UNIVERSITY OF JOSIP JURAJ STROSSMAYER IN OSIJEK
FACULTY OF CIVIL ENGINEERING IN OSIJEK

UNDERGRADUATE UNIVERSITY STUDIES OF CIVIL ENGINEERING

STUDY PROGRAMME

Osijek, March 2005

www.gfos.hr
Crkvena 21, 31 000 Osijek
tel: 031/540 070 fax: 031/ 540 071
Drinska 16a, 31 000 Osijek
tel: 031/274 377 fax: 031/ 274 444

CONTENTS

1 INTRODUCTORY PART

1.1 University of Josip Juraj Strossmayer in Osijek, Faculty of Civil Engineering in Osijek

1.1.1 Brief History of the Faculty

University education of civil engineers in the region of East Croatia reaches back into the year 1967, when the department of the Technical College Zagreb was established in Osijek. This department has been active in the region up to 1976 when, as a part of the Educational Centre for Civil Engineers, the Civil Engineering College Osijek was established. The Civil Engineering College was separated from the Civil Engineering School in 1982 and in **1983** it was merged with the Department for Materials and Constructions Osijek into the **Faculty of Civil Engineering Sciences of the Osijek University.** Since than the Faculty has been active within the Civil Engineering Institute Zagreb and after its transformation during the Homeland War in 1991, the four independent units in Zagreb, Split, Rijeka and Osijek were formed. With the separation of the Business centre Osijek of the Civil Engineering Institute of Croatia, the independent **Faculty of Civil Engineering Osijek** was founded **February 7, 1992**.

1.1.2 Past Experiences in the Implementation of University Educational Programmes

Faculty of Civil Engineering Osijek, with its 29 years of experience in educating civil engineers in Slavonia, is today one of the prominent faculties of Josip Juraj Strossmayer University, and of Slavonia, Croatia and Europe. This fact has become evident in the increased interest of students for the studies at the Faculty of Civil Engineering in Osijek and in the tendency of shortening the time of the studying. According to the present situation at the Faculty, the quality of curricula of the undergraduate and postgraduate studies, the success of the scientific and teaching workers, co-workers and other faculty members in all fields of their work, and the successful managing with the revenues, the Faculty has proved its seriousness and high position in university education and science in Croatia.
During the last 29 years of the Faculty, over **1100** students have become **civil engineers**, almost **300** of them have become **Bachelors of Science in civil engineering**, and **4** candidates have acquired their **doctoral degrees in technical sciences (Ph.D.)**. In 2003 the Faculty established the **dislocated study of civil engineering for the Vukovar-Srijem county** in Vinkovci. During 2003 and 2004 the Faculty of Civil Engineering in Osijek has initiated and realised **the CARDS project of the life-long education** of civil engineers which at once embraced more than one thousand civil engineers in the region of East Slavonia. The life-long education of civil engineers in the region is supported by regular organisation of scientific and professional lectures and presentations, and by publishing of textbooks, mimeographed course materials, monographs for students and civil engineers.
The concept of the new study programmes of the Civil Engineering Faculty of Josip Juraj Strossmayer in Osijek follows the tradition of high-quality university education of civil engineers in our region and coordinates them with the modern European (the Bologna Declaration) and world trends.

1.1.3 Taking Part in the Community Life

The Faculty staff has been active in the community life by taking part in those kinds of engineering work that demand specific knowledge and experience: reviews, environmental

protection studies, geodetic and geotechnical measurements, and measurements of the seismic response, structure testing, architectural recording of protected structures and engineering objects and innovations in the production of engineering structural elements. The revenue coming from the scientific-research work in the economy makes more than 20 % of all the Faculty revenues which approximately corresponds the trends at other university institutions in the world.

1.1.4 International Cooperation

Many Faculty members were staying as visiting lecturers and co-workers on the projects of two European (3 members) and two US universities (3 members). Some Faculty members were awarded scholarships at some prominent European (ETH, Vienna, Utrecht, Stuttgart, Hagen) and US universities (Pen State, Berkley, Purdue, Illinois). The Faculty also sends a representative of Osijek University in the European University Association, and cooperates with the Pecs University in Hungary with which it has preliminary agreed to organize joint postgraduate studies of civil engineering (official language – English).
Our students participate in the IAESTE programme of students' exchange and during the last 5 years more than 30 students were exchanged and at the same time our faculty hosted 5 foreign students. 3 students took part in the international CEEPUS programme.

1.2 Reasons for Initiating the Studies

1.2.1 Needs of the Labour Market

There are several basic reasons for initiating the studies, the most important one is based on the needs analyses of the labour market. According to the Regional Employment Office in Osijek of the Croatian Employment Bureau, there were **no unemployed civil engineers in the region of Slavonija-Baranya county in December 2004.** Reputable civil engineering firms which employ many workers are often limited with the lack of qualified workers, so that some public (Croatian Waters) and private (APZ Zagreb) firms give scholarships to third- and forth-year students. From time to time they also do «head hunting» among best students offering them jobs. The labour market offers civil engineers great employment possibilities: in manufacturing firms (concrete batching plants, cement plants, in the production of bricks, tiles, carpentry, locksmith's products...) in firms that build roads, bridges, residential, public and industrial buildings, in firms that deal with rehabilitation and wrecking, in public firms, in management and state administration, in schools and universities. For the purpose of better communication, in 2001 AMCA-FA-Mursae, the association of former students of Civil Engineering Faculty was founded. According to AMCA-FA-Mursae more than 90% of our former students work in the region of Slavonia. They work as junior researchers, teachers in secondary schools, civil engineering firms, design offices, Civil Engineering Institute of Croatia, public companies, in management and abroad.

1.2.2 Connection with Modern Scientific Concepts

The new study programmes are based on the long-time and diverse scientific work of our employees in Croatia, as well as on the cooperation with European scientific and educational institutions. Currently nine scientific-research projects financed by the Ministry of Science, Education and Sports are being carried out at our Faculty. There are also three international projects which involve American, German and Slovenian partners. The projects deal with very diverse topics and comprise the problems of earthquake engineering, timber and concrete

constructions, soil mechanics, as well as different economical aspects of civil engineering. Scientists of the Faculty of Civil Engineering in Osijek take part in the three **TEMPUS** projects: the first one dealing with the coordination of civil engineering education in Croatia with the Bologna Declaration, the second one with the application of the Bologna Declaration at the Osijek University. The Faculty is a partner in **CARDS** inter-border cooperation projects of the sustainable development of Baranya family farms, with the accent on the preservation of the landscape of Baranya villages.

1.2.3 Comparison with Foreign University Study Programmes

During the making of the study programmes we took part in shaping the **TEMPUS** project **«Restructuring and Updating of Civil Engineering Curriculum, TEMPUS JEP NO. 17062-2002»** on which all four civil engineering faculties in Croatia are engaged together with the international consortium of 10 European faculties. This cooperation, as well as the active participation in the adaptation of study programmes of engineering studies in Croatia organized by the Ministry of Science, Education and Sports, led to the coordination of all the suggested programmes of civil engineering faculties in Croatia (November 2004). The differences in the undergraduate study programmes were less than 10%.
During the making of the programmes we consulted the contents of study programmes of many European and American civil engineering faculties, and used the guidelines of professional organisations which, in some countries, define engineering competencies. We mostly followed the instructions of **EUCEET (European Civil Engineering Education and Training)** which embraces 136 scientific institutions of which more than 100 civil engineering faculties are in Europe (EUCEET projects «Harmonising Engineering Education Across Europe» 2004). We also coordinated the programmes with the guidelines of **SEFI (European Society for Engineering Education** project: »Enhancing Engineering Education in Europe, Innovative Curricula in Engineering Education 2003), with the standards of the German institution for accreditation of university programmes in civil engineering **ASBau (Akkreditierung un Qualitatssicherung zeitgemasser Studiengange des Bauingenieurwesens an deutschen Hochschulen)** from 2003, and with the criteria for accreditation of engineering programmes in the USA **(Engineering Accreditation Comission, Accreditation Board for Engineering and Technology (ABET)** from 2003 and 2004.

University	TU Delft	ETH	Uni Hann.	TU Graz	TH Aachen	Maribor	Credit range	average of credits	EUCEET	Osijek
ECTS credits	180,0	180,0	210,0	180,0	202,0	180,0	180 - 202	**187,4**	**180,0**	**180,0**
Mathematics	20,0	24,0	20,0	29,0	17,0	27,7	17,0-29,0	**22,7**	**23,0**	**22,0**
Mechanics	20,0	21,0	27,5	48,0	32,0	38,9	20,0-48,0	**30,4**	**31,5**	**33,0**
Architectural Structures	3,0	0,0	0,0	21,5	10,0	7,4	0,0-21,5	**7,8**	**6,0**	**18,0**
Engineering Structures	20,0	19,0	15,0	9,5	27,0	18,6	9,5-27,0	**18,1**	**22,0**	**20,0**
Hydraulic Engineering	18,0	13,0	10,0	16,0	21,0	5,3	5,3-21,0	**15,6**	**10,5**	**13,0**
Geotechnical Engineering	9,0	19,0	10,0	0,0	13,5	13,4	0,0-19,0	**10,3**	**13,0**	**17,0**
Construction Materials	3,0	13,0	10,0	4,0	10,5	8,6	3,0-13,0	**8,3**	**6,5**	**6,0**
Management and Economics	13,0	7,0	15,0	3,0	27,5	13,6	3,0-27,5	**13,1**	**18,0**	**14,0**
Transportation Engineering	5,0	7,0	10,0	12,5	25,0	6,2	5,0-25,0	**11,9**	**4,5**	**5,0**
Computer Science	2,0	9,0	15,0	10,5	0,0	6,4	0,0-15,0	**7,2**	**8,0**	**8,0**
Urban Planning	7,0	7,0	5,0	1,0	0,0		0,0-7,0	**4,3**	**7,5**	**5,0**
Geodesy	3,0	6,0	5,0	7,0	2,0	4,2	2,0-7,0	**6,9**	**5,5**	**4,0**
Construction Law	4,0	4,0	5,0	0,0	3,0	0,0	0,0-5,0	**3,7**	**0,0**	**2,0**
Physics	0,0	7,0	7,5	5,0	3,5	13,9	0,0-13,9	**6,6**	**6,5**	**6,0**
Descriptive Geometry	2,0	0,0	0,0	8,5	0,0	6,0	0,0-8,5	**3,2**	**5,0**	**4,0**
Chemistry	0,0	0,0	0,0	0,0	0,0	0,0	0,0-0,0	**0,0**	**3,5**	**0,0**
Other	51,0	24,0	55,0	0,0	10,0	9,8	0,0-51,0	**28,0**	**9,0**	**15,0**

Table 1: ECTS credits for some areas of specialization in the first three years of the studies on the chosen European civil engineering universities

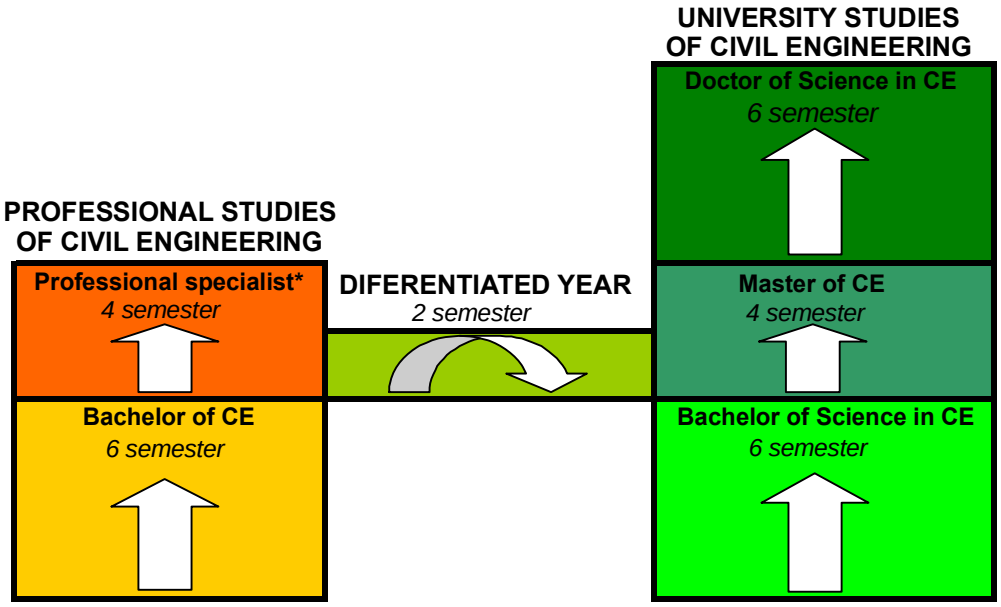
The compilation of **the Bologna Declaration**, the recommendation of the **ASCE Body of Knowledge** committee and the results of EUCEET study on the basic content of the civil engineering studies, gave us a good criterion needed for defining professional knowledge necessary to any civil engineer. The table shows the ECTS credits for particular courses in the first three years of the studies on the chosen European universities in comparison with the suggested undergraduate study programme of the Faculty. Despite certain differences, undergraduate curriculum of our faculty fits into the frame of ECTS credits in all courses and it is most similar to the study programmes of 100 European universities **(EUCET).**

1.3 Potential Partners Outside the Institutions of Higher Education

Outside the higher education system there is an interest for study programmes, particularly in the form of the continuous engineering education.

