabus	Newton´s laws of dynamics. Equations of motion. Kinematics of a particle. Position, velocity and acceleration as vectors. Kinematics of curvilinear motion. Choice of the observer and the co-ordinate system. Dynamics of curvilinear motion of the material particle. Central force system. Impulse of the force and momentum. Angular momentum. Work and power. Laws of dynamics as applied to rigid bodies. Euler´s equations and moments of inertia. 2D motion of the rigid body. Angular momentum around a principal axis of inertia. 3D motion of the rigid body. Equler´s angles and rotation of the Earth. Free and forced undamped and damped oscillations of the material particle. Dynamics of the systems of material particles. Eigenvalue problem. Principle of virtual work in dynamics. Action integral and Hamilton´s principle. Lagrange´s equations and their application to the systems of concentrated masses and springs. Introduction to the dynamics of deformable bodies. Cauchy´s equations of motion.
Student obligations	Understanding of the course material is periodically checked via three preliminary exams, the results of which are being added to the results of the written exam. Attendance to the preliminary exams is not mandatory.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Jecić, S.: Mehanika II -- Kinematika i dinamiks, Tehnička knjiga, Zagreb. 2. Čaušević, M.: Tehnička mehanika -- Kinematika, Školska knjiga, Zagreb. 3. Kiričenko, A.: Tehnička mehanika -- II dio: Kinematika, Sveučilišta u Osijeku i Zagrebu. 4. Kiričenko, A.: Tehnička mehanika -- III dio: Dinamika, Sveučilište u Zagrebu. **Recommended:** 1. Beer, F.P.; Johnston, E.R., Jr.: Vector Mechanics for Engineers – Dynamics, McGraw-Hill, Singapore , 1990 (0-07-100455-6) 2. Pytel, A.; Kiusalaas, J.: Engineering Mechanics – Dynamics, Harper Collins, New York, 1996 (0-673-99871-1) 3. McLean, W.G.; Nelson, E.W.: Engineering Mechanics (Schaum's Outline Series), McGraw-Hill, New York, 1962 (07-044812-4) 4. Wells, D.A.: Lagrangian Dymanics (Schaum's Outlines), McGraw-Hill, New York, 1967 (07-069258-0)

Course:	**GEODESY**

Course code: P-164	**Pre-requisites:**	**Hours of Active Classes:** 45 lectures: 30 exercises: 15 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 3,5

Course objectives	understanding and learn basic terminology of land surveying
Syllabus	basic concepcts of surveying vertikal control distance angles position control surveys satellite positioning
Student obligations	course attendance obligatory projekt work
Exam	written and oral exam
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Macarol, S.: Praktična geodezija, Tehnička knjiga, Zagreb, Pribičević B., Medak D.:Geodezija u građevinarstvu, V.B.Z. d.o.o. Zagreb 2003. **Recommended:** 1. Janković, M.: Inženjerska geodezija I i II Kapetanović N., Selesković F.: Geodezija, Univerzitetska knjiga, Sarajevo Schofield W.: Engineering surveying, Butterworth Heinemann 2001.

Course:	**CIVIL ENGINEERING STRUCTURES**

Course code: OA-157	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 15 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 4

Course objectives	To learn fundamental principles of house building
Syllabus	1. Foundations 2. Hidro and thermo isolations 3. Walls of stone, brick,composite walls 4. Floors (concrete,wood,iron) 5. Roofs of wood,concrete,prefabricated 6. Doors and windows 7. Elements of final sistemation works
Student obligations	Attendance to the course has to be in accordance to the University/Faculty regulations. Practical - project work.
Exam	Written and oral exam
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Peulic, Konstruktivni elementi zgrada I i II, Tehnička knjiga Zagreb,2003 2. Neufert, Arhitektonsko projektiranje, Golden media marketing, 2004. **Recommended:** 1. Manuali UTET. UTE, Torino,1988.

Course:	**THE ENGLISH LANGUAGE**

Course code: FD-195	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 0 seminars: 30
Course status: mandatory	**The course consists of:** lectures - seminars	**ECTS:** 3,5

Course objectives	The student is expected to develop communicative competence, namely the ability to understand and produce English in speech and writing.
Syllabus	Grammar themes (the general grammar rules of the English language, the grammar structures specific to the language of the engineering profession and the similarities and differences in grammar structures between English and Croatian) at the levels of: - word-formation - morphology (parts of speech, morphological changes) - syntax (sentence types, sentence elements, word order; use and sequence of tenses; active-passive relation; infinitive and participle clauses). Lexical themes: - general vocabulary - technical and vocational terminology (mathematics, information technology, geodesy, construction materials, building construction, soil mechanics, foundations, transportation engineering, bridges, tunnels, hydraulic works).
Student obligations	- Attendance to the course as defined by the Faculty regulations. - Two written tests and one oral test at the end of 1st and 2nd terms as a condition for the verification of the course. The scores obtained at the tests are added together (each written test is worth 30% and the oral test 40% scores)
Exam	none
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Special English: Engineering, 1. Civil and Mechanical Engineering, New York: Collier Macmillan International, 1977. 2. Hall, E.: The Language of Civil Engineering in English, Regents Publishing Company, New York, 1977. 3. Babić, I.: Pregled gramatike engleskog jezika, Rijeka: Dušević & Kršovnik, 2000. **Recommended:** 1. Prager, A.: Trojezični građevinski rječnik, Zagreb: Masmedia, 2003. 2. Cota, P.: Englesko-hrvatski, njemačko-hrvatski i hrvatsko-englesko-njemački rječnik graditeljstva, Zagreb: CORPO, 1998. 3. Bujas, Ž.: Veliki englesko-hrvatski rječnik, Zagreb: Nakladni zavod Globus, 1999. 4. Bujas, Ž.: Veliki hrvatsko-engleski rječnik, Zagreb: Nakladni zavod Globus, 1999.

Course:	**THE GERMAN LANGUAGE**

Course code: FD-196	**Pre-requisites:**	**Hours of Active Classes:** 60 lectures: 30 exercises: 0 seminars: 30
Course status: mandatory	**The course consists of:** lectures - seminars	**ECTS:** 3,5

Course objectives	The student is expected to develop communicative competence, namely the ability to understand and produce German in speech and writing.
Syllabus	Grammar themes: - Broadening prior knowledge of general grammar rules of the German language. - Teaching the grammar structures specific to the language of the engineering profession. - Dealing with grammar problems at the levels of word-formation, morphology (parts of speech, morphological changes) and syntax (sentence types, sentence elements, word order; use and sequence of tenses; active-passive relation; infinitive and participle clauses). - Defining the similarities and differences in grammar structures between German and Croatian. Lexical themes: Relating new technical and vocational terminology (mathematics, information technology, geodesy, construction materials, building construction, soil mechanics, foundations, transportation engineering, bridges, tunnels, hydraulic works) to prior knowledge of general vocabulary.
Student obligations	– Attendance to the course as defined by the Faculty regulations. – Two written tests and one oral test at the end of 1st and 2nd terms as a condition for the verification of the course. The scores obtained at the tests are added together (each written test is worth 30% and the oral test 40% scores)
Exam	None
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Marčetić, T.: Pregled gramatike njemačkoga jezika / Deutsche Grammatik im Ueberblick, Zagreb: Školska knjiga, 2003. 2. Štambuk, Z - Marinić, D. - Rendulić, I. - Brnetić, Ž.: Deutsch und Technik: Lesen und Verstehen von Fachtexten mit Sprachuebungen, Udžbenici Sveučilišta u Zagrebu, Zagreb: Školska knjiga, 1993. 3. Cota, P.: Englesko-hrvatski, njemačko-hrvatski i hrvatsko-englesko-njemački rječnik graditeljstva, Zagreb: COPRO, 1998. **Recommended:** 1. Prager, A.: Trojezični građevinski rječnik, Zagreb: Masmedia, 2003. 2. Jakić,B. - Hurm, A.: Hrvatsko-njemački rječnik: s gramatičkim podacima i frazeologijom, Zagreb, Školska knjiga, 2004. 3. Uroić, M. - Hurm, A.: Njemačko-hrvatski rječnik: s gramatičkim podacima i frazeologijom, Zagreb, Školska knjiga, 2002.