1.4 Openness of the Studies towards the Mobility of Students

In 1993 the Civil engineering studies, with its first autonomous programme, has already been declared as an «international programme». Today it continues to aim toward the openness of the studies and mobility of students. As a result of these aspirations several dozen foreign students have graduated at our faculty. Moreover, the mobility of students is ensured by the agreement on coordination and mutual acknowledgment of curricula at all civil engineering faculties in Croatia and harmonisation of programmes with European standards (see table 1) enables mobility on the European level. Besides, this mobility is also enabled by the possibility of conducting some lectures in English language (see the study programme). Also a part of scientific and educational employees is involved in teaching at other faculties of University of Josip Juraj Strossmayer in Osijek, Faculty of Agriculture and Art Academy.



Students' mobility at the Faculty of Civil Engineering in Osijek

2 GENERAL PART

2.1 Title of Studies

Faculty of Civil Engineering at the University of Josip Juraj Strossmayer in Osijek offers a study programme called **Undergraduate University Studies of Civil Engineering,** general course.

2.2 Coordinator of Studies

The **Faculty of Civil Engineering of Josip Juraj Strossmayer University** is in charge of undergraduate university studies.

2.3 Duration of Studies

The duration of Undergraduate University Studies of Civil Engineering is **three years**.

2.4 Admission Policy

The selection of enrolled candidates is performed by evaluating the success achieved in the previous education (grade point average in Mathematics, Physics and general success) and by means of a qualifying entrance exam.

2.5 Competencies

Bachelor of Science in Civil Engineering *is trained for:*

- basis in design of structures
- small project management and supervision
- structural analysis and dimensioning in concrete, metal and timber
- planning of water conduit and sewerage
- management of smaller parts of more complex projects

Competences / skills of ***Bachelor of Science in Civil Engineering***

- understanding of construction processes, design projects and methods for dimensioning

Graduate studies in Croatia that one can select in order to continue the studies:

- graduate studies of civil engineering in Zagreb, Split, Rijeka and Osijek

2.6 University Degree Acquired after Finishing the Studies

The Faculty provides study programmes leading to **bachelor's degree (Bachelor of Science in Civil Engineering).**

3. DESCRIPTION OF STUDY PROGRAMME

3.1. Study programme

3.1.1. Undergraduate University Studies

I SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures	Hours a week practice	Exam	ECTS credits
1.05 -101	Mathematics I	Ass.Prof. NINOSLAV TRUHAR	4,00	3,00	yes	8,00
1.05 -102	Descriptive Geometry	M.Sc.IVANKA STIPANČIĆ -KLJAJIĆ	2,00	2,00	yes	5,00
1.02 -101	Physics	Ph.D.JOSIP BRANA	3,00	1,00	yes	5,00
2.01-101	Building Structures I	doc.dr.sc. ŽELJKO KOŠKI	2,00	2,00	yes	5,00
2.01-102	Engineering Drawing/CAD	Ass.Prof. NIKOLA KLEM	2,00	2,00	yes	5,00
5.07-101	Physical Education I	ŽELJKA VUKIĆ	0,00	2,00	no	0,00
total of compulsory courses			**13,00**	**12,00**		**28,00**
optional courses						
6.03-101	German I	ANAMARIJA BISKUPOVIĆ	0,00	2,00	quiz	2,00
6.03-102	English I	LIDIJA KRALJEVIĆ	0,00	2,00	quiz	2,00
2.01-103	Introduction to Building	Ass.Prof. SANJA LONČAR-VICKOVIĆ	2,00	0,00	quiz	2,00
2.09-101	Application of Computers	Ass.Prof. NIKOLA KLEM	0,00	2,00	quiz	2,00
total of all courses						**30,00**

II SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures	Hours a week practice	Exam	ECTS credits
1.05-103	Mathematics II	Ass.Prof. NINOSLAV TRUHAR	4,00	3,00	yes	8,00
2.15-101	Mechanics I	Ass.Prof. ALEKSANDAR JURIĆ	3,00	2,00	yes	6,00
2.01-104	Building Structures II	Ass.Prof. ŽELJKO KOŠKI	2,00	2,00	yes	5,00
2.04-101	Geodesy	Ass.Prof. BRANKICA MALIĆ	2,00	2,00	yes	5,00
2.10-101	Engineering Geology	Asc. Prof. TOMISLAV IVANKOVIĆ	2,00	1,00	yes	4,00
5.07-101	Physical Education I	ŽELJKA VUKIĆ	0,00	2,00	no	0,00
total of compulsory courses			**13,00**	**12,00**		**28,00**
optional courses						
6.03-103	German II	ANAMARIJA BISKUPOVIĆ	0,00	2,00	quiz	2,00
6.03-104	English II	LIDIJA KRALJEVIĆ	0,00	2,00	quiz	2,00
2.09-102	Computer Programming in Civil Engineering	Ass.Prof. NIKOLA KLEM	0,00	2,00	quiz	2,00
total of all courses						**30,00**

**s- seminar*

III SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures+practice		Exam	ECTS credits
1.05-104	Mathematics III	Ass.Prof. NINOSLAV TRUHAR	3,00	2,00	yes	6,00
2.15-102	Strength of Materials I	Ass.Prof. MIRJANA BOŠNJAK - KLEČINA	3,00	2,00	yes	6,00
2.15-103	Construction Materials	Ass.Prof. MIROSLAV MIKOČ	3,00	3,00	yes	7,00
2.15-104	Mechanics II	Ass.Prof. ALEKSANDAR JURIĆ	3,00	2,00	yes	6,00
2.05-301	Hydrology	Prof. VLADIMIR PATRČEVIĆ	2,00	0,00	yes	3,00
5.07-102	Physical Education II	ŽELJKA VUKIĆ	0,00	2,00	no	0,00
total of compulsory courses			**14,00**	**9,00**		**28,00**
optional courses						
5.02-101	Construction Regulations	Asc.Prof. VLADIMIR SKENDROVIĆ	2,00	0,00	s	2,00
2.01-105	Structural Physics	Ass.Prof. ŽELJKO KOŠKI	2,00	0,00	quiz	2,00
total of all courses						**30,00**

IV SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures+practice		Exam	ECTS credits
2.15-105	Strength of Materials II	Prof.VLADIMIR SIGMUND	3,00	2,00	yes	6,00
2.15-106	Structural Analysis I	Ass.Prof. SILVA LOZANČIĆ	3,00	2,00	yes	6,00
5.01-101	Engineering Economy	Prof. KSENIJA ČULO	2,00	2,00	yes	4,00
2.15-107	Construction Technologies and Machinery	Prof. PETAR BRANA	3,00	1,00	yes	6,00
2.05-302	Fluid Mechanics	Ass.Prof. LIDIJA TADIĆ	3,00	2,00	yes	6,00
5.07-102	Physical Education II	ŽELJKA VUKIĆ	0,00	2,00	no	0,00
total of compulsory courses			**14,00**	**9,00**		**28,00**
optional courses						
2.15-108	Urban Planning and Environmental Protection	Ass.Prof. ŽELJKO KOŠKI Ass.Prof. LIDIJA TADIĆ	2,00	0,00	quiz	2,00
2.01-106	Residential and Public Buildings	Ass.Prof. SANJA LONČAR-VICKOVIĆ	1,00	1,00	s	2,00
total of all courses						**30,00**

V SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures+practice		Exam	ECTS credits
2.15-109	Structural Analysis II	Ass.Prof. SILVA LOZANČIĆ	3,00	2,00	yes	6,00
2.05-303	Water Supply and Sewage Systems	M.Sc. TATJANA MIJUŠKOVIĆ-SVETINOVIĆ	2,00	2,00	yes	5,00
2.05-201	Concrete Structures I	Prof. DRAGAN MORIĆ	3,00	2,00	yes	6,00
2.05-101	Soil Mechanics	Prof.MENSUR MULABDIĆ	3,00	2,00	yes	6,00
2.05-401	Roads	M.Sc. JOSIP BOŠNJAK	3,00	3,00	yes	7,00
total of compulsory courses			**14,00**	**11,00**		**30,00**
total of all courses			**14,00**	**11,00**		**30,00**

VI SEMESTER

Compulsory courses	Course	Lecturer	Hours a week Lectures+practice		Exam	ECTS credits
2.05-102	Geotechnical Engineering	Prof.MENSUR MULABDIĆ	2,00	2,00	yes	4,50
2.05-202	Timber Structures I	Prof.STJEPAN TAKAČ	2,00	2,00	yes	4,50
2.05-203	Metal Structures I	Ass.Prof. DAMIR MARKULAK	3,00	2,00	yes	6,00
2.15-110	Construction Management I	Ass.Prof. SAŠA MARENJAK	3,00	2,00	yes	6,00
2.05-204	Masonry Structures I	Prof. STJEPAN TAKAČ	2,00	1,00	yes	4,00
2.05-ZR	Graduation thesis			4,00	yes	5,00
total of compulsory courses			**12,00**	**13,00**		**30,00**
total of all courses			**12,00**	**13,00**		**30,00**

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
1.05-101	**MATHEMATICS I**	**4 + 3**	**COMPULSORY**	**I**	**8,00**
Lecturer: Ass.Prof. NINOSLAV TRUHAR					

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

Numbers: Natural and cijeli brojevi. Rational and real numbers. Intervals. Infimum and supremum of sets. Complex numbers.Sequences and series of real numbers: Basic concept, definition of sequance and some special sequances (aritmetic, geometric, harmonic, Fibonacci sequence,...). Convergence of sequences and rouls for limit calculation. Definition and convergence of series. Convergence criteria.Functions: Basic concept, definition and some properties of functions. Restrictions. Compositions of functions. The basic elementar functions. Polynomilas. Rational functions. Functions defined usin parameters.Limits and continous functions: The basic concept of function limits. Rouls for calculation of function limits. One side limits. Some special limits. Asymptotes. Continous functions. The basic properties of continous functions.Differential calculus: The basic concept of derivation. Derivation of elementary functions. Rouls of derivation. Derivations of higher order. Implicit derivation and implicit functions. Apliation of differential calculusc(monotonity, local extrema, convexity, L'Hospital's roul, curvature). Taylor's series of function.Vectors in spaces: The basic concept of vectors and operations with them. Linear combination of vectors and basis. Scalar product. Vectors' product. The triple product. Multiple product. Lines and planes in space. Matrices: Linear operators. Matrices and matrix operations. Regular matrix. Matrix rank.System of linear equations: Motivation and basic concepts. Kronecker-Capelli-Rouché solution of the system. Gaussian eliminations.Determinants: Definition and basic concept of determinants. Laplace's roul for calculation of determinant. Cramer's roul. Eigenvalues and eigenvectors of quadratic matrices. Definit matrices.

1.4 Competence

To inform students about the fundamentals of differential calculus of one variable functions and about the methods of mathematical analysis, which are the basis for many other courses. Students will be also informed about the fundamentals of the linear algebra, based on plane and space geometry.

1.5 Obligatory sources

1. D. Jukić, R. Scitovski, Matematika 1, Odjel za matematiku, Elektrotehnički fakultet, Prehrambeno tehnološki fakultet, Osijek, 2000.
2. B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1986.
3. S. Kurepa, Matematička analiza 1,2, Tehnička knjiga, Zagreb, 1989, 1990.
4. S. Kurepa, Uvod u linearnu algebru , Školska knjiga, Zagreb, 1978.
5. P. Javor, Uvod u matematičku analizu, Školska knjiga, Zagreb, 1986.

1.6 Additional sources

1. M. Crnjac. D. Jukić, R. Scitovski, Matematika, Sveučilište u Osijeku, 1994.
2. Schaum's outline series , McGRAW-HILL, New York, 1991.

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar: no
Pre/Corequisites:		

1.8 Quality control

colloquia

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
1.05-102	**DESCRIPTIVE GEOMETRY**	**2 + 2**	**COMPULSORY**	**I**	**5,00**
Lecturer:	**M.Sc.IVANKA STIPANČIĆ-KLAIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

The task of Descriptive Geometry. The basic geometrical constructions.The basic geometrical curves and their construction. The perspective affinity and collineation.
Monge's method of projections: orthogonal projections onto the pair of planes the laws of the projections. The basic geometrical elements: the point, line, plane and their relationships. The projection of 2-dim (planar) contents, the general and special relationships (the parallelism and orthogonality) between them, the metrics. The additional projections, the rotation of plane, the valid laws, the projections of 2-dim (planar) objects. The basic 3-dim relationships, the problems in space, the projections of 3-dim objects.
The general parallel projection, the valid laws. The axonometric (3-D) projections of objects.
The planar intersections of some surfaces.
The use of computer support graphics is included in all sequences.

1.4 Competence

At the end of the course a student is expected to meet and to know a graphical communication between 3-dimensional space objects and their presentation on 2-dim spaces (and vice versa). Those competences are learned across the different methods of projections which are used in civil engineering. The basic quality of this knowledge is in use of laws which are valid in some methods of projection.

1.5 Obligatory sources

1. Babić, S. Gorjanc, A. Slijepčević, V. Szirovicza: Nacrtna Geometrija-zadaci, HDKGIKG, Zagreb, 2002.
2. V. Niče: Deskriptivna geometrija, Školska knjiga, Zagreb 1992.

1.6 Additional sources

1. K. Horvatić-Baldasar, I. Babić: Nacrtna geometrija SAND d.o.o., Zagreb, 1997.
2. Z. Kurnik, D. Palman, B. Pavković: Zadaci iz nacrtne geometrije-Mongeova projekcija,Tehnička knjiga, Zagreb,1973.

web-sites: www.hdgg.hr , www.grad.hr/nastava/geometrija and every other book or web site in all world's languages

1.7 Exam

Exam:	Oral: yes	Written: yes (eliminatory)	Seminar: no
Pre/Corequisites: No prerequisites			

1.8 Quality control

Four programs

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
1.02-101	**PHYSICS**	**3 + 1**	**COMPULSORY**	**I**	**5,00**
Lecturer:	**Ph.D. JOSIP BRANA**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

Introduction and system of units. Vectors. Motion in one dimension. Motion in two dimensions. Newton`s law of motion. Applications of Newton`s laws of physics. Newton`s law of universal gravitation. Work, energy and power. Conservation of energy. Momentum and the motion of systems. Momentum conservation law. Collisions. Static equilibrium of a rigid body. Torque about fixed axis. Rotation and translation. Rotational kinetic energy. Moment of inertia. Angular momentum. Rotational dynamics. Rotational work for a rigid body. Conservation of angular momentum. Oscillations. Solids and fluids.

Temperature and heat transfer. Heat conduction law and heat conduction material properties. Properties of solids and fluids to up warming. State equation of an ideal gas. Specific heat and latent heat. Work. First and second law of thermodynamics and applications.

Electric charges, Coulomb`s law and electric field. Potential energy of a charge in electric field, electric potential and voltage. Units. Capacitance, and properties of insulators. Current and resistance in DC circuits. Instruments for voltage and current measurements. Ohm's law. Energy and power of DC current. Batteries and currents in electrolytes. Magnetic field and sources of magnetic fields. Biot and Savart's law. Faraday's law and inductance. Magnetic field in matter. Units. AC generators. Properties of AC – power.

Harmonic and unharmonic waves. Mathematical description and characteristics. Power of waves. Interference and diffraction of harmonic waves. Acoustic waves in different media. Sources of a sound. Sound intensity. Interference of acoustic waves. Doppler's effect.

Basic laws of geometrical optics. Mirrors and lenses. Lasers. Basics of photometry.

1.4 Competence

1.5 Obligatory sources

1. Nikola Cindro; Fizika I, II, „Školska knjiga“, Zagreb, 1991.

1.6 Additional sources

1. Frederick J. Keller, Edward W. Gettys, Malcolm J. Scove, PHYSICS, Mc Graw-Hill

1.7 Exam

Exam:	Oral: yes	Written: yes	Seminar: no
Pre/Corequisites:			

1.8 Quality control

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-101	**BUILDING STRUCTURES I**	**2 + 2**	**COMPULSORY**	**I**	**5,00**

Lecturer: **Assistant professor ŽELJKO KOŠKI, Ph.D. of Arch.**	**Collaborators:** **VALIS ŠTAJNER, B.Sc. in Civil Engineering**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**NO**

1.3 Course curricula

Introduction in scientific discipline which is about elements of building construction based on characteristics of construction materials, laws of statics and building physics.Influence on permanence of building and types of building constructions. Types of Projects, location permit, building permit and operating licence. Brick walls, types of bricks and brick walls. Rules of brick masonry. English, Polish and Flemish bond. Perpendicular interlock and intersection of brick walls. Brick pillars, spherical brick walls. Walls of hollow concrete blocks. Brick chimneys, prefabricated chimneys and ventilation channels. Brick arches – straight, segment and semicircle arch. Bricklayer formwork.Mortars. Lime mortar, cement lime, cement, gypsum mortar. Stone walls – classification of stones.Arches in the stone walls - straight, segment and semicircle arch. Layer formwork. Stone pillars. Lining facades with thin stone panels. Concrete walls, reinforced concrete walls – classification, characteristics. Concrete foundations. One and two sided formwork of concrete walls. Formwork of circular reinforced concrete wall. Formwork of retaining wall. Reinforced concrete lintels and pillars and formwork. Lightweight concrete. Gypsum walls and glass walls. Floor structure – flooring, construction, ceiling. Reinforced concrete floors – classification. Monolitic, semiprefabricared and prefabricated reinforced concrete floor structure. Formwork. Reinforced concrete floor structure with glass blocks.Wooden floor structures – classification. Wooden floor structures between steel beams.

1.4 Competence

Introduction with basic elements of building constructions through the process of construction and its graphic demonstration in different types of projects.

1.5 Obligatory sources

1. Đuro Peulić : Konstruktivni elementi zgrada, Croatia knjiga 2002. Zagreb
2. Z. Vrkljan : Oprema građevnih nacrta, Građevinski institut – Fakultet građevinskih znanosti, Zagreb 1986.
3. Ivo Kordiš: Izvedbeni nacrti, Građevinski institut – Fakultet građevinskih znanosti, Zagreb 1986.

1.6 Additional sources

Different types of projects for buildings.

1.7 Exam

Exam: yes	Oral: yes Written: yes	Seminar: no
Pre/Corequisites: Technical drawing/CAD and Descriptive geometry		

1.8 Quality control

On exercises students are drawing three projects in which they apply knowledge from lectures.
1. Location plan and preliminary design 2.Main design 3.Formwork plan

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-102	**ENGINEERING DRAWING / CAD**	**2 + 2**	**COMPULSORY**	**I**	**5,00**
Lecturer:	**Ass. Prof.NIKOLA KLEM**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**YES**	**NO**

1.3 Course curricula

Introduction to engineering drawing
Purpose of engineering drawing. Types, scales and content of drawing. Layout of drawing, Format of drawing, Linetypes: linewidth and linestyles. Dimensioning. Conventional shading. Disposition of drawing. Abbreviations. Symbols and marks.
Phases of making the creation of the layout documentation. Preliminary design. Final design. Worbing design. Detailing. Schemes. Paper formats. Folding up sheets.
Drawing using Computers.
Basic concepts and principles of computer graphics. Computer program AutoCAD - 2D. Basic elements of computer program Corel DRAW. Basic elements of computer program ArchieCAD.

1.4 Competence

Introducing studens to elements of engineering drawins. Freehand drawing. Drawing using computer.

1.5 Obligatory sources

1. Zvonimir Vrkljan, Oprema građevinskih nacrta (Drawing in Civil Engineering), Zagreb, 1986.

1.6 Additional sources

1. Margareta Trconić, Tehničko crtanje pomoću računala – AutoCAD 2004 (Engineering Drawing Using Computer – AutoCAD 2004), Vinkovci, 2003.

1.7 Exam

Exam:	Oral: -practical Written: Yes	Seminar:
Pre/Corequisites: positive evaluation of more than 75% exercises		

1.8 Quality control

Systematic follow-ups of students computer skills.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
5.07-101	**PHYSICAL AND HEALTH CULTURE I**	**0 + 2**	**COMPULSORY**	**I, II**	**0,00**
Lecturer:	**ŽELJKA VUKIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**NO**	**YES**	**NO**

1.3 Course curricula

Kineziology, Physical and health culture, Kinezi-rekreation, Meaning of sport and methodology of sport training Kinezitherapy, Investigation and structure of kineziology, Structure of anthropological room, Health status and prevention, Function of respiratory apparatus, Function of cardiovascular system.
Evaluation of functional abilities and measuring instruments, Evaluation of motoric abilities and measuring instruments, Evaluation of morphological characteristics and measuring instruments, Working ability and the w of evalution, Evalution of body carrige, Models and working devices for development of motoric dimenzions, Models and working devices for development of funcitonal abilities, Models of health - curative programmes, Models physical exercises depending on type of illness
Models and working devices in aerobic conditions, Models of depending motoric abilities, Models of health - preventive recreational programmes, Evaluation of immediate effects transforming processes, Control of rehabilitation treatment. Models and working devices for development of creatine – phosphatic - alactative mechanism, Models and working devices for development of glycol - lactative mechanism, Basic methods of anabolic training

1.4 Competence

Satisfying a biological need for moving, Developing a habit for heathy way of living, Gaining basic knowledge, skills and habits, Reaching certain level of motoric achievements, Increasing motoric i functional abilities, Training all students for self _ controling of effects of transformational processes, Incresing working abilities.

1.5 Obligatory sources

1. Mraković, M.: Introduction in Systematic Kineziology, Zagreb, 1997.
2. Mišigoj-Duraković, M. et al.: Morphological Antropometry in Sport, Zagreb, 1995.
3. Milanović, D.: Diagnostics in Sport, Rovinj, 1996.
4. Milanović, D.: Fitness, Zagreb, 1996.
5. Andrijašević, M.: Sport-Recreation in Place of working and Living, Zagreb, 1996.
6. Pečina M. i Heimer, S.: Sport Medicine, Zagreb, 1993.
7. Milanović, D.: Reference book for Sport Trainers, Zagreb, 1997.
8. Metikoš, D. i drugi: Modern Aerobics, Zagreb, 1997.
9. Groser, M., H. Ehlenz, E. Zimmermann: Richting Muskeltraining, BVL Verlagsgesellschaft, Munchen, 1987.
10. Vukić, Ž. Željka Vukić, S. Jančić: Reference book for independent aimed students` exercises, Osijek, 1999.

1.6 Additional sources

1.7 Exam

Exam: yes	Oral: no	Written: no	Seminar: no
Pre/Corequisites: obligatory attendance			

1.8 Quality control

Evaluation of initial state, Evaluation of immediate and cumulative effects of transforming processes

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
6.03-101	**GERMAN I**	**0 + 2**	**OPTIONAL**	**I**	**2,00**
Lecturer:	**ANAMARIJA BISKUPOVIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**YES**	**NO**	**YES**

1.3 Course curricula

The Basics of Civil Engineering - structural physics, chemistry, biology, ecology; building and civil engineering; building work; construction site; site facilities
Early Construction Methods (arch, cross vault, dome, flying buttress…)

- The Stonehenge
- The Pantheon in Rome
- The Notre Dame Cathedral

Modern Construction Methods ∧ Skyscrapers : Home Insurance Building, Sears Tower, Petronas Tower, Taipei Financial Center… - bearing capacities and load bearing systems
The Leaning Tower in Pisa
Antonio Gaudi: Sagrada Familia (Barcelona)
Dams; The Hoover Dam; Three Georges Dam
Aqueducts
Revision

1.4 Competence

To develop and improve the four basic language skills: speaking, listening, reading and writing – in everyday language, to introduce technical terminology, to communicate about the subjets related to the civil engineering read, interpret (explain) and translate the technical articles in order to find and exchange some important information.

1.5 Obligatory sources

1. Ritoša, M. – V. Sekula (1989.) Njemački za građevinare, Škola za strane jezike, Zagreb

1.6 Additional sources

1. Tecilazić, Franci (1996.) Deutsch für Studenten der Architektur, Arhitektonski fakultet Sveučilišta u Zagrebu, Zagreb

Technical journals:

2. Detail, Institut für Internationale Architektur – Dokumentation
3. Bautechnik, Ernst & Sohn, Berlin
4. Bauingenieur, Springer Verlag, Berlin
5. Bauen mit Holz, ed: Klaus Fritzen, Berlin
6. Beton und Stahlbetonbau, editor: Konrad Bergmeister and others, Berlin

Internet sources

1.7 Exam

Exam:	Oral: No Written: No	Seminar: No Preliminary exam: Yes
Pre/Corequisites: Regular attendance at classes, written translations, presentation of a seminar work		

1.8 Quality control

written assignments (e.g. translations, grammar exercises)
term papers, reports, presentations

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
6.03-102	**ENGLISH I**	**0 + 2**	**OPTIONAL**	**I**	**2,00**
Lecturer:	**LIDIJA KRALJEVIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**YES**	**NO**	**YES**

1.3 Course curricula

Architect Imhotep
The Mistery yet Unsolved
The Majestic Taj Mahal
Astonishing Cathedrals
Steel and Structures Never Possible Before
What is Civil Engineering?
From Vision to Reality
Dams – Lords of Water
Three Georges Dam – The Biggest Dam in the World
Imposing Bridges
The AKB
Canal & Aqueducts
Tunnels
The Simplon
Revision

1.4 Competence

To develop and improve the four basic language skills (speaking, listening, reading and writing – in everyday language and in ESP), to develop an adequate level of language competence (in everyday language and in E , to introduce professional vocabulary.