Course:	**PHYSICAL TRAINING AND HEALTH CULTURE**

Course code: FD-793	**Pre-requisites:**	**Hours of Active Classes:** lectures: exercises: 30 seminars:
Course status: optional	**The course consists of:** - exercises -	**ECTS:** 1,0

Course objectives	Objective of the Course is to provide by physical training such an educational which will stimulate student's curiosity, improve thir intelectual development and prepare them for thier profesional competence. Physical training developes their abilities to be succesfull in various scientifici fields.
Syllabus	Group or individual exercises (fitness, tenis, swimming, climbing etc), but depending on the material and financial possibilities pf the Faculty to provide necessary and adequate means.
Student obligations	Presence to the activities to be recorded by lecturer's signature
Exam	Not applicable
Assessment	Not applicable
Literature	**Essential:** Not obligatory **Recommended:** Literature related to the sports specified in Syllabus

Course:	**MATHEMATICAL ANALYSIS II**

Course code: M-181	**Pre-requisites:** Mathematical analysis I	**Hours of Active Classes:** 90 lectures: 45 exercises: 45 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 7,5

Course objectives	The main goal of the course is to help students understanding in differential equations and basic principals of statistics.
Syllabus	Arc length. Multiple integrals with applications. Derivation and integration under integral. Vector analysis, gradient, divergence, rotation. Line integrals. Surface integrals. Differential equations. Cauchy problem. Linear differential equations. Systems of linear differential equations. Numerical solve of differential equations. Partial differential equations. Fourier method. Method of separation of variables. Power series solutions. Wave equation. Diffusion equation. Variation princip. Numerical solve of partial differential equations. Method of discrete variation. Eigenvalue problem. Principal statistical values. Stochastic processes. Correlations function. Statistical tests with applications.
Student obligation	Students are obliged to attend lessons.
Exam	Exam exists in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Kurepa, S.: Matematička analiza 1, Školska knjiga, 1975. 2. Kurepa, S.: Matematička analiza 2, Školska knjiga, 1975. 3. B. Apsen, B.: Riješeni zadaci više matematike 1, 2, 3, Tehnička knjiga, Zagreb, 1989. 4. Demidović, B.P.: Zadaci i riješeni primjeri iz više matematike, Tehnička knjiga , Zagreb, 1989. **Recommended:** 1. Kurepa, S.: Matematička analiza 3, Školska knjiga, 1975

Course:	**STRENGTH OF MATERIALS II**

Course code: TM-146	**Pre-requisites:** Strength of Materials I	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5,5

Course objectives	To understand tensorial character of stress and strain andbehaviour of a linear elastic material in 2D and 3D states of stress and strain To learn how to solve 2D and 3D problems in mechanics of deformable media. To acquire necessary skills for the courses, Structural Mechanics 2, Soil and rock mechanics, Fluid mechanics, Steel Structures, Concrete Structures and Timber Structures.
Syllabus	Introduction to 2D and 3D stress states. Stress vector. Equilibrium equations. Stress tensor. Principal stresses. Mohr´s circle. Kinematic equations. Strain tensor. Constitutive equations. Linear elastic material. Shear stresses in beams. General state of stress in beams. Timoshenko´s theory of beams. Saint Venant´s torsion. Torsion of non-circular cross-sections. Shear stresses in thin-walled cross-sections. Shear centre. Strain energy. Maxwell and Betti theorems. Castigliano´s theorems. Yield stress. Equivalent stress according to different theories. Yield-state design.
Student obligations	Understanding of the course material is periodically checked via preliminary exams, the results of which are added to the results of the written exam.
Exam	Written.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Šimić, V. Otpornost materijala 1 i 2, Školska knjiga, Zagreb, 1992, 2002 2. Brnić, J, Turkalj, G. Nauka o čvrstoći 1 i 2, Tehnički fakultet Sveučilišta u Rijeci, 2004, 2006 **Recommended:** 1. Alfirević, I. Nauka o čvrstoći I, Tehnička knjiga, Zagreb, 1995 2. Bazjanac, D. Nauka o čvrstoći, Tehnička knjiga, Zagreb, 1973 3. Rašković, D. Otpornost materijala, Građevinska knjiga, Beograd, 1985 4. Timošenko, S. Otpornost materijala 1 i 2, Građevinska knjiga, Beograd, 1972, 1966 5. Brčić, V. Otpornost materijala, Građevinska knjiga, Beograd, 1982 6. Srpčič, S.: Mehanika trdnih teles, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Ljubljana, 2003 7. Beer, F.P, Johnston, E.R. Mechanics of materials, McGraw-Hill, London, 1992 8. Benham, P.P, Crawford, R.J. Mechanics of engineering materials, Longman, Harlow, 1988

Course:	**APPLIED GEOLOGY**

Course code: G-104	**Pre-requisites:** Constructive geometry	**Hours of Active Classes:** 35 lectures: 30 exercises: 5 seminars: 0
Course status: mandatory	**The course consists of:** lectures excercises -	**ECTS:** 3,0

Course objectives	Preparing students for basic understanding geological fabric and dynamic of the Earth and aspects of geology that are relevant in civil engineering. Students should be able to identify and describe common rocks and soil. The course prepares students for supplementary courses in geotechnics, hydrotehnics and environmental protection.
Syllabus	Origine, structure and dynamics of the Earth Minerals and their physical and chemical properties Igneous, sedimentary and metamorphic rocks Deformation of rock: folding and faulting Earthquakes and seismtectonic activity Geologic time and stratigraphic geology Geological fabric of Republic of Croatia Groundwaters and their dynamics Weathering of rocks and soil formation Geomorfological processes Using of rock and soils in construction Site investigations and geological mapping
Student obligations	Course attendance Preliminary exam
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Šestanović, S.: Osnove geologije i petrografije. IV izdanje. Građevinski fakultet Sveučilišta u Splitu, 2001. 2. Tišljar, J.: Petrologija s osnovama mineralogije. Rudarsko-geološko-naftni fakultet Sveučilišta u Zagrebu, 1999. 3. Šestanović, S.: Osnove inženjerske geologije-primjena u graditeljstvu. Geoing, Split 1993. 4. Pollak, Z.: Hidrogeologija za građevinare. Poslovna knjiga, Zagreb, 1995. 5. Benac, Č.: Rječnik geoloških pojmova, www.gradri.hr. **Recommended:** 1. Herak, M.: Geologija. Školska knjiga, III izdanje, Zagreb 1984. 2. Tišljar, J.: Sedimentne stijene. Školska knjiga, Zagreb 1994. 3. Skinner, B.J. & Porter, S.C.: The Dynamic Earth: An Introduction to Physical Geology. IV ed., John Wiley and Sons, Inc. New York, 2000. 4. Waltham, A.C.: Foundations of Engineering Geology. Blackie Academic & Proffesional, Oxford, 1994.

Course:	**STRUCTURAL MECHANICS I**

Course code: TM-150	**Pre-requisites:** Mechanics I	**Hours of Active Classes:** 75 lectures: 45 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 6,5

Course objectives	At the end of the course unit the student is expected to be able to prepare statical calculation of line statically determinate constructions of engineering structures under unmovable and movable loads.
Syllabus	Types of structures. Types of loads. Concept of structure. Kinematic and static stability of structures. Equations of statics. Principles of virtual work, minimum potential energy, superposition, symmetry and antisymmetry. Application of static methods for the calculation of various statically determinate constructions: simply supported beam, cantilever beam, overhanging beams, combined beams (Gerber's beams), indirectly loaded girders, frames. Plane and space trusses: types of trusses and calculation methods (methods of joints, methods of sections, method of changing bars). Three-hinged systems. Supported and reinforced beams. Application of kinematic methods for the calculation of statically determinate constructions. Influential functions and influential lines. Use of influential lines. Determination of influential lines on the simple and complex girders. Procedures of determination of displacements in statically determinate constructions. Method of the unit load.
Student obligations	- course attendance: min. 70% hours of lectures and exercises - preliminary exams: obligatory - accepted project work before the oral exam
Exam	- written exam, - oral exam. Positively marked written exam is a condition for the oral exam.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Simović, V.: Structural Statics I, Građevinski institut, Zagreb, 1988.; 2. Wagner, W.; Erlhof, G.: Practical structural analysis I, 1979. **Recommended:** 1. Werner, H.: Technical Mechanics, Građevinski fakultet, Zagreb, 1986. 2. McCormac, J.C.: Structural Analysis, 1966.; 3. Đurić, M.: Statics of structures, 1979.

Course:	**STRUCTURE AND CHARACTERISTICS OD MATERIALS**

Course code: MK-123	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 30 exercises: 0 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 2,5

Course objectives	Students are introduced to the principles of materials science, which deals with structure of materials and its relation to properties of materials, and the behavior of materials under mechanical loads.
Syllabus	Atomic bonding (Ionic Bonds, Covalent Bonds, Metallic Bonds, Van der Waals Bonding). The Architecture of Solids (Crysttaline State, Amorphous State, Polymeric State). Development of microstructure (Solidification, Phase Changes, Phase Diagrams). Surface Properties (Surface Tension, Adsorption, Capillary effects, Colloids). Response of Materials to Stress (Compression, Tension, Bending, Torsion). Failure and Fracture (Failure Theories, Fracture Mechanics). Rheology of Fluids and Solids (Elastic and Viscous Behavior, Creep of Engineering Materials). Fatigue.
Student obligations	Participation in all lectures and exercises. Preliminary exams.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Young, J.; Mindess, S.; Gray, RJ.; Bentura: The Science and Technology of Civil Engineering Materials, Prentice Hall, 1998. 2. Ukrainczyk, V: Poznavanje gradiva, Institut građevinarstva Hrvatske, Alcor, Zagreb, 2001. **Recommended:** 1. Ashby, M.F.; Jones, D.R.: Engineering Materials 1, Butterworth Heinemann 1996. 2. Illston, J.M.; Domone, P.L.J. (ed.): Construction materials – their nature and behaviour, E & FN SPON Chapman & Hall, 1994.