1.5 Obligatory sources

1. L. Kraljevic: Structures in Time & Space I, Civil engineering faculty, J.J.Strossmayer University Osijek, 2002
2. L.Kraljevic: Structures in Time & Space II, Civil engineering faculty, J.J. Strossmayer University Osijek, 2002

1.6 Additional sources

1. Kralj-Štih: English in Civil Engineering, Croatian university edition 2004.
Internet sources

1.7 Exam

Exam:	Oral: No Written: No	Seminar: No Preliminary exam: Yes
Pre/Corequisites: Regular attendance at classes, written translations, presentation of a seminar work		

1.8 Quality control

written assignments (e.g. translations, grammar exercises)
term papers, reports, presentations

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-103	**INTRODUCTION TO BUILDING**	**2 + 0**	**OPTIONAL**	**I**	**2,00**
Lecturer: SANJA LONČAR-VICKOVIĆ, Architect, Ph.D.					

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**YES**

1.3 Course curricula

Basic architectural terminology, forms and themes. Osijek's architectural history, town planning growth aspects and review of most important edifices and built entities.
Architecture in pre-history. First built artefacts. Egypt; ideology, chronology, town planning, types of buildings, case studies, specifics. Greece; civilisation growth, town planning, greek temple, public and residential architecture, buiders and buildings. Rome; historical review, town planning, architectural typology, new materials and structures, builders,buildinds, roman architecture in Croatia. Early christian architecture; chronology, locations, architectural forms, examples in Europe and Croatia. Romanic architecture; locations, typology, romanic church, most important buildings in Europe and Croatia. Gothic architecture; chronological and geographical limits, typology, gothic cathedral, gothic architecture in Croatia. Renaissance; chronological and geographical definition, ideology, typology, forms, important european and regional examples. Baroque and manirism; chronology, typology, forms, Europe, Croatia, Osijek and Tvrđa. Architecture of the 19th century; chronological and geographical limits, builders and buildings, historicistic architecture in Osijek and Croatia. Art nouveau; timeline, forms, materials, examples in Europe and the world, Osijek's case studies. Modern architecture; origins, Bauhaus, founders, authors, buildings, Osijek and Croatia. Recent architecture; architects and their works.

1.4 Competence

Understanding basic architectural terminology, themes and forms. Understanding the global course of architec history while accentuating local and regional building.

1.5 Obligatory sources

1. Janson, H.W.; Janson, A.F. Povijest umjetnosti, Stanek, Varaždin 2003.

1.6 Additional sources

1. Mažuran, I. Srednjovjekovni i turski Osijek, Školska knjiga, Osijek 1994.
2. Müller, W.; Vogel, G. Atlas arhitekture, Golden marketing, Zagreb 1999.
3. Secesija slobodnog i kraljevskog grada Osijeka, Zavod za znastveni i umjetnički rad HAZU, Osijek 2001.
4. Vitruvije: Deset knjiga o arhitekturi, Golden marketing, Zagreb 1999.

1.7 Exam

Exam:	Oral: none	Written: none	Seminar: yes
Pre/Corequisites: none			

1.8 Quality control

During the semester students complete a research paper where they use text and graphics to present buildings from Osijek or its surroundings, implementing knowledge acquired in class and using regional approach. At the end of each lecture another student prepares short presentation of his/her paper for other students.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.09-101	**APPLICATION OF COMPUTERS**	**0 + 2**	**OPTIONAL**	**I**	**2,00**
Lecturer:	**Ass. Prof.NIKOLA KLEM**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**NO**	**YES**	**NO**

1.3 Course curricula

Basic knowledge
Computer hadrware and software. Basic components of PC-s. Operating systems. Data structure of disk. Fundamentals of the MS Windows.
Text processing
Basic knowledge about text processing and text processors. Basic elements and applications of the MS Word.
Spreadsheet calculations
Basic knowledge and programs for spreadsheet calculations. Basic elements and applications of the MS Excel
Presentations
Basic knowledge about design, preparation and presentation of presentations. Basic elements and applications of the MS-PowerPoint.

1.4 Competence

To learn students basic computer literacy trough basic knowledge of programs for text processing, spreadshee calculations and preparing presentations.

1.5 Obligatory sources

1. Ljiljana i Nenad Milijaš, Windows XP, Pro-mil, Varaždin, 2003.

1.6 Additional sources

1. Ljiljana Milijaš, Office XP, Pro-mil, Varaždin, 2003.

1.7 Exam

Exam:	Oral: practical Written: Yes	Seminar:
Pre/Corequisites: positive evaluation of more than 75% exercises		

1.8 Quality control

Systematic follow-ups of students computer skills.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
1.05-103	**MATHEMATICS II**	**4 + 3**	**COMPULSORY**	**II**	**8,00**
Lecturer:	**Ass. Prof. NINOSLAV TRUHAR**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

The Integral: Areas of plane region and volumes of solids of revolution. Definite integral. Riemann's theorem. Mean value theorem for definite integral of continuos function. Darbouxov theorem. Newton-Leibniz's formula. The basic integration rouls. The basic technics of inegration. Applications of integration. Improper integral. Multivariable Functions: Sets in R^n and metrix. The basic concept of multivariable function. Sketch the graph of a function of two variables. Series in R^n. Limits and the concept of continuity of a multivariable function. Partial derivative and concept of differentiability higher-order partial derivatives of a function of two or three variables. Schwartz's theorem. Jacobian. The Chain Rules for functions of several variables. Lagrange's mean value theorem. equations of tangent planes and normal lines to surfaces. Taylor's mean value theorem. Taylor's series. The absolute and relative extrema of a function of several variables. Polar, cylindric and spherical ccoordinate system.Multiple integration: Double and triple integral. Evaluation of double and triple integral using substition. Application of double and triple integrals. Derivation under integral. Space curves and line integral: The basic concept of vector-valued function. Curves. Line integral. Mass and lenght of the curve. Green's Theorem. Orientation of curves. Work. Surface integral. Parametric equation of curves. Curvature and torsion. Frenet frame field.Scalar and vector field: Gradient of the scalar field. Directional derivatives for scalar and vector fields. Divergence and curl of a vector field. Conservative fields.Surface integrals: Definition of a parametric surface. Definition of a surface integral. Surface integral for a parametric surface. Orientation of a surface. The concept of a flux integral. The Divergence Theorem to calculate flux. Stoke's Theorem.

1.4 Competence

To inform students about the fundamentals of integral calculus for one variable functions. The basic results of the vector analysis and their application at calculating volumes and surface areas will be analysed as well.

1.5 Obligatory sources

1. S. Suljagić, Matematika 2, Građevinski fakultet,Zagreb, http://www.grad.hr/nastava/matematika/mat2/index.htm
2. B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1986.
3. S. Kurepa, Matematička analiza 1,2,3, Tehnička knjiga, Zagreb, 1989, 1990, 1975.
4. P. Javor, Matematička analiza 2,3, Element, Zagreb, 2000

1.6 Additional sources

1. M. Crnjac, D. Jukić, R.Scitovski, Matematika, Sveučilište u Osijeku, 1994.
2. I. Ivanšić, Fourierovi redovi. Diferencijalne jednadžbe, Odjel za matematiku, Sveučilište u Osijeku, Osijek, 2001.

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar: no
Pre/Corequisites:		

1.8 Quality control

colloquia

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-101	**MECHANICS I**	**3 + 2**	**COMPULSORY**	**II**	**6,00**

Lecturer: **Ass. Prof.ALEKSANDAR JURIĆ**	**Collaborators:** **M.Sc.ĐURĐICA MATOŠEVIĆ** **JURKO ZOVKIĆ, B.Sc.**

1.2 Instructional format

Lectures	Practical exercises	Eksperimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Contents

Basic principles. Force and moment. Couple, Varignon's theorem, reduction of a system of forces to one force and one couple. Analytic addition of a system of forces. Analytic resolution of a force into components. Analytic equilibrium conditions. Elements of graphic-static for plane force system. Analytic and graphic determination position of centre of gravity. Equilibrium of rigid bodies, Mechanical systems, simple structures and loads. Internal forces in members and the diagrams. Statically determinate plane trusses. Forces in cables. Method of virtual work. Friction.

1.4 Competence

The purpose of the study of mechanics I is to learn basic principles und methods for solution probems, succes combine theory and practice in development of structures.

1.5 Obligatory sources

1. Tehnička mehanika I – statika, A. Kiričenko, Građevinski institut Zagreb, 1990.;
2. Tehnička mehanika I – statika, D. Bazjanac, Tehnička knjiga Zagreb, 1966.;

1.6 Additional sources

1. Uvod u statiku – F.Mateliček, D. Semenski, Z. Vnučec, Golden marketing, Zagreb, 1999.;
2. Statics - F.P. Beer, E.R. Johnston, Jr., McGraw-Hill Publishing Company, New York, 1988.;
3. Statics - J.L. Meriam, John Wiley & Sons, Inc., New York, 1975.; Statics and Dynamics - A. Ruina, R. Pratap, Oxford University Press, 2002.

1.7 Exam

Exam:	Oral:yes	Written: yes	Seminar: yes
Pre/Coreguisites: Mathematics I			

1.8 Quality control

Assessment of knowledge is carried out in the semester by two colloquia and seminar. Condition for the second signature is 30% per colloquia and correct seminar.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-104	**BUILDING STRUCTURES II**	**2 + 2**	**COMPULSORY**	**II**	**5,00**

Lecturer: **Assistant professor ŽELJKO KOŠKI,Ph.D. of Arch**.	**Collaborators:** **VALIS ŠTAJNER,B.Sc. in Civil Engineering** **SANDRA NJERGEŠ, B.Sc. in Arch.**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**NO**

1.3 Course curricula

Introduction in scientific dicipline building physics. Subject of investigation and goals of building physics.
Basic concepts and physics elements in heat science. Classification of heat transfering : conduction, flowing and radiation.
Coefficient of thermal conductivity for construction materials. Classification for heat insulation materials.
Thermal insulation of building elements. Calculation of coefficient “k”
Condensation of water steam on interior surface of external constructin element. Thermal bridges.
Diffusion of water steam through the construction elements. Glasser method for calculating diffusion of water steam.
Acustic insulation of construction elements. Air suond and sound of impact. Svimming floors.
Roofing – tradicional and engineering construction. Types of roofs according to shape.
Rafter and purlin roofs. Empty roofs, types of constructions, details.
Hipped roofs – order of solving, span length.
Flat roofs – classification, details.
Protection of the ground humidity – waterproofing. Protection of ground water.
Staircases – reinforced concrete, timber and steel stairs. Shapes, details and graphic demonstration in floor plans and sections.
Floors. Classification according to materials, thermal loos and way of construction.
Doors and windows. Types according to way of opening and materials. Details.

1.4 Competence

Introduction with basic elements of building constructions through the process of construction and its graphic demonstration in different types of projects.

1.5 Obligatory sources

1. Đuro Peulić : Konstruktivni elementi zgrada, Croatia knjiga 2002. Zagreb
2. Z. Vrkljan : Oprema građevnih nacrta, Građevinski institut – Fakultet građevinskih znanosti, Zagreb 1986.
3. Ivo Kordiš: Izvedbeni nacrti, Građevinski institut – Fakultet građevinskih znanosti, Zagreb 1986.

1.6 Additional sources

Different types of projects for buildigs.

1.7 Exam

Exam: yes	Oral: yes Written: yes	Seminar: no
Pre/Corequisites: Elements of building construction I		

1.8 Quality control

On exercises students have to draw three projects in which they apply knowledge from lectures.
1. Building physics 2. Executable project for roof 3.Executable project – section through staircase.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.04-101	**GEODESY**	**2 + 2**	**COMPULSORY**	**II**	**5,00**

Lecturer:	**Collaborators:**
BRANKICA MALIĆ Ph.D.Geod. Assistant Professor	**VLADIMIR MOSER M.S. in Geodesy**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**YES**

1.3 Course curricula

Definition of geodesy. Overview of geodetic activities. The size and shape of the Earth. The coordinate systems. The map projections. Gauss-Krüger projection (Transverse Mercator). Geodetic networks. Trigonometric and traverse network, network of lower order control points. Levelling net. Representation of the shape of the ground on the mapsTheory of errors with computation of adjustment. Geodetic computation.Geodetic instruments. Theodolite. Measurement of distances by tape or chain and optical measurement of distances. Electromagnetic distance measurement. Planimetric survey (in rectangular coordinates; by bearing and distance). Level. Levelling (barometric heighting, trigonometric, geodetic and hydrostatic levelling). Photogrammetry (terrestrial, aerial and satellite photogrammetry). Cartography. Thematic and digital cartography. Printing technology.Planimetric setting out and contour setting out.

1.4 Purpose of the course

To introduce the types of geodetic activities; to learn the geodetical terms, to use of geodesy in civil engineerin

1.5 Obligatory sources

1. Macarol, S. (1985): Praktična geodezija, Tehnička knjiga, Zagreb

1.6 Additional sources

1. Feil, L. (1989): Teorija pogrešaka I, Geodetski fakultet, Zagreb
2. Feil, L. (1990): Teorija pogrešaka II, Geodetski fakultet, Zagreb
3. Janković, M. (1982): Inžinjerska geodezija I dio, SNL, Zagreb
4. Janković, M. (1981): Inžinjerska geodezija II dio, SNL, Zagreb
5. Hake, G., Grünreich, D. (1994): Kartographie, Walter de Gruyter, Berlin, New York
6. Witte, B., Schmidt, H. (1995): Vermessungskunde und Grundlagen der Statistik für das Bauwesen, Konrad Wittwer, Stuttgart

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar:
Pre/Corequisites: to do seminar work ,the condition for an oral exam - written exam (computation example and first theoretical example)		

1.8 Quality control

Obligatory attendance of lessons, excersises: to do seminar work, exam: oral and written.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
	ENGINEERING GEOLOGY	**2 + 1**	**COMPULSORY**	**I**	**4,00**
Lecturer:	**Ass.prof. ORTOLAN ZELIMIR**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**NO**

1.3 Course curricula

Introduction to geology, basic geological scientific areas and disciplines. Systematics of petrogenic minerals. Basic petrographical terms. Igneous, sedimentary and metamorphic rocksRock weathering, chemical diagenesis of clayey sediments, metamorphic processes and their influence on geotechnical properties of rocks.Geotectonics. Forms of occurrence, position and distribution of rocks in the lithosphere. Layers and folds, faults (joints), thrust faults.Dynamics of the Earth. Modern exodynamic factors, processes and occurrences. Engineering-geological properties of rocks and terrain. Basic engineering-geological classification of rocks. Endodynamic processes, tectogenesis of the lithosphere, magmatism. Fixist and mobilistic concepts. Dynamics of the Earth's crust, movement of lithospheric plates, seismic activity (earthquakes). Stratigraphic geology. Basic elements of hydrogeology. Hydrogeological properties of rocks. Geological mapping, geological columns and profiles, explanations and legends. Programming and realization of engineering-geological and/or geotechnical investigations. Investigation methods. On site sampling methods. Engineering geological and hydrogeological maps, specific prognostic maps Modern trends in engineering-geological and/or geotechnical modeling. Engineering geological and/or geotechnical correlation columns. Prognostic engineering geological and/or geotechnical profiles. Modern approach to rock mass classification. Geotechnical and seismical microzoning.

1.4 Competence

Future civil engineers will be introduced to major geological disciplines and to the "arsenal" available in such disciplines, as a necessary prerequisite for geotechnical modeling and complex calculations used in various civil engineering activities: study and improvement of landslides, determination of geotechnical properties of transportation facilities, construction of water engineering facilities, urbanization of space (geotechnical and seismic microzoning), modern classification of rock and soil for various uses, exploitation and protection of ground water reserves and preservation of ground water quality.

1.5 Obligatory sources

1. Tajder, M. & Herak, M. (1972): Petrologija i geologija, Školska knjiga, Zagreb.
2. Šestanović, S. (1993): Osnove inženjerske geologije (primjena u graditeljstvu). Geoing – Split.
3. Šestanović, S. (2001): Osnove geologije i petrografije (četvrto izdanje). Građevinski fakultet Sveučilišta u Splitu.
4. Pollak, Z. (1995): Hidrogeologija za građevinare. Poslovna knjiga, Zagreb.

1.6 Additional sources

1. Crnković, B. & Šarić, Lj. (2003): Građenje prirodnim kamenom. Institut građevinarstva Hrvatske, Zagreb.
2. Herak, M. (1990): Geologija, Školska knjiga, Zagreb.
3. Tišljar, J.(1994): Sedimentne stijene. Školska knjiga, Zagreb.
4. Tišljar, J.(2001): Sedimentologija karbonata i evaporita. Institut za geološka istraživanja, Zagreb.
5. Tišljar, J.(2004): Sedimentologija klastičnih i silicijskih taložina. Institut za geološka istraživanja, Zagreb.

1.7 Exam

Exam:yes	Oral: yes Written: yes	Seminar: no
Pre/Corequisites:		

1.8 Quality control

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
5.07-102	**PHYSICAL EDUCATION II**	**0 + 2**	**COMPULSORY**	**III, IV**	**0,00**
Lecturer:	**ŽELJKA VUKIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**NO**	**YES**	**NO**

1.3 Course curricula

Antropological status, Planing and programming of transforming processes, Energetic capacities, Locomotor system, Role of mascles and physiology of body carriage. Measuring and evaluation of cumulative effects of recreational programmes, Basic methods of aerobic training, Basic methods of anaerobic training, Deformities spine, thorax and feet, Health gymnastic,
Models and working devices for development of glycolytic – lactative mechanism, Discontinuons working meth Continuons working methods, Sport and recreational programm models, Physical training models for students health injuries in relation to the kind and gradation of injury, Measuring and evaluation of cumulative effects of recreational programms,
Kinezistimuli of explosive type, Kinezistimuli of repetitive strength, Kinezistimuli of speed, Kinezistimuli of coordination, Kinezistimuli of flexibility and relaxibility, Exercises for perfect body carriage and declining irregularities, Evaluation of immediate effects of transformation process, Controle of rehabilitation treatment, Measuring and evaluation of cumulative effects of transforming processes.

1.4 Competence

Satisfying a biological need for moving, Developing a habit for heathy way of living, Gaining basic knowledge, skills and habits, Reaching certain level of motoric achievements, Increasing motoric i functional abilities, Training all students for self _ controling of effects of transformational processes, Increasing working abilities.

1.5 Obligatory sources

1. Mraković, M.: Introduction in Systematic Kineziology, Zagreb, 1997.
2. Mišigoj-Duraković, M. et al.: Morphological Antropometry in Sport, Zagreb, 1995.
3. Milanović, D.: Diagnostics in Sport, Rovinj, 1996.
4. Milanović, D.: Fitness, Zagreb, 1996.
5. Andrijašević, M.: Sport-Recreation in Place of working and Living, Zagreb, 1996.
6. Pečina M. i Heimer, S.: Sport Medicine, Zagreb, 1993.
7. Milanović, D.: Reference book for Sport Trainers, Zagreb, 1997.
8. Metikoš, D. i drugi: Modern Aerobics, Zagreb, 1997.
9. Groser, M., H. Ehlenz, E. Zimmermann: Richting Muskeltraining, BVL Verlagsgesellschaft, Munchen, 1987.
10. Vukić, Ž. Željka Vukić, S. Jančić: Reference book for independent aimed students` exercises, Osijek, 1999.

1.6 Additional sources

1.7 Exam

Exam: yes	Oral: no	Written: no	Seminar: no
Pre/Corequisites: obligatory attendance			

1.8 Quality control

Evaluation of initial state, Evaluation of immediate and cumulative effects of transforming processes

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
6.03-103	**GERMAN II**	**0 + 2**	**OPTIONAL**	**II**	**2,00**
Lecturer:	**ANAMARIJA BISKUPOVIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**YES**	**NO**	**YES**

1.3 Course curricula

Timber; Timber Construction
- Framework Building
- The Tugenhat House

Natural Stones (granite, basalt, limestone, marble…)
- Pyramids of Ancient Egypt – Houses of Eternity
- The Majestic Taj Mahal

Artificial Stones; Bricks; Cement
The Greal Wall of China
Concrete; Reinforced Concrete
The Notre Dame Chapel, Ronchamp
Steel Structures: The Eiffel Tower
Bridge Construction: Arch Bridges; Beam Bridges; Suspension Bridges; Cable-Stayed Bridges
Revision

1.4 Competence

to develop and improve the four basic language skills: speaking, listening, reading and writing – in everyday language and in ESP (English for Specific Purposes)
to introduce technical terminology
to communicate about the subjets related to the civil engineering
to read, interpret (explain) and translate the technical articles in order to find and exchange some important information

1.5 Obligatory sources

1. Ritoša, M. – V. Sekula (1989.) Njemački za građevinare, Škola za strane jezike, Zagreb

1.6 Additional sources

1. Tecilazić, Franci (1996.) Deutsch für Studenten der Architektur, Arhitektonski fakultet Sveučilišta u Zagrebu, Zagreb

Technical journals:

2. Detail, Institut für Internationale Architektur – Dokumentation
3. Bautechnik, Ernst & Sohn, Berlin
4. Bauingenieur, Springer Verlag, Berlin
5. Bauen mit Holz, ed: Klaus Fritzen, Berlin
6. Beton und Stahlbetonbau, editor: Konrad Bergmeister and others, Berlin

Internet sources

1.7 Exam

Exam:	Oral: No Written: No	Seminar: No Preliminary exam: Yes
Pre/Corequisites: Regular attendance at classes, written translations, presentation of a seminar work		

1.8 Quality control

written assignments (e.g. translations, grammar exercises)
term papers, reports, presentations

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
6.03-104	**ENGLISH II**	**0 + 2**	**OPTIONAL**	**II**	**2,00**
Lecturer:	**LIDIJA KRALJEVIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**YES**	**NO**	**YES**

1.3 Course curricula

Transportation System
Highway Structures
Surveying
Environmental/Sanitary Engineering
Statics
Wood Design & Construction
Loads in Structural Design
Earthquake Effects on Structures
Geological Survay
Mechanical Properties of Materieals
Failure & Fracture
Statically Determinate Structures vs. Statically Indeterminate Structures
Deflections
Foundations
Types of Foundations
Vectors
How to Plan a House – Specifications
Job Planning & Management
Revision

1.4 Competence

To develop and improve the four basic language skills (speaking, listening, reading and writing – in everyday language and in ESP), to develop an adequate level of language competence (in everyday language and in E ,to introduce professional vocabulary.

1.5 Obligatory sources

1. L. Kraljevic: Structures in Time & Space I, Civil engineering faculty, J.J.Strossmayer University Osijek, 2002
2. L.Kraljevic: Structures in Time & Space II, Civil engineering faculty, J.J. Strossmayer University Osijek, 2002

1.6 Additional sources

1. Kralj-Štih: English in Civil Engineering, Croatian university edition 2004.

Internet sources

1.7 Exam

Exam:	Oral: No Written: No	Seminar: No Preliminary exam: Yes
Pre/Corequisites: Regular attendance at classes, written translations, presentation of a seminar work		

1.8 Quality control

written assignments (e.g. translations, grammar exercises)
term papers, reports, presentations

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.09-102	**COMPUTER PROGRAMMING IN CIVIL ENGINEERING**	**0 + 2**	**OPTIONAL**	**II**	**2,00**
Lecturer:	**Ass.Prof.NIKOLA KLEM**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
NO	**NO**	**YES**	**NO**

1.3 Course curricula

Fundamentals
Algorithmic structures. Problem solving by use of computers. Data types and its representation in computer storage. Performing of arithmetic operations by computer.
Principles of programming languages
Programming languages and compilers. Program structure. Data names, constants and variables. Arithmetical expressions. Assignment statement. Development environment and integrated workspace.
MATLAB
Introduction. Characters, variables, defined names. Interactive work. MATLAB programs. Customization of MATLAB. Formatted output. Relational an logical expressions . Control structures (branching, looping, breaks). Opening and closing files. Input and output of data. Arrays. Functions (subroutines). Graphics in MATLAB. Selected applications.

1.4 Competence

To learn students basic elements of computer programming in MATLAB that they can use this programming language for solving problems in later courses.

1.5 Obligatory sources

Matlab Manual
Sušanj, Dario: Java : programiranje za Internet i World Wide Web, Zagreb, Znak, 1997.

1.6 Additional sources

Tucaković, Tihomir: C Windows programiranje, Varaždin, Pro-mil, 2004.

1.7 Exam

Exam:	Oral:-practical Written: Yes	Seminar:
Pre/Corequisites: positive evaluation of more than 75% exercises		

1.8 Quality control

Systematic follow-ups of students computer skills.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
1.05-104	**MATHEMATICS III**	**3 + 2**	**COMPULSORY**	**III**	**6,00**
Lecturer:	**Ass.Prof. NINOSLAV TRUHAR**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

Differential equations: Ordinary differential equations. Separation of variables. Homogeneous differential equations. Linear differentia equations: Linear differential equations of the first order. Exact differential equation. Reduction of order of ordinary differential equation. Linear differential equations of the second order with constant coefficients. Special cases with symetric functions. Variation of parameters: Linear differential equations of the higher order. Method of varition of parameters. Linear differential equations of the n-th order. Harmonic oscillator.
Boundary problems: Initial and boundary conditions. Kinematic (Dirichletov, geometric, the first) boundary condition. Dynamic (Neumann, natural, the second) boundary condition. Initial condition. Linearity: homogenisation of boundary conditions. Uniqueness of the solution. Koncentrirano djelovanje. Greenova funkcija. Računanje Green's function. Solving the boundery problem using Green's function.
Fourier's method: Eigenfunctions and eigenvalues. Fourier's series, convergence. Even and odd functions. Free oscillations. Interpretation of solution. Homogenization of the boundary conditions. Forced oscillations. heat transfer trouth beam. Varition princip. Exact solution. Varition calculus.