Course:	**HYDROLOGY**

Course code: H-117	**Pre-requisites:**	**Hours of Active Classes:** 45 lectures: 30 exercises: 15 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 3

Course objectives	- To provide that students during the course adopt basic knowledges and concepts of hydrological processes and regularities - To present students basics of statistic procedures and their application as well as the application probability theory. Enabling students for independent performance of elementary hydrologic calculations in hydrotechnics.
Syllabus	- History and deffinition. Water distribution and water cycle. Hydrometry (measurements of hydrologic parameters, measurement instruments and equipment, judgement of measurement errors) - Meteorologic and hydrologic parameters (precipitation, temperature, evaporation, humidity, water level, runoff, suspended and drawed sediment, water temperature...). Definition of runoff curves, curces of duration and frequency of detected parameters - Basic application of mathematical-statistical methods and probability theory in hydrology. Numerical character of random variables. Empiric and theoretic functions of probability distribution. Testing of statistic hypotheses. Correlations and regressions in hydrology. - Water catchment and river hydrography, relation between precipitations and runoffs, hydrologic balance - Low and middle waters. Analysis of runoff hydrograms, basic parametric calculations of high waters - empiric and rationale methods, IDR and HDR curves. Hydrograms.
Student obligations	- Attendance to lectures and exercises as defined by the faculty regulations. - Attendance to the demonstrational field exercise in hydrometry. - Preparing and delivering of a program from exercises (application of statistic and parametric methods in hydrologic calculations)
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Žugaj, R. :Hidrologija, RGN fakultet, Zagreb, 2002; 2. Bonacci, O.: Meteorološke i hidrološke podloge, Priručnik za hidrotehničke melioracije, Društvo za odvodnjavanje i navodnjavanje Hrvatske, Zagreb, 1984, 3. Pauše, Ž. Uvod u matematičku statistiku, Školska knjiga Zagreb, 1993.. **Recommended:** 1. Bonacci, O.: Oborina – glavna ulazna veličina u hidrološki ciklus, Geing, Split, 1994., 2. Chow, Ven Te, etc.(1988): Applied Hydrology, McGraw-Hill Publishing Co.

Course:	**SOIL AND ROCK MECHANICS**

Course code: G-106	**Pre-requisites:** enrolled Applied Geology	**Hours of Active Classes:** 75 lectures: 45 exercises: 20 seminars: 10
Course status: mandatory	**The course consists of:** lectures exercises seminars	**ECTS:** 5,5

Course objectives	The student is expected to acquire a basis knowledge and understending of the behaviour of soils and rocks. Enable to identify and classificy soils and rocks, learn fundamental principles of stregth, deformability and others properties of soils and rocks. Prepare studenst for Geotechnical Engineering and others applied courses.
Syllabus	Physical and mechanical properties of soils and rocks Clasiffications and indentifications of soils and rocks Laboratory and in situ testings of soils and rocks Water in soils and rock masses Stregth of soils, rocks and rock masses Stress in soils and rock masses Bearing capacity of soils and rock masses Deformability of soils, rocks and rock masses Consolidation in soils Lateral earth pressure
Student obligations	Lecture course attendance Exercise course attendance Seminar course attendance
Exam	Written and oral exam. Positively marked written exam is a condition for the oral exam. Written exam consist of theoretical and numerical part.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Nonveiller, E.: Mehanika tla i temeljenje građevina, Školska knjiga, Zagreb, p.780, 1979. 2. Hoek, E.: Rock Engineering, A Course Notes, http://www.rocscience.com, p. 313, 2000. 3. Bieniawski, Z.T.: Engineering Rock Mass Classification, New York: John Wiley & Sons, p. 251, 1989. 4. Vrkljan, I., Inženjerska mehanika stijena, interna skripta Građevinskog fakulteta u Rijeci, 2002. **Recommended:** 1. Verruijt, A.: Soil Mechanics, Delft University of Technology, 2001. 2. Naval Facilities Engineering Command: Soil Mechanics, Design Manual 7.01, Alexandria, VI, 1986.

Course:	**STRUCTURAL MECHANICS II**

Course code: TM-149	**Pre-requisites:** enrolled Structural Mechanics I	**Hours of Active Classes:** 75 lectures: 45 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 6,5

Course objectives	At the end of the course unit the student is expected to acquire a basis theoretical knowledge and practical methods of calculation of statically indeterminate constructions of engineering structures under the static loads.
Syllabus	Methods for analysis of statically indeterminate constructions. Differential equations of elastic line. Energetic principles. Force method. Equations of continuity. Flexibility matrix. Centre of elastic displacement. Influence of coercive displacements. Influence of temperature changes. Calculation of statically indeterminate trusses. Determination of influential functions by the force method. Displacement method. Stiffness matrix. Condensation of the local stiffness matrix. Forces on fixed ends of the beam. Vector of equivalent load. Equations of the constructional system. Boundary conditions. Forming of the stiffness matrix of the constructional system. Calculation of various statically indeterminate constructions by the displacement method: orthogonal frames, symmetric girders, space structures, grid structures. Determination of the influential functions by the displacement method. Engineering displacement method. Movable and unmovable constructional systems.
Student obligations	- course attendance: min. 70% hours of lectures and exercises - preliminary exams: obligatory - accepted project work before the oral exam
Exam	- written exam, - oral exam. Positively marked written exam is a condition for the oral exam.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Anđelić, M.: Statics of indeterminate line structures, DHGK, Zagreb 1993. 2. Wagner, W.; Erlhof, G.: Practical structural analysis III, 1981. . **Recommended:** 1. Livesley, R. K.: Matrix Methods of Structural Analysis, 1975.; 2. Đurić, M.: Statics of structures, 1979. 3. Solovjev, Đ.: Statics of structures (part II), Veselin Masleša, Sarajevo, 1956.

Course:	**FLUID MECHANICS**

Course code: H-115	**Pre-requisites:** Mechanics II	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5,5

Course objectives	- To provide that during the course students adopt basic elements of engineers foreseeing, conclusion making and elementary hydrotechnical tasks solving from the domain of fluid mechanics - Enabling students for independent realisation of basic tasks from the domain of fluid mechanics.
Syllabus	Basic concepts of fluid. Fields. Physical characteristics of fluids. Rheologic diagram. Forces on fluid. Statics of fluids. Balance equation. Relative mirovanje. Floating and body stability. Kynematics of fluids. Movements of fluid particles. Steady flow. Maintenance laws. Fluid dynamics. Equation of maintenance of movement quantity. General law of real fluid flow. Equation of maintenance of kynetic energy. Bernoulli's equation for ideal and real fluid. Laminar flow. Turbulent flow. Border layer. Resistance to the flow, calculation of local and linear energy losses. Potential flow. Equations of potential flow. Border conditions. Modeling of fluid flow. Similarity law. Systems under pressure. Pumps. Turbines. Runoff. Spillways. Open channel flow. Underground water flow. Wells.
Student obligations	- Attendance to lectures and exercises as defined by the faculty regulations. - Two colloquies, one in the middle and another at the end of lectures (25% score is prerequisite for approaching to the exam)
Exam	The exam is taken in written form. -
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Hrelja, H.: Vjerovatnoća i statistika u hidrologiji, Građevinski fakultet, Sarajevo, 2000. 2. Bras, R.L.: Hydrology, Addison - Wesley Publ. Comp., Massachusetts, 1990. 3. Ward, R.C.; Robinson, M.: Principles of hydrology, McGraw-Hill book Comp., 1990. 4. Chow, V.T.; Maidment, D.R.; Mays, L.W.: Applied hydrology, McGraw-Hill, 1988. 5. Singh, V.P. (editor): Computer Models of Watershed Hydrology, Water Resource Publications, Hihglands Ranch, Colorado, 1995. 6. Salas, J.D.and all.: Applied Modeling of Hydrologic Time Serias, Water Resources Publication, Fort Collins, Colorado, 1986. **Recommended:** 1. Suhir, E.: Applied Probability for Engineers and Scientists. McGraw-Hill, New York, 1997. 2. Srebrenović, D.: Primjenjena hidrologija, Tehnička knjiga, Zagreb, 1986. 3. Bonacci, O.: Karst Hydrology, Springer Verlag, Heidelberg, 1989. 4. Bonacci, O.: Oborine - glavna ulazna veličina u hidrološki ciklus, Sveučilišni udžbenik, Geing, Split, 1994. 5. Ožanić, N.(editor).: Priručnik za hidrotehničke melioracije, III kolo, Knjiga 1, Građevinski fakultet u Rijeci, Rijeka, 2003.

Course:	**INTRODUCTION TO ROAD DESIGN**

Course code: P-165	**Pre-requisites:** Geodesy	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 4,5

Course objectives	The student is expected to become familiar with basic design of roads in rural areas and it's elements.
Syllabus	- History of road design and construction - Road classification - Basic elements in road design and constructions - Traffic loading - Theory of vehicle - Horizontal elements in road design, elements of horizontal road line - Vertical elements in road design - Road cross-sections - Basis of flexible pavement design (standards) - Materials for construction of road subbase and pavement - Basis of road drainage - Basis of road intersections
Student obligations	- accepted project work (project for road in rural area)) untill specified date, oral preliminary exam
Exam	The exam is taken in written form. -
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Korlaet, Ž.: Uvod u projektiranje i građenje cesta, Sveučilište u Zagrebu, Zagreb, 1995. 2. Dragčević, V., Korlaet, Ž.: Osnove projektiranja cesta, Sveučilište u Zagrebu Građevinski fakultet, Zagreb 3. Pravilnik o osnovnim uvjetima kojima javne ceste izvan naselja i njihovi elementi moraju udovoljavati sa stajališta sigurnosti prometa, Narodne novine br.110/01 4. Žnideršić, B., Priručnik za iskolčavanje kružnih krivina, Građevinska knjiga, 1972. 5. Žnideršić, B., Priručnik za obilježavanje prijelaznice oblika klotoide pravokutnim koordinatama, Građevinska knjiga, 1972. **Recommended:** 1. Prvi Hrvatski kongres o cestama 1995, Zbornik priopćenja, Hrvatsko društvo za ceste-Via Vita, Opatija 1995 2. Drugi Hrvatski kongres o cestama 1999, Zbornik priopćenja, Hrvatsko društvo za ceste-Via Vita, Cavtat 1999 3. Treći Hrvatski kongres o cestama 2003, Zbornik priopćenja, Hrvatsko društvo za ceste-Via Vita, Trogir 2003.