1.4 Competence

To inform students about the fundamentals of the differential equations and their application, about the basic concepts of the partial differential equations and their application in dealing with the boundary problems.
Throughout course of lectures the basic concepts will be analyzed in an informal way and their usefulness and application will be also illustrated. During the practice students should master the appropriate techniques and t should become qualified for solving some specific problems.

1.5 Obligatory sources

1. S. Suljagić, Matematika III, Građevinski fakultet, Zagreb, http://www.grad.hr/nastava/matematika/mat3/index.htm
2. R. Scitovski, Numerička matematika, Odjel za matematiku, Elektrotehnički fakultet,Osijek, 2000.
3. S. Kurepa, Matematička analiza 2, Tehnička knjiga, Zagreb, 1990.
4. G. Strang, Applied Mathematics and Engineering Mathematics - Course Outline, http://www-math.mit.edu/.

1.6 Additional sources

1. McGRAW-HILL, Schaum's outline series, New York, 1991.

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar: no
Pre/Corequisites:		

1.8 Quality control

colloquia

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-102	**STRENGTH OF MATERIALS I**	**3 + 2**	**COMPULSORY**	**III**	**6,00**
Lecturer: **Ass.Prof.MIRJANA BOŠNJAK-KLEČINA**		**Collaborators:** **TANJA KALMAN, B.Sc.Civ.Eng.**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**COLLOQUIA**

1.3 Course curricula

General Assumptions and Fundamental Postulates. Analysis of Stress. Equilibrium Equations and Transformation Properties. Analysis of Strain. Displacement and Deformation. Equations of Compatibility. Hooke's Law. Mechanical Properties of Materials. Axially Loaded Bar. Stress Concentration. Indeterminate Force System. Thin-Walled Pressure Vessels. Direct Shear Stresses. Moments of Inertia, Products of Inertia of Plane Areas. Effect of Torsion. Elastic Torsion of Thin-Walled Tubes. Elastic Bending of Beams**.** Bending of Composite Beams and Beams with variable Stiffness. Shear center. Elastic Deflection of Beams and Methods for Determinations.

1.4 Competence

Understanding of Stress and Strain Analysis and their Determination.

1.5 Obligatory sources

1. Šimić, V.: Otpornost materijala I, Školska knjiga, Zagreb, 1992.
2. I.Alfirević, Nauka o čvrstoći I i II, Tehnička knjiga i Golden marketing, 1994. i 1999.

1.6 Additional sources

1. Timošenko, S.: Otpornost materijala I. i II. dio, Građevinska knjiga, Beograd, 1965
2. Brnić, J.: Nauka o čvrstoći, Školska knjiga, Zagreb, 1991
3. Bochmann-Festigkeitslehre Verlag für Bauwessen, Berlin, 1990

1.7 Exam

Exam: Yes	Oral: Yes Written: Yes	Seminar: Colloquia
Pre/Corequisites: Mathematics 1, Mechanics 1		

1.8 Quality control

Written and oral Colloquia

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-103	**CONSTRUCTION MATERIALS**	**3 + 3**	**COMPULSORY**	**III**	**7,00**
Lecturer: **Ass.Prof.MIROSLAV MIKOČ**		**Collaborators:** **IVANKA NETINGER, B.Sc. in Civil Engineering**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**YES**

1.3 Course curricula

Distributes building materials. Physical, physical-mechanical and chemical features of building materials. Quality Control. Norms. Stability of building materials. Stone. Wood. Ceramics. Glass. Metals. Polymers. Needleworks. Colours and lacquers Glues. Cement. Cements general property. Cements special property. Cement quality control. Concrete aggregate. Aggregates quality control. Water to concrete preparation. Concrete. Properties of Fresh Concrete. Hardenend Concrete. Influence moisture and temperature on concrete. Concrete quality controly. Aditives. Concrete Manufaturing. Concretes special property.

1.4 Purpose of the course

Introduce Students with Production, Characteristics properties and Testing, how would could executive correct Selection Building Materials at Building Construction

1.5 Obligatory sources

1. Ukrainczyk, V.; Poznavanje gradiva, Alkor, Zagreb, 2001.
2. Krstulović, P.; Svojstva i tehnologija betona, Građevinski fakultet Sveučilišta u Splitu, Split, 2000.
3. Ukrainczyk, V.; Bjegović D.; Mikulić D.; Rak, Z.; Poznavanje gradiva, auditorne vježbe, praktikum, aktivna nastava, Građevinski fakultet, Sveučilišta u Zagrebu, Zagreb, 1994.

1.6 Additional sources

1. Ukrainczyk, V.; Beton, Alkor, Zagreb, 1994.
2. Beslać, J.; Materijali u arhitekturi i građevinarstvu, Školska knjiga, Zagreb, 1989.
3. Ghosh, N.; Cement and Concrete Science Technology Vol – 1, Part – I, New Delhi, 1991.
4. Đureković, A.; Cement, cementni kompozit i dodaci za beton, Školska knjiga, Zagreb, 1996.
5. Ashby, Michael F.; Joneas David R, H.; Enginering Materials 1, Butterworth-Heinemann, Oxford- Boston-Johannesburg-Melbourne- New Delhi-Singapore, 1996.

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar: yes
Pre/Corequisites: attend Lectures and Practical exercises 75 percent of total Number of hours. Make and delivary the Programs.		

1.8 Quality control

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-104	**MECHANICS II**	**3 + 2**	**COMPULSORY**	**III**	**6,00**
Lecturer: **Ass.Prof.ALEKSANDAR JURIĆ**		**Collaborators:** **M.Sc.ĐURĐICA MATOŠEVIĆ**			

1.2 Instructional format

Lectures	Practical exercises	Eksperimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Content

Basic concepts and definitions. Kinematics of particles. Kinematcs of rigid bodies. Kinetics of particles. Kinetics of system of particles. Kinetics of rigid bodies. Impact. Vibration and time response. Free response. Introducion into vibration of a beams a concentrated mass.

1.4 Competence

The purpose of the study of mechanics is to learn basic principles und methods for solution kinematics and kin probems. It is exercise for successfully understanding courses Structural Analysis I and II, Stability and Struct dynamics.

1.5 Obligatory sources

1. Tehnička mehanika II – kinematika, A. Kiričenko, FGZ Zagreb, 1984.;
2. Tehnička mehanika III – dinamika, A. Kiričenko, PBI,d.o.o. Zagreb, 1996.

1.6 Additional sources

1. Dynamics - F.P. Beer, E.R. Johnston, Jr., McGraw-Hill Publishing Company, New York, 1988.;
2. Dynamics - J.L. Meriam, John Wiley & Sons, Inc., New York, 1975.;
3. Statics and Dynamics - A. Ruina, R. Pratap, Oxford University Press, 2002.

1.7 Exam

Exam:	Oral:yes	Written: yes	Seminar: yes
Pre/Coreguisites: Mechanics I			

1.8 Quality control

Assessment of knowledge is carried out in the semester by two colloquia and seminar. Condition for the second signature is 30% per colloquia and correct seminar.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-301	**HYDROLOGY**	**2 + 0**	**COMPULSORY**	**III**	**3,00**
Lecturer:	**Asc.Prof. PATRČEVIĆ VLADIMIR**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**NO**

1.3 Course curricula

History and development of hydrology, definition, division and tasks. Water and natural characteristic of water. Distribution of water and circulation in nature, hydrological cycle and watery balance. Characteristics and importance of the closed hydrological systems. Atmosphere, process and measurement in the atmosphere, energy balance, air motion, atmospheric pressure, temperature, humidity. Precipitation, rainfall, measurement, data processing's, intensity. Evaporation, importance, methods and approach of calculate, measurement. The surface water, natural water regime, factors of runoff, watershed, hydrography. Hydrologic measurement, importance measurements in the hydrology and development of measuring technique. Depth water, water level, velocity, flows. Methods and processing in hydrologic measurement recorded Stage Hydrograph and Discharge Hydrograph, Stage discharge relationship, Rating curve. Hydrological methods and procedures at water balance, runoff coefficient, specifically outflow. Mathematical the statistical method in the hydrology, probability in the hydrology, curve of distribution, ITP curves.

1.4 Competence

Introduces to basic physical processes of the hydrological cycle. Getting to know method of measurement hydrological processes, analyze and systematize of results .

1.5 Obligatory sources

1. Čavlek E.: Osnove hidrologije, Geodetski fakultet Sveučilište u Zagrebu,1992. / Srebrenović D.: Primjenjena hidrologija, Tehnička knjiga, Zagreb, 1986.

1.6 Additional sources

1. Meteorološke i hidrološke podloge, Priručnik za hidrotehničke melioracije, Društvo za odvodnjavanje i navodnjavanje Hrvatske, Zagreb 1984

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar:
Pre/Corequisites:		

1.8 Quality control

consultations during the semester

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
5.02-101	**CONSTRUCTION REGULATIONS**	**2 + 0**	**OPTIONAL**	**III**	**2,00**
Lecturer:	**Asc. Prof.VLADIMIR SKENDROVIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**YES**

1.3 Course curricula

Principles of the Building Law,. Technical properties of importance for buildings. Participants in the building process, owner, designer, licensed reviewer. Main design and execution drawings. Building permit. Building site layout. Documents to be kept on the site, diary. Permit for the use of the building. Supervision. Licenses for design and supervision. The role of the Croatian Chamber of Civil Engineers and Architects. Technical regulations and standards.
Public interest. Spatial planning. Environmental protection. Environmental impact assessment. Land acquisition, land registry, cadastre.
Relationship among the participants in the building process. Principles of the Law on Obligations. Warranty for the stability and safety of buildings. Construction contract. Autonomous regulations.
Procurement of works. Competitive tendering. The Law on Public Procurement.

1.4 Purpose of the course

Students will learn the legal and regulatory framework for design and construction and will be guided on how to the relevant sources of the law. The aim of the course is to build competence of future civil engineers in design and construction of building in accordance with the relevant regulations mindfull of protection of the environme and public interest.

1.5 Obligatory sources

1. Building Law
2. Law on Public Procurement
3. Law on Obligations

1.6 Additional sources

1. Course Textbook

1.7 Exam

Exam:	Oral: Written:	Seminar: Yes
Pre/Corequisites:		

1.8 Quality control

1 Course

1. 1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-105	**STRUCTURAL PHYSICS**	**2 + 0**	**OPTIONAL**	**III**	**2,00**
Lecturer: **Assistant professor ŽELJKO KOŠKI, Ph.D. of Arch.**		**Collaborators:** **VALIS ŠTAJNER, B.Sc. in Civil Engineering**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**NO**

1.3 Course curricula

Introduction in scientific discipline building physics. Subject of investigation and goals of building physics.
Basic concepts and physics elements of heat science. Classification of heat transfer : conduction, flowing and radiation
Coefficient of thermal conductivity for construction materials. Classification for heat insulation materials.
Thermal insulation of building elements. Calculation of coefficient “k” with one number for building.
Linear coefficient “k”. Coefficient “k” with one number for building.
Temperature curve. Heat accumulation.
Characteristics of humidity air. Condensation of water steam. Thermal bridges.
Diffusion of water steam through the construction elements.
Affecting of sun radiation on constructive elements. Sun protection.
Types of use of solar energy in buildings.
Thermal stabilization of exterior constructive elements in the summer period.
Temperature changing and Thermal stress.
Acoustics. Physics (objective) characteristics of sound. Noise.
Physiologic (subjective) characteristics of sound.
Sound waves in closed space.
Sound transmitting from room to room.
Transmitting of sound of impact from room to room.
Repairing and reconstruction of buildings as an improvement of physics building characteristics.

1.4 Purpose of the course

Introduction with fields of applying relative young scientific discipline building physics and concrete calculations of physics building characteristics.

1.5 Obligatory sources

1. Vladimir Šimetin : Građevinska fizika, Građevinski institut – Fakultet građevinskih znanosti Sveučilišta u Zagrebu , Zagreb 1983.

1.6 Additional sources

Parts of projects for physics building characteristics.

1.7 Exam

Exam: yes	Oral: no Written: yes	Seminar: no
Pre/Corequisites: Elements of building construction II		

1.8 Quality control

Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-105	**STRENGTH OF MATERIALS II**	**3 + 2**	**COMPULSORY**	**IV**	**6,00**

Lecturer:	**Collaborators:**
Prof. VLADIMIR SIGMUND	**Ass.Prof. MIRJANA BOŠNJAK-KLEČINA** TANJA KALMAN, B.Sc.in Civil Engineering

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**NO**

1.3 Course curricula

Special beam problems, statically indeterminate beams, special topics in elastic beam theory, theories of failure, members subjected to combined loadings, the energy methods, buckling and elastic stability, theory of plasticity, experimental elasticity, fundamentals of FEM.

1.4 Competence

Advanced strength and stress analysis.

1.5 Obligatory sources

1. Šimić, V.: Otpornost materijala II, Školska knjiga, Zagreb, 2002.
2. I.Alfirević, Nauka o čvrstoći I i II, Tehnička knjiga i Golden marketing, 1994. i 1999.

1.6 Additional sources

1. A.S.Ugural, "Stresses in plates and shells", second edition, McGraw-Hill, 1999.
2. Timošenko, S.: Otpornost materijala I. i II. dio, Građevinska knjiga, Beograd, 1965
3. Z.Kostrenčić, Teorija elastičnosti, Školska knjiga, Zagreb, 1982

1.7 Exam

Exam: yes	Oral: yes	Written: yes	Seminar: no
Pre/Corequisites:			

1.8 Quality control

Colloquia

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-106	**STRUCTURAL ANALYSIS I**	**3 + 2**	**COMPULSORY**	**IV**	**6,00**
Lecturer: **Ph. D. SILVA LOZANČIĆ, Civ. Eng.**		**Collaborators:** **TANJA KALMAN,B.Sc in Civ. Eng.**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Subject, objective and methods of structural analysis. Basic principles. Structural systems classification. Structural systems geometric invariability. Loadings. Analysis methods and properties of statically determinate structures: plane structures with hinges; trusses, assemblied systems: three-hinged arches and frames with solid and truss girders, reinforced structural systems, supported and suspended girders, space trusses. Moving loads. Influence lines.Displacements and deformations. Bar energy theorems.

1.4 Competence

To learn the basics of statically determinate structural systems, the methods of calculating internal forces and structure displacements and numerical analysis of statically determinate systems.

1.5 Obligatory sources

1. V. Simović: Građevna statika I, 1988., sign. 1.19-155

1.6 Additional sources

1. W. Wagner, G. Erlhof: Praktična građevinska statika I, 1979., sign. 1.19-124
2. A.Ghali, A.M.Neville and T.G.Brown : "Structural analysis ",Spon press, 2003.
3. Đurić: Statika konstrukcija, Građevinska knjiga, Beograd, 1979.
4. I. P. Prokofjev: Teorija konstrukcija I i II, Građevinska knjiga, Beograd, 1966.

1.7 Exam

Exam:	Oral:yes	Written:yes	Seminar:yes
Pre/Corequisites: Mechanics I			

1.8 Quality control

Through preliminary exams, seminars and short tests

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
5.01-101	**ENGINEERING ECONOMY**	**2 + 2**	**COMPULSORY**	**IV**	**4,00**
Lecturer:	**Prof. KSENIJA ČULO**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**YES**

1.3 Course curricula

Importance of the economic knowledge of the constuction engineers in theirs businesses. Concept and role of the management and managers. Strategic management. Factors of management effectiveness. Specifics of the construction business and it's organization (Nacional classification of economic fields). Participants in the building. Construction low. Enterprises: kinds, establishing, bankruptcy, liquidation. Low on companies. Construction performance, capital, resources and theirs flow in production process, goods-money cycle, turnover coefficient. Costs: idea of consuption and costs, kinds of costs, writing off value of capital assets, interaction costs and level used capacity, costs movement and critical points, following and accounting cost clasification. Calculation production price, selling price, tender price. Calculation methods. Analyzing relation: impact-market-income-price-costs-profit/deficit. Financial business result. Criterions of business effectiveness. Profit/deficit account. Management bases. Organizational culture and business success. Learning organization. Standards. Idea and importance of evaluation investment alternatives.

1.4 Competence

In this course, students would be introduced with elementary engineering economy knowledge necessary in everyday business. Main management functions quality of which has direct implication on the business effectiveness depends on hierachical manager level are discussed. Main ideas corroborated by practice examples are introduced and discussed. During seminars, concrete problems and their solutions are research

1.5 Obligatory sources

1. Medanić, B.: Construction Management, University in Zagreb, Split, Rijeka, Osijek – Faculty of Civil Engineering in Zagreb, Split, Rijeka, Osijek., 1997
2. Low on Enterprises, Narodne novine 111/93, 34/99, 52/00
3. Construction low, Narodne novine 175/03

1.6 Additional sources

1. Aničić, D.; Čulo, K.: Građevinski inženjeri na putu u Europu (Civil Engineers on the Way to Europe). Osijek: European Union and Faculty of Civil Engineering Osijek, 2003 .
2. Santini, I.: Troškovi u poslovnom odlučivanju (Costs in business decisin making), HIBIS, Zabreb, 1999.
3. Blank, L.T., Tarquin, A.J.: Engineering Economy, McGraw-Hill, 1989.

1.7 Exam

Exam:	Oral: Yes Written: No	Seminar: Yes
Pre/Corequisites: course presence		

1.8 Quality control

During seminars, students are obliged to complete seminar paper. The final result will be dependent of paper quality and knowledge on exam.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-107	**TECHNOLOGIES AND MACHINERY**	**3 + 1**	**COMPULSORY**	**IV**	**6,00**

Lecturer:	**Collaborators:**
Prof. PETAR BRANA	**M.Sc.DRŽISLAV VIDAKOVIĆ**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

Production and construction material processing, definition and technology purpose. Basic technological methods. The analysis of optional solutions. Criteria of selecting optimal procedures depending on available production resources. Definition and presentation of technological processes (the diagram and process carte). Contents of the technological project. Technology of digging, knowing machines and their performance capabilities – calculating effects (bulldozers, graders, loaders, scrapers and transport machinery, machines for pounding the ground).
Producing stone aggregates, Grinding machinery, cleaning and separation machinery. Production and technology of using asphalt.
The technology of using concrete. Machinery for making concrete mixtures. Capacity conditions and installation location. Machinery for external transport and possible radius of transport. Vertical and horizontal transport on the construction site. Tower cranes, mobile cranes, concrete pumps, concrete cannons, transport belts. Processing fresh concrete. Concrete treatment. Concrete laying in special conditions (high and low temperatures).
Treating concrete iron. Paneling and scaffolding for concrete objects. Prefabricating concrete construction. Basic assembling systems. Junctions and ways of connecting and monolithization.

1.4 Competence

Introduce students with basics of construction technologies and determining the effect of appropriate machiner

1.5 Obligatory sources

1. R.Lončarić, Organizacija izvedbe građevinskih projekata, Zagreb, 1995.
2. G. Bučar, Oplate i skele za betonske radove, GF Osijek, 1996.
3. G. Bučar, Tesarski, armirački i betonski radovi, GF Osijek, 1999.

1.6 Additional sources

1. B.Trbojević, Građevinske mašine, GK, Beograd, 1989.
2. E. Slunjski, Građevinski strojevi, Zagreb, 1995.

1.7 Exam

Exam:	Oral: Yes Written: Yes	Seminar:
Pre/Corequisites:		

1.8 Quality control

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-302	**FLUID MECHANICS**	**3 + 2**	**COMPULSORY**	**IV**	**6,00**
Lecturer: **Ass.Prof.LIDIJA TADIĆ**		**Collaborators:** **Ass.Prof. MARIJA ŠPERAC**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**NO**

1.3 Course curricula

Properties of fluids
Hydrostatics- Properties of hydrostatic force. Basic differential equations of hydrostatics. Total hydrostatic force on plane and curved area. Archimedes Principle.
Hydro kinematics-Fluid flow and deformations. Velocity and acceleration fields. Streamlines and stream tubes. Flow types, Principle of mass conservation. Equation of continuity.
Hydrodynamics. Surface and gravity forces. Principle of impulse conservation. Bernoulli theorem for ideal fluid. Bernoulli theorem for real fluid. Hydrodynamic losses. Reynolds number. Boundary layer. Laminar and turbulent flow. Nikuradze experiment. Shearing stress at a pipe wall. Shape head losses. Steady uniform flow in open channels. Chezy equation. Specific energy. Froude number. Supercritical, critical and subcritical flow. Hydraulic jump. Non-uniform steady flow in open channels in prismatic and non-prismatic channels. Holes and weirs

1.4 Competence

Introduction to the basic principles of fluid mechanics as a foundation for the solution of all hydro technical problems

1.5 Obligatory sources

1. Vuković,Ž(1996): Osnove hidrotehnike 1

1.6 Additional sources

1. Virag Z(2002): Odabrana poglavlja mehanike fluida –primjeri I zadaci
2. Werner, A (2002):Odabrana poglavlja mehanike fluida-zbirka zadataka

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar:
Pre/Corequisites:		

1.8 Quality control

3 preliminary exams and anaysis of experimental excercises

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-108	**URBAN PLANNING AND ENVIRONMENTAL PROTECTION**	**2 + 0**	**OPTIONAL**	**IV**	**2,00**
Lecturer:	**Ass.Prof. ŽELJKO KOŠKI** **Ass.Prof. LIDIJA TADIĆ**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**YES**

1.3 Course curricula

Urban planning – Željko Koški, assistant professor

-Introduction. Planning in general and urban planning, categories of urban plans. Strategy of urban planning in Republic of Croatia.
-Conceptual urban design. Competitions.
-Procedure of preparation, and acceptance of urban plans. Integral parts of urban plans.
- Development of settlements through the history. Towns and regions. Role of towns in land utilisation, gravitational zones of towns, structuring of urban land
-Regulations and laws in the field of urban planning
-Revitalisation of urban areas. Elements of urban ecology

Environmental protection-Lidija Tadić, assistant professor

-Impacts of engineering structures on natural resources. Application of sustainable development concept. Methodology of defining the state of environment. Regulations and laws. Environmental impact assessment. Especially vulnerable structures: waste deposits. Sustainable constructing – possible solutions in environmental protection. Costs and benefits in environmental protection

1.4 Competence

Introduction to the basic elements of urban planning and methods of development urban plans. Introduction to environmnetal protection and impacts of engineering structures on natural resources.

1.5 Obligatory sources

1. Zakon o prostornom uređenju – NN br. 30 od 15. travnja 1994.
2. Marinović-Uzelac: Naselja,gradovi,prostori
3. Izvješća o stanju okoliša u Republici Hrvatskoj 1998, 2000
4. Tadić.L(2003): Strategija zaštite okoliša i uloga građevinarstva,Građevinski inženjeri na putu u Europu,poglavlje u knjizi 362-380,Osijek

1.6 Additional sources

1. L. Mumford: Grad u historiji, Naprijed – Zagreb
2. B. Milić : Razvoj grada kroz stoljeća; Školska knjiga, Zagreb 1994.
3. Carpenter,T.G (2001:)The Environmental Impact of Construction,Vol.1,2

1.7 Exam

Exam:	Oral: Written:	Seminar: yes
Pre/Corequisites:		

1.8 Quality control

Individual case study

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.01-106	**RESIDENTIAL AND PUBLIC BUILDINGS**	**1 + 1**	**OPTIONAL**	**IV**	**2,00**
Lecturer: Ass.Prof. SANJA LONČAR-VICKOVIĆ, Architect					

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Lectures:
Residential architecture. Housing, spacial organization, housing density, building types, town planning. Man as a module of spatial organization. A flat and its functions. Typology and disposition of rooms. Relations and orientation of spatial groups. Residential buildings' typology. Family home, twin houses, terraces, cascades, housing estates and projects, residential towers.
Public buildings. Offices; types, location, orientation. Schools; functions nad types, location, orientation, classrooms. Social institutions; kindergardens, student dorms, institutions for the elderly. Health institutions; hospitals, clinics, infirmaries. Malls; typology, organization, location. Hotels, restaurants. Sport facilities; typology, playgrounds, open air facilities, stadiums, gyms, arenas.
Practical exercises: completing a design of a flat.

1.4 Competence

Knowing and understanding basic characteristics and terminology of residential and public architecture, ability to design a simple flat or family house.

1.5 Obligatory sources

1. Neufert, E.: Elementi arhitektonskog projektiranja, Golden marketing, Zagreb 2002

1.6 Additional sources

1. Knežević, G; Kordiš, I: Stambene i javne zgrade, Tehnička knjiga, Zagreb 1981.
2. Knežević; G. Višestambene zgrade, Tehnička knjiga, Zagreb 1986.
3. Planić, S.: Kultura stanovanja, Revija, Osijek 1985.

1.7 Exam

Exam:	Oral: none Written: none	Seminar: yes
Pre/Corequisites: none		

1.8 Quality control

During the semester students complete a research paper where they use text and graphics to present a chosen type of residential or public buildings, implementing knowledge acquired in class and using regional approach. At the end of each lecture another student prepares short presentation of his/her paper for other students.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-109	**STRUCTURAL ANALYSIS II**	**3 + 2**	**COMPULSORY**	**V**	**6,00**
Lecturer: **Ph. D. SILVA LOZANČIĆ, Civ. Eng.**		**Collaborators:** **JURKO ZOVKIĆ, Civ. Eng.** **TANJA KALMAN, Civ. Eng.**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Statically undeterminate structures.
Analysis, basic assumptions and methods. Analysis of statically undeterminate structures-solid and truss girders, continuous girders, frames and arches.
Method of forces. Idealisation of Structures. Compatibility equations. Elements and structural systems flexibility matrices. Flexibillity coefficients and vectors determination.
Displacement method of analysis. Numerical model determination. Equilibrium equations. Elements of stiffness and forces matrices.
Application of displacement method: moment distribution-iteration analysis methods.
Space bar structural systems – properties and calculation methods.