Course:	**ENGINEERING MATERIALS**

Course code: MK-124	**Pre-requisites:** Physics	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5

Course objectives	Students will get a basic knowledge about the materials used in civil engineering and their technology and they will be introduced to testing methods and standards for construction materials.
Syllabus	Particulate Composites. Aggregates. Portland Cement Concrete. Asphalt Cement and Asphalt Concrete. Steel. Wood. Glass. Polymers and Plastics. Fiber-reinforced Composites.
Student obligations	Participation in all lectures and scheduled group laboratories. Submit a final laboratory reports. Preliminary exams.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Young, J.; Mindess, S.; Gray, R.J.; Bentura: The Science and Technology of Civil Engineering Materials, Prentice Hall, 1998. 2. Ukrainczyk, V: Poznavanje gradiva, Institut građevinarstva Hrvatske, Alcor, Zagreb, 2001. 3. Ukrainczyk, V: Beton – struktura, svojstva, tehnologija, Alcor, Zagreb, 1994. 4. Bjegović, D. i dr.: Auditorne vježbe, Praktikum, Aktivna nastava, Građevinski fakultet Sveučilišta u Zagrebu, 1994. **Recommended:** 1. Ashby, M.F.; Jones, D.R.: Engineering Materials 1, Butterworth Heinemann 1996. 2. Illston, J.M.; Domone, P.L.J. (ed.): Construction materials – their nature and behaviour, E & FN SPON Chapman & Hall, 1994.

Course:	**BASICS OF CONCRETE STRUCTURES**

Course code: NK-135	**Pre-requisites:** Strength of Materials I, Structural Mechanics II	**Hours of Active Classes:** 75 lectures: 45 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 6

Course objectives	The acquired knowledge of working concepts and properties of various concrete bearing structures will make the students competent to do independent designs of concrete structures. It will also be the background for further practical and scientific education in the field of concrete structures and structural engineering in general.
Syllabus	Property of reinforced concrete. Limit state design, partial factors of safety, global factor of safety. Analysis of the section. Stress-strain relations. Distribution of strains and stresses across a section. Singly reinforced rectangular section in bending. Reinforcement at the ultimate limit state. Flanged section in bending at the ultimate limit state. Bending plus axial load at the ultimate limit state. Analysis of section subjected to shear. Solid slabs spanning in one and two directions. The basic notions of masonry structures. The deposit brick, mortar and reinforcements. Unreinforced and reinforced masonry structures. The ceilings will be taken out from reinforced brick elements and concrete. Practices: Auditory demonstration of the characteristic systems according to types and building technology.
Student obligations	Practical elaboration of the content of the practices: working out a major project of concrete structure in a space concept (disposition, static structure model, resistance and stability of structure elements and the entire. Working out programmes is adjusted to firmly set auditory (40%) and constructive practices (60%). A successful programme is a condition for the verification of the course.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Tomičić, I.: Betonske konstrukcije, DHGK, Zagreb, 1996. 2. Tomičić, I.: Betonske konstrukcije – odabrana poglavlja, DHGK, Zagreb, 1990. 3. Tomičić, I.: Priručnik za proračun armiranobetonskih konstrukcija, DHGK, Zagreb, 1993. 4. Mosley W.H., Hulse R., Bungey J.H.: Reinforced concrete Design to Eurocode 2, Macmillan Press LTD, 1996. 5. Nilson A.H., Winter G.: Design of concrete structures, McGrau-Hill, Inc., 1987. 6. Beckett D., Alexandrou A.: Introduction to Eurocode 2. E&FN SPON, 1997. 7. Sorić Z.: Zidane konstrukcije I, HSGI, Zagreb, 1999. **Recommended:** 1. Sahnovski, K.V.: Armiranobetonske konstrukcije, Građevinska knjiga, Beograd, 1962. 2. Ulicki, I.I.: Armiranobetonske konstrukcije, Građevinska knjiga, Beograd, 1977. 3. Park R., Paulay T.: Reinforced Concrete Structures, John Wiley, New York, 1975. 4. Aničić D., Tomažević M.: Konstruiranje i proračun zidanih konstrukcija, Građevinski kalendar 1990. i 1991.

Course:	**INTRODUCTION TO STEEL STRUCTURES**

Course code: NK-136	**Pre-requisites:** Structural Mechanics I	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises seminars	**ECTS:** 5

Course objectives	Ability to identify, formulate and solve engineering problems in the field of design of steel-framed structures.
Syllabus	Need for and use of steel structures; Types of steel structures; Manufacturing from molted iron to steel in the past; Definition of basic steel characteristics (weldability of steel, brittle fracture, imperfections); Quality of steel in civil structural engineering; Loads, actions and partial safety factors; Safety concept: Ultimate Limit States and Serviceability Limit States; Dimensions, properties and classification of cross-sections; Resistance of cross-sections: compression, moment and shear resistance; Interactions; Resistance of members: buckling resistance and lateral torsional buckling; Members subjected to axial compression force and bending after Eurocode 3; Joints and connections: column to beam and column to foundation; Bolted and welded connections; Welding technologies; Design and construction of Single-storey, one way spanning buildings; Problems in construction and operations; Computer Aided Design and suitable software.
Student obligations	Obligatory attendance to the course. Accepted project work before the end of the term.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Androić, B., Dujmović, D., Džeba, I., METALNE KONSTRUKCIJE 1, IGH, Zagreb, 1994. 2. Androić, B., Dujmović, D., Džeba, I., METALNE KONSTRUKCIJE 2, IA PROJEKTIRANJE, Zagreb, 1995. 3. Džeba, I., Androić, B., Dujmović, D., METALNE KONSTRUKCIJE 3, IA PROJEKTIRANJE, 1998. 4. Androić, B., Džeba, I., Dujmović, D., INTERNATIONAL STRUCTURAL STEEL SECTIONS: Design Tables According to Eurocode 3, Ernst & Sons A Wiley Company, 2000 **Recommended:** 1. Androić, B., Dujmović, D., Džeba, I., METALNE KONSTRUKCIJE 4, IGH, Zagreb, 2003. 2. Dujmović, D., Androić, B., Džeba, I., MODELIRANJE METALNIH KONSTRUKCIJA PREMA EUROCODE 3, IA PROJEKTIRANJE, Zagreb, 2004. 3. Eurocode 3 – Design of steel structures, Part 1-1: General rules and rules for buildings, European Committee for Standardization, EN 1993-1-1:1992.

Course:	**INTRODUCTION TO HYDRAULIC ENGINEERING**

Course code: H-118	**Pre-requisites:** Fluid Mechanics	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5

Course objectives	- To provide that during the course students adopt basic elements of engineers foreseeing, conclusion making and elementary hydrotechnic tasks solving from the domain of water supply, drainage and regulation constructions - Enabling students for independent solving of basic tasks from the domain of water supply, dreainage and water bed regulation
Syllabus	- Water and water resources (basic concepts, water distribution in hydrosphere, water quality, water managemental systems and surroundings, structural and non-structural measures in water management) - Water supply systems (water demands, water conditioning, elements of water supply systems, basics of planning, constructioning and maintaining of water supply systems) - Systems of the drainage of sewage and precipitation water (dimmensioning quantities, elements of the drainage systems, sewage water purification, recipient characteristics, protection from water pollution, basics of planning, constructioning and maintaining of water drainage systems) - River bed regulations (morphology of the river bed, floods, sediment, longitudinal and transversal constructions in water bed, basics of planning, constructioning and maintaining of constructions)
Student obligations	- Attendance to lectures and exercises as defined by the faculty regulations. - Preparing and delivering of a program from exercises (designing of the idea solution for water supply system, sewage system and/or water bed regulation)
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Gulić, I. (2000): Opskrba vodom, HSGI, Zagreb; 2. Margeta, J. (1998): Kanalizacija naselja, GF Split, GF Osijek, IGH,PC Split., 3. Vuković, Ž. (1994): Osnove hidrotehnike, Akvamarine, Zagreb. **Recommended:** 1. Tedeschi, S. (1996): Zaštita voda, Hrvatsko društvo građevinskih inženjera 2. Svetličić,E. (1987): Otvoreni vodotoci – regulacije, GF Zagreb.; 3. Chin, A.D.: 2000, Water – Resources Enginnering, Prentice Hall, New Jersey.

Course:	**CONSTRUCTION MANAGEMENT AND TECHNOLOGY**

Course code: OA-147	**Pre-requisites:** Structure and Characteristics of Materials	**Hours of Active Classes:** 75 lectures: 45 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 6

Course objectives	Acquiring technological and organisational knowledge and skills required to manage and lead construction.
Syllabus	1. Construction technics and technology 2. Earthworks technology 3. Technology of ready-mixed concrete and mortar 4. Steel bending works technology 5. Transports – cargo lifting and transfer 6. Scaffolds and formworks 7. Technology of asphalt works 8. Introduction to construction organisation 9. System and project, the basics of project management 10. Design of construction organisation 11. Organisation of construction processses 12. Site organisation 13. Construction planning 14. Organisation of participants in building process; 15. Safety at work
Student obligations	attendance to the course according to the Faculty regulations accepted project work before the end of the term
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Car-Pušić, D.: Organizacija i tehnologija građenja, 2004. (unreviewed course materials for internal use) 2. Lončarić, R.: Organizacija izvedbe graditeljskih projekata 3. Slunjski, E.: Strojevi u građevinarstvu, HDGI, Zagreb, 1998. **Recommended:** 1. Bučar G.: Tesarski, armirački i betonski radovi na gradilištu, Građevinski fakultet J.J. Strossmayera, Osijek, 1997. 2. Trbojević, B.: Građevinske mašine, Beograd, 1985. 3. Trbojević, B.: Organizacija građevinskih radova, Naučna knjiga, Beograd, 1992. 4. www.grad.hr.-djelatnici-dr.sci.Zdravko Linarić-Dokumenti raspoloživi za download- 5. Leksikon osnovne građevinske mehanizacije 6. Učinak građevinskih strojeva 7. Postrojenja za proizvodnju gradiva, I dio-Drobilane, Tvornice betona(betonare), Asf. baze

Course:	**GEOTECHNICAL ENGINEERING**

Course code: G-107	**Pre-requisites:** Soil and Rocks Mechanics	**Hours of Active Classes:** 75 lectures: 45 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises seminars	**ECTS:** 6

Course objectives	The student is expected to acquire a basis knowledge of geotechnical engineering. The main objective of this course is to educate future engineers in basic geotechnical analysis and develop competences in design of foundations and other geotechnical structures. Prepare students for others applied courses.
Syllabus	Spread foundations Deep foundations: piles and slurry walls Deep foundations: caissons, pneumatic caissons and box Retaining constructions Sheet-pile walls Slope stability: triggering mechanisms and stability analysis Slope stability: stabilization of slopes Earth structures Construction methods of tunnel, shafts and underground structures Underground excavation instability mechanisms Stabilization principles of the underground excavation
Student obligations	Lecture course attendance Exercise course attendance Seminare course attendance
Exam	Written and oral exam. Positively marked written exam is a condition for the oral exam. Written exam consist of theoretical and numerical part.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Nonveiller, E.: Mehanika tla i temeljenje građevina, Školska knjiga, Zagreb, p.780, 1979. 2. Bowles, J.E.: Foundation analysis and design, Mc. Graw Hill, III. Ed. Int. Student ed., New York, p 816, 1986. 3. Vrkljan, I., Inženjerska mehanika stijena, interna skripta Građevinskog fakulteta u Rijeci, 2002. **Recommended:** 1. Nonveiller, E.: Kliženje i stabilizacija padina, Školska knjiga, Zagreb, p.204, 1987. 2. Naval Facilities Engineering Command: Foundation, Design Manual 7.01, Alexandria, VI, 1986. 3. Hoek, E., Bray, J.W.: Rock Slope Engineering, 2nd. Edn., The Institute of Mining and Metallurgy, London, p. 527., 1977. 4. Hoek, E., Brown, E.T.: Underground Excavations in Rock, Istitution of Mining and Metallurgy, London, 1980.

Course:	**CONSTRUCTION ECONOMICS**

Course code: OA-148	**Pre-requisites:** enrolled Construction Management and Technology	**Hours of Active Classes:** 45 lectures: 30 exercises: 15 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 4

Course objectives	Acquiring knowledge required for costs analysis and construction works price calculation
Syllabus	1. Construction standards 2. Construction standards for particular works – preliminaries, earthworks, carpenters works, steel bending works, concrete works, masonry works, transfers, craftsmanly works 3. Machine works standards 4. Structure of cost in construction – material costs, costs of labour, machine work costs, machine amortization, direct and indirect costs, structure of indirect site costs, company administration costs, additional calculation, calculated factor, price analysis, construction works price calculations
Student obligations	attendance to the course according to the Faculty regulations accepted project work before the end of the term
Exam	written exam, oral exam
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Bučar, G.: Priručnik za građevinsko poduzetništvo Normativi građevinskih radova,ICG Omišalj,Rijeka,1999.; ili 2. Bučar, G.: Normativi i cijene u graditeljstvu,ICG Omišalj, Građevinski fakultet u Rijeci, Rijeka, 2003. **Recommended:** 1. www.grad.hr-djelatnici-dr.dci.Zdravko Linarić-Dokumenti raspoloživi za download-Troškovi strojnog rada u građenju 2. Žaja, M.: Ekonomika proizvodnje, Školska knjiga, Zagreb, 1991.

Course:	**FIELDWORK**

Course code: OA-149	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 0 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** - exercises -	**ECTS:** 3

Course objectives	Introduction with the practical application of managerial and technological knowledge solving the particular site problems.
Syllabus	3-4 organized site visits, introduction with construction of particular objects, and practical problems in specific fields solving.
Student obligations	70 % site visits attendance project work
Exam	none
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** **Recommended:** 1. Bučar, G.: Tesarski, armirački i betonski radovi na gradilištu, Građevinski fakultet J.J. Strossmayera, Osijek, 1997. 2. Lončarić, R.: Organizacija izvedbe graditeljskih projekata

Course:	**FINAL YEAR PROJECT**

Course code: ZR-PRED	**Pre-requisites:** The exam can be undertaken only after all other course exams have been passed	**Hours of Active Classes:** 30 lectures: exercises: seminars: 30
Course status: mandatory	**The course consists of:** - - seminars	**ECTS:** 5

Course objectives	The successfully passed final year project exam confirms that the student has, in the course of their studies, acquired the necessary skills to produce and present a major seminar work (project plan or a solution to a theoretical or practical civil engineering problem) in the area of planning and design of a simpler civil engineering structure or system.
Syllabus	The final year project is to be conducted during the total of 140 hours (ECTS 5), which includes 60 hours of active classes. The project subject can be practical or theoretical and has to be related to a civil engineering activity and the undergraduate courses. It is chosen by the student and confirmed by the board in charge during the sixth term and not later than 1 May of the running year. The final year project can be of the following types: - planning a simpler civil engineering facility (a smaller bridge, a road out of a city, a simpler system of water supply or discharge etc.) - building organisation project of a simpler facility - design of a concrete, steel or timber structure - analytical or numerical analysis of an engineering problem which requires additional theoretical insight The student collaborates closely with the supervisor, who is normally the teacher of the course thematically associated with the project. If necessary, a co-supervisor may also be nominated.
Student obligations	The student is expected to submit the working version of the project to the supervisor as a condition for the confirmation of the course. The final version of the project should be submitted to the supervisor and the General Office (two copies) at least seven working days before the tentative presentation date. The presentations take place during the exam periods and the General Office notifies about the actual dates.
Exam	The exam is conducted orally, through a public presentation of the project.
Assessment	80% for the written project, 20% for the presentation.
Literature	**Essential:** Depending on the subject **Recommended:** Depending on the subject

Course:	**ENGINEERING GEOMETRY**

Course code: M-182	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 10 exercises: 0 seminars: 20
Course status: optional	**The course consists of:** - - seminars	**ECTS:** 3

Course objectives	- to acquire the knowledge about quadric surfaces and methods for constructive elaboration - interdisciplinary approach to geometry in engineering, computer graphics and object -shapes - to acquire the problem-oriented exercises, using computer graphics - to develop abbility to identify, formulate and solve complex engineering geometric problems
Syllabus	Computer graphics and CAGD -Computer Aided Geometric Design Perspective projection and it's use in CAD Surfaces on objects. Introduction to theory of surfaces. Quadrics. Surface modelling in CAD. Intersection of a quadric and a plane. Constructive methods in virtual 3D-space on computer. Intersection of quadrics. Space quartic curves. Solid-modelling, transformations of primitives and constructive solid geometry Tangent plane and normal in the regular point of the surface. Main and gaussian curvature of surfaces. 3D constructions using CAD. Ruled surfaces. Ruled quadrics and CAD modelling. Ruled quadrics in civil engineering. Constructive elaboration. Geometry of roofs Quoted projection. Topographic surfaces. Tracing. Solving methods using profiles and contour lines.
Student obligations	- course attendance - active collaboration- seminars - accepted project work before the end of the term
Exam	none
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Pletenac, Lidija: Inženjerska geometrija u CAD- u, elektronički udžbenik-skripta, 2. Brauner, Kickinger: Geometrija u graditeljstvu, Školska knjiga, Zagreb, 1980. (prevele Kurilj, Hajsig) 3. Babić; Gorjanc; Sliepčević; Szirovicza: Konstruktivna geometrija, IGH, Zagreb, 2000. 4. Niče, dr.Vilko: Deskriptivna geometrija I i II, Školska knjiga, Zagreb, 1992. 5. Turk, Stanko: Računalna grafika. Osnovi teorije i primjene, Školska knjiga, Zagreb, 1987. 6. Design CAD Manual (raspoloživ u elektroničkom obliku). **Recommended:** 1. Gerald Farin: Curves and Surfaces for Computer Aided Geometric Design, (a practical guide), Academic Press, Boston, 1990. 2. Foley, van Dam, Feiner, Hughes, Phillips: Introduction to Computer Graphics, Addison – Wesley , Massachusetts, 1994. 3. Foley, van Dam, Feiner, Hughes, Computer graphics: Principles and Practice, Addison Wesley, Massachusetts, 1990. 4. Hohenberg, Fritz: Konstruktive Geometrie in der Technik, Wien,1961. 5. John Vince: 3-D computer animation, Addison –Wesley Publishing Company 1994 6. Giering, Dr. Osvald; Seybold, Dr. Hans: Konstruktive Ingenieurgeometrie, Carl Hanser Verlag, München

Course:	**COMPUTER APPLICATIONS**

Course code: M-184	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 10 exercises: 10 seminars: 10
Course status: optional	**The course consists of:** lectures exercises seminars	**ECTS:** 3

Course objectives	learn fundamental principles of CAD and GIS software introduction to autnomous use of one CAD package
Syllabus	- computer graphics, - database systems - definition of CAD,CAE, CAAD, CAM - CAD in Civil Engineering - An example of CAD software - principles of work, types of commands, coordinate system - GIS: definition , fields of application
Student obligations	- attendance to the course as defined by the Faculty regulations - accepted computer assignments until specified date and one seminar work
Exam	no exam
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. course materials presented on the web site www.gradri.hr/~informatika 2. the relevant web site adresses presented on the course web site 3. manuals related to the software presented during the lessons- literature is regularly renewed **Recommended:**

Course:	**INTRODUCTION TO PROGRAMMING**

Course code: M-177	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 10 exercises: 20 seminars: 0
Course status: optional	**The course consists of:** lectures exercises -	**ECTS:** 3.0

Course objectives	The goal of the course is to achieve an overview of information technologies which can be used in the professional field. The student will learn how to approach and solve specified problem with a computer. The student will learn to create simple VBA programs in Excel and will get familiar with databases.
Syllabus	Programming, program languages and their classification, specialized languages (DSL), script languages, compilers and interpreters, algorithms, steps in programming: from defining a program to application maintenance, object oriented programming, VBA – Visual Basic for Applications, VBA for Excel
Student obligations	Accepted computer assignments until specified date and one seminar work
Exam	none
Assessment (1)	Activity in class, assignments and seminars (100%)
Literature	**Essential:** **Recommended:** 1. J. Walkenbach: Excel 2007 Power Programming with VBA, Wiley

Course:	**COMMUNICATION SKILLS**

Course code: FD-193	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 15 exercises: 15 seminars: 0
Course status: optional	**The course consists of:** lectures exercises -	**ECTS:** 2

Course objectives	The course goal is to provide understanding of fundamental knowledge about interpersonal communication, about verbal and nonverbal communication, and to enhance skills at interpersonal communication.
Syllabus	1. Effective communication: Components and process. Communication Types. Communication barriers. Cultural influences. 2. Verbal communication: Language, Meaning. Message clarity. Language formality. Gender differences in communication. 3. Nonverbal communication: Types of nonverbal communication. Functions. Nonverbal expressivity and sensitivity. Verbal and nonverbal contradiction. Self-presentation. 4. Communication skills: - Listening. Importance of listening. Components. Active listening tecniques. - Conflict and negotiation. Types of conflict. Causes and consequences. Conflict resolution. - Assertiveness: What is assertiveness. Causes of nonassertiveness. Special techniques of assertive communication. - Communication in the workplace: Interview. Communication in organisation. Communication climate. Communication in work tems. Leadership. Public communication.
Student obligations	Students must be active and participate in class activities.
Exam	-
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Adubato, S., Foy DiGeronimo, T. (2004). Govorite iz srca. Alinea, Zagreb.2004 2. Breakwell, G.M. (2001). Vještine vođenja intervjua. Jastrebarsko, Naklada Slap. 3. Miljković, D., Rijavec, M. (1999). Menedžerske vještine 1, IEP, Zagreb. 4. Miljković, D., Rijavec, M. (2002). Menedžerske vještine 3, IEP, Zagreb. 5. Breakwell, G.M. (2001). Vještine vođenja intervjua. Jastrebarsko, Naklada Slap. 6. Tannen, D. (1998). Ti to baš ne razumiješ, Zagreb, Izvori. **Recommended:** 1. Adler, R.B., Rodman, G. (2000). Understanding Human Communication, Harcourt, Forth Worth. 2. Fox, R. (2001). Poslovna komunikacija. Hrvatska sveučilišna naklada, Zagreb. 3. Knapp, M., Hall, J.A. (2002). Nonverbal Communication k in Human Interaction, Wadsworth, Belmont. 4. Trenholm, S., Jensen, A. (2000). Interpersonal Communication, (4. izd.), Wadsworth, Belmont. 5. Verderber, K.S., Verderber, R.F. (2001). Inter-Act. Interpersonal Communication Concepts, Skills, and Contexts, 9th ed., Wadsworth, Belmont.

Course:	**INTRODUCTION TO LANGUAGE CULTURE**

Course code: FD-199	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 15 exercises: 15 seminars: 0
Course status: optional	**The course consists of:** lectures exercises -	**ECTS:** 2

Course objectives	The main course objective is mastering the basics of linguistic and grammar norms, in written as well as oral expression. Students will gradually become acquainted with accurate terminology as well as the uses of normative manuals (orthography, grammar, dictionaries, linguistic reference books et al.).
Syllabus	Language as system and language as standard (system norms and norms of function); standard language and its norms; standard language realization and functional styles (stylistic norms); elements of grammar (morphological, syntactic) and lexical norm; normative reference books (grammar books, dictionaries, orthographic lexica) and their use. Written expression; orthographic norm; rules of orthography; spell checking and the use of spell-checkers; forms of written expression and text structure. Oral expression; orthoepic norms; values of spoken language (syntax melody, diction and accentuation); sentence as a unit of communication (expression); suprasyntactic unity (text, discourse); speech composition; forms of oral expression; rhetoric. Language in professional use; scientific style as one of the functional styles of standard language; characteristics and layers within styles (professional, popular-scientific, scientific etc.); terminology; terminological lexica; Croatian unilingual dictionaries; organization of scientific/professional text (written and/or spoken).
Student obligations	Students are required to take active part in all aspects of course attendance; they will solve linguistic problems individually or in group assignments.
Exam	-
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Anić, Vladimir, Rječnik hrvatskoga jezika, Novi Liber, Zagreb 1998. 2. Anić, Vladimir – Goldstein, Ivo, Rječnik stranih riječi, Novi Liber, Zagreb 1999. 3. Babić, Stjepan – Finka, Božidar – Moguš, Milan, Hrvatski pravopis, Školska knjiga, Zagreb 1996. 4. Rječnik hrvatskoga jezika, ed. Jure Šonje, Leksikografski zavod - Školska knjiga, Zagreb 2000. 5. Škarić, Ivo, Temeljci suvremenoga govorništva, Školska knjiga, Zagreb 2000. 6. Težak, Stjepko – Babić, Stjepan, Gramatika hrvatskoga jezika, Školska knjiga, Zagreb 1992… **Recommended:** 1. Barić, Eugenija et al, Hrvatska gramatika, Školska knjiga, Zagreb 1995. 2. Barić, Eugenija et al, Hrvatski jezični savjetnik, Institut za hrvatski jezik i jezikoslovlje, Pergamena - Školske novine, Zagreb 1999. 3. Batnožić, Slaven – Ranilović, Branko – Silić, Josip, Hrvatski računalni pravopis (Gramatičko-pravopisni računalni vodič), Matica hrvatska - SYS, Zagreb 1996. 4. Brodnjak, Vladimir, Razlikovni rječnik srpskog i hrvatskog jezika, Školske novine, Zagreb 1991. 5. Govorimo hrvatski (jezični savjeti), ed. M. Dulčić, Zagreb 1997.

Course:	**CONSTRUCTION HISTORY**

Course code: OA-154	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 15 exercises: 0 seminars: 15
Course status: optional	**The course consists of:** lectures - seminars	**ECTS:** 2

Course objectives	Inform students about the historical development of architectural constructions for a better understanding of modern constructional solutions. Expand the knowledge of modern construction possibilities.
Syllabus	- Prehistory- megalithic menhir, dolmen (Space concept), archetypal hut, column, beam, bearing. - Egypt, Mesopotamia, stone, brick, tectonics, stereotonic structures, statics authority. - Greece, beauty canon, ideal proportion (Proportional concept), module. Temple, theatre. - Antique Rome, arch, tunnel volt, colonnade, arcade, dome, engineering constructions. - Byzantine dome on pendentives. - Middle Ages, retardation, fortification, basilica as the typology of a new focus of interest. - Gothic structuralism, ribs, vaults, supports, perpendicular and floral Gothic. - Reneissance and baroque renewal of the antique model, reneissance dome. - Engineering constructions of the 19th century, steel, glass, concrete, world exhibitions, train stations, halls, suspension bridges. Art Nouveau at the turn of the century, Constructivism, Futurism, Modernism of the 20th century. - Postmodernism, Deconstructivism, High-tech, space shell, grid, suspended and pneumatic constructions.
Student obligations	- Course attendence - Visits to sites and theme exhibitions - Seminar work
Exam	- -
Assessment	Preliminary exams, seminars (100%). -
Literature	**Essential:** 1. Čokić, R.: Povijest arhitekture, Školska knjiga, Zagreb 1968. 2. Milić, B.: Razvoj grada kroz stoljeća, I, II, III, Školska knjiga, Zagreb 90/04 3. Tonković, I.: Priča o građenju, Tehnička knjiga, Zagreb 4. MGR: Arhitektura Rijeke, Moderna, Secesija, Historicizam, 96-01. **Recommended:** 1. Janson, H.W.: History of art, New York 61/02. 2. Encyclopaedia of 20th Century Architecture, Thames and Hudson 1989. 3. Pearman, H.: Contemporary World Architecture, Phaidon 1998. 4. Enciklopedijska izdanja

Course:	**BUILDING AND CONSTRUCTING ENGLISH**

Course code: FD-197	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 15 exercises: 10 seminars: 5
Course status: optional	**The course consists of:** lectures excercises seminars	**ECTS:** 2.0

Course objectives	Language competence perfection in written and oral form, drawing of reports and papers in English.
Syllabus	Grammar section (specific grammar patterns): - Grammar constructions typical for ESP, their application in written forms Language section (general vocabulary, vocational and profession-related terminology): - Vocabulary extension in relation to specific Civil Engineering fields - Idioms and phrases used in everyday communication whose literal meaning is related to Civil Engineering - Writing a CV, business correspondence, job applications
Student obligations	- Attendance to the course as defined by the Faculty regulations. - Two written tests and one oral test. The scores obtained at the tests are added together (each written test is worth 30% and the oral test 40% scores). The condition for obtaining credits is 40% of total points
Exam	none
Assessment (1)	Course attendance, activity in class, seminars (100%).
Literature	**Essential:** - Texts used in lectures and exercises - Any grammar of English language **Recommended:** - A. Prager: Trojezični građevinski rječnik, Masmedia, 2003.

Course:	**INTRODUCTION TO SPATIAL PLANNING**

Course code: OA-144	**Pre-requisites:** None	**Hours of Active Classes:** 45 lectures: 30 exercises: 0 seminars: 15
Course status: mandatory	**The course consists of:** lectures - seminars	**ECTS:** 3

Course objectives	Familiarising of students with theory an practise of urban and regional planning and standard types of urban studies and plans, so they can understand and participate in process of planning and management of urban spaces.
Syllabus	- Basic terms and definitions about urban planning and spatial planning and land use - Urban studies and land use plans: types, characteristics, basic parts - Policy making methodology - Regulations ,institutions and laws in the process of planning and implementation of urban plans - -Geographical, functional and economical impacts on the development of urban areas and regions - Analysis and space planning of different activities: residence, work, industry, recreation, green spaces and parks, traffic and other infrastructure systems, tourism, historical and cultural objects and areas - Analysis and space planning of different areas: centre board district, residential areas, rural areas - Basic social, economical and environmental impacts on urban planning.
Student obligations	- participating in the class - seminar work
Exam	-
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Marinović-Uzelac, A.: Prostorno planiranje. - Zagreb: Dom i svijet, 2001. 2. Milić, B.: Razvoj gradova kroz stoljeća I (1994), II (1994) i III (2002) - Zagreb: Školska knjiga. 3. Marinović-Uzelac, A.: Naselja, gradovi i prostori. - Zagreb: Tehnička knjiga, 1986. 4. Zakoni i propisi u svezi prostornog planiranja i prostornog uređenja i građenja. - Zagreb: Narodne novine RH. **Recommended:** 1. Prinz, D.: Staedtebau. - Stuttgart: Kohlhammer, 1988. i 1992. 2. Mumford, L.: Grad u historiji. - Zagreb: Naprijed, 1968. 3. Šćitaroci, M.-O.: Hrvatska parkovna baština. - Zagreb: Školska knjiga, 1992. 4. Marinović-Uzelac, A.: Teorija namjene površina u urbanizmu. - Zagreb: Tehnička knjiga, 1989. 5. Meise, J., Volwahsen, A.: Stadt- und Regionalplanung. - Vieweg und Sohn, 1980. 6. Marinović-Uzelac, A.: Socijalni prostor grada. - Zagreb: SN Liber, 1986. 7. Maksimović, B.: Urbanizam. - Beograd: Naučna knjiga, 1980. 8. Prostorno-planska dokumentacija (općina, grad, županija, makroregija, država, Europska unija).

Course:	**BUILDING DESIGN**

Course code: OA-143	**Pre-requisites:**	**Hours of Active Classes:** 45 lectures: 15 exercises: 30 seminars: 0
Course status: optional	**The course consists of:** lectures exercises -	**ECTS:** 3

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. – Konstruction as the basis of formation - public buildings for special purposes, halls, big sheds, stadiums, theatres, aeroports.
Student obligations	– Course attendence – 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	– -
Assessment	Preliminary exams, seminars (100%). –
Literature	**Essential:** 1. Neufert, E.: Arhitektonsko projektiranje, IGH Zagreb 2002. 2. Proizvodni programi građevinske opreme 3. Planovi i projekti izvedenih rješenja. **Recommended:** 1. G. Knežević, I. Kordiš: Stambene i javne zgrade, tehnička knjiga, Zagreb 2. Encyclopaedia of 20th Century Architecture, Thames and Hudson 1989. 3. H. Pearman: Contemporary World Architecture, Phaidon 1998. 4. R. Fisher: New Structures, New York, London 1964. 5. T. Herzog: Pneumatic Structures, C.L.Staples, London 1977. 6. I. Tonković: Priča o građenju, Tehnička knjiga, Zagreb

Course:	**INTRODUCTION TO BUILDING PHYSICS**

Course code: MK-122	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 20 exercises: 0 seminars: 10
Course status: optional	**The course consists of:** lectures - seminars	**ECTS:** 2

Course objectives	Enabling student to independently solve practical engineering problems from the field of the course.
Syllabus	Introduction. Modelling of fundamental equations in difusion and heat transfer. Modelling of Helmholz wave equation. Computer programs for Assessment of heat and sound resistance in buildings.
Student obligations	Two assignments to be done with software by prof. I.Kožar and program MathCAD.
Exam	-
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Kožar, Ivica: Kompjuterski programi, Građevni godišnjak 1997, str.565-574. 2. Chapra, S.C., Canale, R.P.: Numerical Methods for Engineers, McGraw Hill, 1988. 3. MathCAD 2001 user manual. **Recommended:** 1. Gertis, K., Mehra, S-R., Veres, E., Kießl, K.: Bauphysikalische Aufgabensammlung mit Lösungen, Teubner, Stuttgart, 1996. 2. Ožbolt, J., Kožar, I., Eligehausen, R., and Periškić, G., (2005). "Instationäres 3D Thermo-mechanisches Modell für Beton," Beton und Stahlbetonbau, in press (to be published in January, 2005).

Course:	**ENVIRONMENTAL PROTECTION**

Course code: G-105	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 10 exercises: 0 seminars: 20
Course status: optional	**The course consists of:** lectures - seminars	**ECTS:** 2

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 constuction works. Students will be prepared for supplementary courses: Geohazards, Traffic and environment and Waste menagement.
Syllabus	Basic principles of environmental protection, Biological diversity and biogeochemical cycles Global ecosystem: interaction of geosphere, hydrosphere, atomosphere, 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	-
Assessment	Preliminary exams, seminars (100%).
Literature	**Essential:** 1. Benac, Č. ZAŠTITA OKOLIŠA ZA STUDENTE GRADITELJSTVA. Građevinski fakultet Sveučilišta u Rijeci, 2004. www.gradri.hr 2. Glavač, V., UVOD U GLOBALNU EKOLOGIJU. Hrvatska sveučilišna naknada, Ministarstvo zaštite okoliša i prostornog uređenja, Pučko otvoreno učilište-Zagreb. Zagreb, 2001. **Recommended:** 1. Springer, P.O., ed., EKOLOŠKI LEKSIKON. Ministarstvo zaštite okoliša i prostornog uređenja, Barbat, Zagreb. Zagreb, 2001. 2. Botkin, D.B.and Keller, E.A. ENVIRONMENTAL SCIENCE, John Wiley and Sons (4. ed.), 2003 3. Prohić, E., GEOKEMIJA. Targa Zagreb, Zagreb, 1998. 4. Črnjar, M.,: EKONOMIKA I POLITIKA ZAŠTITE OKOLIŠA. Ekonomski fakultet Sveučilišta u Rijeci, Glosa Rijeka. Rijeka, 2002.

Course:	**MANAGEMENT IN CIVIL ENGINEERING**

Course code: OA-155	**Pre-requisites:**	**Hours of Active Classes:** 45 lectures: 30 excercises: 0 seminars: 15
Course status: mandatory	**The course consists of:** lectures - -	**ECTS:** 3

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 4) Production capacity economy. Costs. 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
Exam	- written exam - oral exam
Assesment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** -Katavić, M., Hamarić, S., Poslovna politika, Sveučilište u Zagrebu, Građevinski institut, Zagreb, 1989 - Žaja, M., Ekonomika proizvodnje, Školska knjiga, Zagreb, 1992. **Recommended:** - Miles, R.E., Theories of Management, McGraw - Hill, 1975. -Wagner, H.M., Principles of Management Science, Eaglewood Cliffs, N.J., Prentice-Hall, 1975.

Course:	**CIVIL ENGINEERING REGULATIONS**

Course code: OA-156	**Pre-requisites:**	**Hours of Active Classes:** 30 lectures: 30 exercises: 0 seminars: 0
Course status: optional	**The course consists of:** lectures - -	**ECTS:** 3

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, oral
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. UČUR, Marinko. Građevinska regulativa, Građevinski fakultet, Rijeka, 2004; Ustav RH, Zakon o gradnji. **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.

Course:	**BRIDGES**

Course code: NK-134	**Pre-requisites:** Engineering Materials	**Hours of Active Classes:** 60 lectures: 30 exercises: 15 seminars: 15
Course status: mandatory	**The course consists of:** lectures - seminars	**ECTS:** 5

Course objectives	The student is expected to acquire a basic knowledge and understanding of bridge building.
Syllabus	- History of bridge construction; general information on bridges; bridge types; elements of bridge disposition; traffic conditions and external effects - Load carrying bridge structures; Substructure; Bridge equipment - Elements of bridge design - Bridge construction; Maintenance of bridges; Safety standards for bridges - Bridges under extreme conditions; Achivements and future developments in bridge construction
Student obligations	Attendance to the course has to be in accordance to the Faculty regulations. It is compulsory to attend an organized visit to the bridge building sites.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Radić, J.: Mostovi, Dom i svijet, Zagreb, 2002. 2. Tonković, K.: Oblikovanje mostova, Tehnička knjiga, Zagreb, 1985. **Recommended:** 1. Šram, S.: Gradnja mostova, Golden marketing, Zagreb, 2002. 2. Tonković, K.: Mostovi u izvanrednim okolnostima, Školska knjiga, Zagreb, 1989. 3. Photocopies - Symposium: Suvremeni postupci izvedbe, DHGK, Brijunski otoci, 1995.

Course:	**INTRODUCTION TO TIMBER STRUCTURES**

Course code: NK-137	**Pre-requisites:** Strenght of Materials II	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5

Course objectives	The basic knowledge of properties, conditions and ways of timber application enables acquisition of limited competence. A student should be capable, either independently or as a team member, of designing the timber structures of simpler static systems and shorter spans. The course is a base for further education in T.Str. and overall Str. Eng. studies.
Syllabus	A general survey of timber structures: historical development and modern systems. Material properties of wood: characteristics and classification of timber in structural engineering. Fire-fighting safety, protection and durability of timber structures. Elements of timber structures: proofs of mechanical resistance and stability (EC5). Connectors in timber structures: nails, screws, bolts, wood screws, clamps, dowels, glues, patent connectors, connecting steel plates. Bearing capacity of joints (EC5). Connection details of traditional timber structure elements: constructive carpentry joints, static connections and extensions, design and shaping. Design outlines of traditional timber roofs. Plane frame systems: modelling, designing of elements and characteristic details. Truss systems: modelling, design of elements and joints. Design basics of compound compressive cross-sections: yielding. Glulam girders: basics of design and shaping. Spatial stability of timber structures: bracing.
Student obligations	Elaboration of a shortened main project of a timber structure (disposition, static models, mechanical resistance and stability of the entire structure and its elements, design and shaping of details). Realisation of programmes is adjusted to a firmly set dynamics of the auditor (40%) and constructive exercises (60%). The second signature conditions are undersigned and successfully passed programme stages of oral exam.
Exam	Written part is in numerical (2h) and theoretical form (1h). If positive, the written part is a pre-requisite for an oral exam (extended check of performance knowledge).
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Bjelanović, A., Rajčić, V.: Drvene konstrukcije prema europskim normama, Hrvatska sveučilišna naklada, Zagreb, 2005. 2. Lecture and practice notes. **Recommended:** 1. Gojković, M., Stevanović, B., Komnenović, M. Kuzmanović, S., Stojić, D.: Drvene konstrukcije - Riješeni primjeri, Građevinski fakultet, Beograd, 2000. 2. DIN 1052: Teil 1, Teil 2, Teil 3, Teil 4, 2000.Informationdienst Holz: Düsseldorf, 1995. 3. Werner, G., Zimmer, K.: Holzbau 1, Holzbau 2, Springer - Verlag, Berlin, 1995.

Course:	**INTRODUCTION TO COASTAL ENGINEERING**

Course code: H-119	**Pre-requisites:** Hydrology	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5

Course objectives	To develop general competences in ocean and coastal engineering field, analysis of coastal processes, design condition analysis, to learn principles of various types of coastal structures (breakwaters, revetments), to develop competencies in their structural sizing, sizing of quay walls and berthing facilities.
Syllabus	Introduction, types of coastal structures, pecularities of construction in coastal areas Coastal processes, waves and currents design conditions, wave transformation in coastal waters Breakwaters - general description Rubble mound structure design and sizing calculations Composite/vertical wall breakwaters, design and sizing calculations Revetments - types and sizing calculations Design of sheet-pile walls and bulkheads Off-shore structures Ports and harbors open for public traffic, special-purpose ports Mooring and berthing systems, mooring and berthing facilities
Student obligations	course attendance, exercise/project work preparation, representative local coastal structures - site visit
Exam	- written and oral exam
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Tadejević, Z.; Prsic, M.: "Coastal Hydraulics - Vol. 1. ", GF Zagreb, 1981. 2. Kolhase, Soren: "Oceanographic and civil engineering basics of port design ", script 3. Kirincic, J.: "Ports and mooring berths", Školska knjiga, Zagreb, 1991. 4. USACE Engineering manuals http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm **Recommended:** 1. Bruun, Per "Port Engineering", 1981. 2. Abbot, M.B. & Price, W.A.: "Coastal, Estuarial and Harbour Engineer's Reference Book", 1994.

Course:	**WATER RESOURCES AND SYSTEMS**

Course code: H-114	**Pre-requisites:** Hydrology	**Hours of Active Classes:** 60 lectures: 30 exercises: 0 seminars: 30
Course status: compulsory	**The course consists of:** lectures exercises seminars	**ECTS:** 5

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. – Develop 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. – Municipal infrastructure water systems - water supply systems, drainage and sewage systems. Functional analysis and organisation. – Waste water treatment methods for water reusing. – 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	The exam is taken in written form.
Assessment	– Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Margeta, J.: Osnove gospodarenja vodama. GF Split, 1992. 2. Maksimović, Č.; Tejada-Guibert, J.A (editors): Frontiers in Urban Water Management. IWA Publishing. London, 2001. 3. Tedeschi, S.: Zaštita voda. HDGI, Zagreb, 1997. 4. Bonacci, O.: Ekohidrologija vodnih resursa i otvorenih vodotoka, GA Split i IGI, Zagreb, 2003. 5. Margeta, J.; Azzopardi, E.; Iacovides, I.: Smjernice za integrački pristup razvoju, gospodarenju i korištenju vodnih resursa, PPA, Split, 1999. 6. Linsley, R.K.; Franzini, J.B.; Freyberg, D.L.: Water Resources Engineering, 4/e, McGraw-Hill Book Comp.Inc., New York, 1992. **Recommended:** 1. Mays, L.W.(ed.): Water Resources Handbook. McGraw-Hill, New York, 1996. 2. Juanico, M.; Dor, I. (editors): Hypertrophic Reservoirs for Wastewater Storage and Reuse - Ecology, Performance and Engineering Design, 1999. 3. Jörgensen, S. E.: Fundamentals of Ecological Modelling, Elsevier, Amsterdam, 1988. 4. PAP: Planning and designing of Urban Waste water Treatment Projects in Mediteranean Coastal Towns, Split, 1992. 5. Biswas, A.K.: Water Resources: Environmental Planning, Management and Development, McGraw-Hill Book Comp.Inc., New York, 1997.

Course:	**TRAFFIC PLANNING AND DESIGN**

Course code: P-166	**Pre-requisites:** Introduction to Road Design	**Hours of Active Classes:** 60 lectures: 30 exercises: 30 seminars: 0
Course status: mandatory	**The course consists of:** lectures exercises -	**ECTS:** 5

Course objectives	- Introducing with the importance of traffic planning, ways of traffic research and traffic analizes - Introducing with principles of highway and intersection traffic design and parking design - View in traffic signs design
Syllabus	- Relations between transport offers and demads - Transport planning. Modal split. Transport research. Traffi analize. - Traffic flow. Highway network. Cathegory and characteristics. - Traffic on highways. Capacity (Level of service). Highway demand dimensions. - Traffic flow conflicts. Safety. Intersections. Principe of traffic regulations. - Types of intersections. Intersection in one level (Shapes "T", "X", roundabouts), multi level intersections. Intersection design. - Strandard traffic signs. Dinamic signs. Traffic lights. Phase plan in space and in time. Co-ordination of traffic lights. - Sign posts and not standard signs. Traffic equipment. - Parking. Technology on parking places. - Sistems and technology of public transportation. Alternative transport.
Student obligations	- Acktiv comments and opinions on lectures. - Exercises work. Work in groups. Presentation of work. - Exam in writeing form.
Exam	The exam is taken in written form.
Assessment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** 1. Cerovac, V.: Tehnika i sigurnost prometa; Sveučilište u Zagrebu - Fakultet prometnih znanosti, Zagreb 2001. 2. Padjen, J.: Prostorno-prometno planiranje, Informator Zagreb 3. Suvremeni promet, Časopis Hrvatskog znanstvenog društva za promet 4. Tehničar - Građevinski priručnik 4 - Poglavlja: 3. Putevi, 4. Saobraćaj u gradovima; Građevinska knjiga, Beograd 1978. 5. Tehničar - Građevinski priručnik 5 - Poglavlja: 1. Putevi, 2.Gradske saobraćajnice; Građevinska knjiga, Beograd 1987. 6. Zakon o sigurnosti prometa na cestama, HAK-Usluge d.o.o., Zagreb 2004. **Recommended:** 1. Građevni godišnjak '96; Legac., I.: Planerske i prometnotehničk 2. Ceste i mostovi, Časopis Društva za ceste Via Vita Kolenc, J.: Infrastruktura cestnega prometa, Univerza v Ljubljani, Fakulteta za pomorstvo in promet, Portorož 1997. 3. Tollazzi, T.: Krožna križišća, Univerza v Mariboru, Maribor 2002.

Course:	**RAILWAY ENGINEERING**

Course code: P-163	**Pre-requisites:** Introduction to Road Design	**Hours of Active Classes:** 60 lectures: 45 excercises: 15 seminars: 0
Course status: optional	**The course consists of:** lectures excercises -	**ECTS:** 5

Course objectives	Student is trained to participate in railway elaboration and construction process on track bed structure and track substructure.
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 -Basis of rail route design; railway project elements -Railway maintaining and reconstruction -Railway stations -Track device: switch, turntable, rail expansion joint
Student obligations	-accepted project work before specified date
Exam	-written exam, oral exam
Assesment	Preliminary exams (70%), written exam (30%).
Literature	**Essential:** Marušić, D., Projektiranje i građenje željezničkih pruga, GF Split, Split, 1994 Kožar, P., Željeznice (skripta) Pollak, B., Željeznički gornji stroj, FGZ, Zagreb, 1982 **Recommended:**

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 cpecific 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 measures for better learning results in a particular course.