1.4 Purpose of the course

To learn the basics of statically undeterminate structural systems and the methods of calculating structure responses. The objective is to obtain the knowledge of proper application of numerical models that civil engineer uses in his/her everyday work.

1.5 Obligatory sources

1. M. Anđelić: Statika neodređenih štapnih konstrukcija, 1993., sign. 1.19-169
2. V. Simović: Zidovi s otovorima okvirne konstrukcije, Tehnička knjiga, Zagreb, 1972.

1.6 Additional sources

1. W. Wagner, G. Erlhof**:** Praktična građevinska statika III, 1981., sign. 1.19-124
2. M. Đurić: Statika konstrukcija, Građevinska knjiga, Beograd, 1979.
3. P. Prokofjev: Teorija konstrukcija I i II, Građevinska knjiga, Beograd, 1966.
4. Đ. Solovjev: Statika konstrukcija. Statički neodređeni nosači, 1956., sign. 1.19-75
5. A.Ghali, A.M.Neville and T.G.Brown : "Structural analysis",Spon press, 2003.

1.7 Exam

Exam:	Oral:yes	Written:yes	Seminar: yes
Pre/Corequisites: Structural analysis I			

1.8 Quality control

Through preliminary exams, seminars and short tests

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-303	**WATER SUPPLY AND SEWAGE SYSTEMS**	**2 + 2**	**COMPULSORY**	**V**	**5,00**
Lecturer: **Ass.Prof.LIDIJA TADIĆ**		**Collaborators:** **M.Sc.TATJANA MIJUŠKOVIĆ SVETINOVIĆ**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Water supply as a part of water resources managemet. Introduction and hystory of water supply and purification. Water demand. Drinking and tehnological water quality: standards, regulations, and goals. Sources of water supply and selection of source. Water intakes protection. Water supply systems. Water supply intakes: groundwater supplies surface water supplies. Synopsis of water treatment processes and selection. Pumps and pumping stations. Hydraulically design of water supply distribution networks. Descriptions of water supply system in the projects. Pipe materials - kinds, use and selection. Construction and maintenance of the water supply system. Water storage tanks and reservoirs – role, design and equipment. Home water supply. Mathematical models of water supply systems. Measuring, regulations and management of water supply system.

Wastewater engineering as a part of water resources management. Introduction and history of sewage. Origin of wastewater, characteristics and theirs impact on environment and human health. Sewage systems and basic schemes of systems. Wastewater design flow. Basic of sewerage design. Limitation of the sewerage system parameters. Conduits – kinds, types, shape, material, size and basic characteristics. Objects in the sewerage system. Pumps and pumping stations. Relief overflow. Combined sewer overflow. Retention basin. Basic wastewater treatment processes. Effluent disposal – basic principles and conditions. Home sewerage. Construction and maintenance of sewer system. Mathematical models of sewage systems, wastewater treatment systems and processes in the recipients of the wastewater. Measuring, regulations and management of sewage systems.

1.4 Competence

The aim of this course is to introduce strudents to the water industry. Students will understand the principles governing analysis, design, construction and maintanance of water supply system and sewerage system. This include the conventional approach to engineering design.

1.5 Obligatory sources

1. Gulić,I.: Opskrba vodom – Zagreb, 2000.
2. Margeta, J.: Kanalizacija naselja – Split, 1998.
3. Vuković, Ž.: Osnove hidrotehnike, PRVI DIO, Druga knjiga – Zagreb, 1996.

1.6 Additional sources

1. Steel, E. W., Mc Ghee T. J.: Water Supply and Sewerage, (6th Ed.), McGraw-Hill Book Company, London, 1991.
2. Metcalf and Eddy, INC: Wastewater Engineering Treatment, Disposal, Reuse (4th Ed.), inter. ed, McGraw-Hill Book Company, NY, 2002.
3. Twort, A.C., Ratnayaka, D.D., Brandt, M.J.: Water Supply (5th Ed.), Edvard Arnold, London, 1985.

1.7 Exam

Exam:	Oral: yes	Written: yes	Seminar: yes
Pre/Corequisites: Hydrology and Hydromechanic			

1.8 Quality control

Two case studies

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-201	**REINFORCED CONCRETE STRUCTURES I**	**3 + 2**	**COMPULSORY**	**V**	**6,00**
Lecturer: **Prof. DRAGAN MORIĆ**		**Collaborators:** **Ph.D.DAMIR VAREVAC**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

History of RC structures, Preferences and faults of RC structures, Idea of reinforcing. STRENGHTS OF Commpression strenght, Concrete class, Acceptance criteria, Tensile strenght, Shear strenght, Fatique and shock strenghts, Fracture energy, Strenghts in real structures.Deformations of concrete under short lasting compression load, Dedormations of concrete under short lasting tension load, Dedormations of concrete under short lasting cycling and fast changing load.Deformations of concrete under long lasting compression load (creeping), Temperature deforrmations and initial volumne deformations.
Types of steel for reinforcement: (geometry, phisyc and mechanic behaviours. Slip bond conection steel-concrete.Anchorange, Minimum of reinforcements, Tensile zone of cross-section, Rulles for rolling (resultant of tensil forces), Protections of reinforcements, Formes and shapes of reinforcements, Stabilisation and fixation of reinforcements, Build in of concrete and distances of bars.
RC slabs, RC walls, RC membranes, RC griders, RC columns, RC frame rigid zones, RC floor structures, RC short cantilevers, RC foundations.Anticorosion protections of reinforcement, Strengthening methods, Repair with jet concret, Repair with mortars, Repair by incjection mass, Repairs of damaged columns, beams, plates and walls.Durability of RC structures, Inspections of RC structures, Testing methods of existing condition of RC structure.RC structural elements in various loads conditions, Failure mechanisms, Strains and stresses in cross section.Rectangular cross sections, Single and double reinforced zones, T cross sections, Cross sections with changeable width, Triangular cross sections.
Axial compression centric force on shorts and slenders columns. Local compression stresses, Axial tensile centric force.Shear stresses in reinforceconcrete cross section in elastic and cracked conditions, Beams with changeable height, Design models: Clasic and modificated Moersch grates.
Design procedure. Structural rules. (Course based on EC-2)

1.4 Competence

Knowing of structural shapes and forms and rules for construction of RC structures, with basic procedures in design of cross sections based on analysis of strain-stress conditions in cross section.

1.5 Obligatory sources

1. I. Tomičić, Reinforced concrete structures (In Croat) DHGK, Zagreb, 1996.

1.6 Additional sources

1. I. Tomičić, Reinforced concrete structures, Chosen chapters (In Croat) DHGK, Zagreb, 1999.

1.7 Exam

Exam: yes	Oral:yes	Written: yes	Seminar: no
Pre/Corequisites: Materials, Resistance of materials, Mechanics			

1.8 Quality control

Three colloquial exams during course lecture

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-101	**SOIL MECHANICS**	**3 + 2**	**COMPULSORY**	**V**	**6,00**

Lecturer: **Prof. MENSUR MULABDIĆ**	**Collaborators:** **KRUNOSLAV MINAŽEK, B.Sc. in Civil Engineering** **DEJAN MRAČKOVSKI, B.Sc. in Civil Engineering**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**YES**

1.3 Course curricula

Introduction – general overview
Basic soil properties, classification, identification of soil
Water in soil, water flow in soil
Stresses in soil, geostatic stresses and stresses from loads
Soil deformability, settlement of soil, consolidation
Soil strength, stress-strain behaviour
Critical state in Soil Mechanics
Slope stability
Shallow foundation, bearing capacity
Lateral stresses in soil
Soil compaction, theoretical approach
Principles of Rock Mechanics
Principles of Soil Dynamics

1.4 Competence

Introduce soil as building material and building environment, present its specific features as material and way o analysis of stress-strain behaviour; explain role and significance of water in soil, present effects of time and wa flow on soil behaviour and their influence on the geotechnical structures (dams, roads, excavations, slopes, foundation)

1.5 Obligatory literature

1. Prof. E.Nonveiller (1981.): Mehanika tla i temeljenje, Školska knjiga
2. T.Roje Bonacci, P.Miščević : Mehanika tla, - skripta, GF Split / GF Osijek
3. M.Mulabdić: Notes for lectures

1.6 Additional literature

Cernica: Soil mechanics, John Wiley and Sons, 1995.

1.7 Exam

Exam:	Oral: Yes Written: Yes	Seminar: No
Pre/Corequisites: passed exam: mechanics, theory of structures, 1. part		

1.8 Quality control

practical work in lab, tests, small size working examples

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-401	**ROADS**	**3 + 3**	**COMPULSORY**	**V**	**7,00**
Lecturer:	**JOSIP BOŠNJAK, M.Sc. Civ.Eng.**				

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Introduction, distribution and regulations of roads. Cross-section of road. Horizontal and Vertical alignment. Interchange. Earth works. Pavement drainage.Materials for roads construction.
The road pavement construction (dimensioning, construction and maintenance, surface characteristics). Influences on road pavement construction. Reconstruction of old pavements. Road design by computer.

1.4 Competence

Introduced students with design, dimensioning, construction and maintenance of roads, with primary regulation roads and road design by computer

1.5 Obligatory sources

1. Korlaet:Uvod u projektiranje i građenje cesta , udžbenik, Zagreb, 1994.
2. B. Babić:Projektiranje kolničkih konstrukcija, Zagreb, 1984.
3. B. Babić, Z. Horvat:Građenje i održavanje kolničkih konstrukcija, skripta, Zagreb, 1984.

1.6 Additional sources

1. Dragčević, Korlaet:Osnove projektiranja cesta, udžbenik, Zagreb, 2003.
2. Božičević, Legac:Cestovne prometnice, Zagreb, 2001.

1.7 Exam

Exam:	Oral: yes Written: yes	Seminar: yes
Pre/Corequisites: to pass an Geodesy exam		

1.8 Quality control

Elaboration of program during semester with permanently control phases of work (Horizontal and Vertical alignment, Cross-section of road) and knowledge.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-102	**GEOTECHNICAL ENGINEERING**	**2 + 2**	**COMPULSORY**	**VI**	**4,50**

Lecturer: **Prof. MENSUR MULABDIĆ**	**Collaborators:** **KRUNOSLAV MINAŽEK,B.Sc.in Civil Engineering** **DEJAN MRAČKOVSKI, B.Sc.in Civil Engineering**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**NO**	**NO**	**YES**

1.3 Course curricula

Introductory lecture; development of the profession, type of activities and work.
Site investigation, shallow foundations. Stabilisation of excavations (deep excavations, sheet-oile walls). Supporting walls, drainage, anchors. Piles, deep foundation. Dams, compaction of soil. Stability of slopes remediation work. Soil improvement. Reinforced soil, geosynthetics. Landfills, geotechnical aspects. Measurement and observation of geotechnical work

1.4 Competence

Introduce geoechnical activities in building industry, type and way of analyses, technology, safety and control of work

1.5 Obligatory literature

1. Prof. E.Nonveiller (1981.): Mehanika tla i temeljenje, Školska knjiga
2. T.Roje Bonacci, P.Miščević : Temeljenje, - skripta, GF Split / GF Osijek
3. M.Mulabdić: Notes for lectures

1.6 Additional literature

1. Cernica: Foundation design, John Wiley and Sons, 1995

1.7 Exam

Exam:	Oral: Yes	Written: Yes	Seminar: No
Pre/Corequisites: soil mechanics			

1.8 Quality control

tests, small size working examples

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-202	**TIMBER STRUCTURES**	**2 + 2**	**COMPULSORY**	**VI**	**4,50**

Lecturer:	**Collaborators:**
STJEPAN TAKAČ, Ph.D. in Architecture	**TIHOMIR ŠTEFIĆ, B.Sc. in Civil Engineering**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**YES**	**YES**

1.3 Course curricula

Introduction to timber structures; historical development of timber structures; tendencies toward further development
Wood as a building material – wood biology; timber production; technical properties of wood; wood rheology; wood preservation in timber structures
Types of timber structures, contemporary timber structures
Fundamentals of timber structures – graphic representation of timber structures; material wood constants; Eurocode 5
Connections in timber structures – types; basics of connection design; connection stability; connecting devices
Joints in timber structures – types; joint dimensioning
Stability of timber structures – technical properties; stability proof; loads and influences; stability proof of timber structure elements; elements of space stability

1.4 Competence

To gain a basic understanding of wood characteristics and properties and timber structures in general

1.5 Obligatory sources

1. Takač, S: "Novi koncept sigurnosti drvenih konstrukcija", Sveučilišni udžbenik Sveučilišta J. J. Strossmayera u Osijeku, Osijek 1997. ISBN 953_96691-1-1

1.6 Additional sources

1. Žagar, Z: "Drvene konstrukcije IV", Udžbenici Sveučilišta u Zagrebu, Zagreb 1999.ISBN 953-6676--04-4.
2. Žagar, Z: "Drveni mostovi", Udžbenici Sveučilišta u Zagrebu, Zagreb 2001. ISBN 953-6676--05-2..

1.7 Exam

Exam:	Oral: yes	Written: yes	Seminar: yes
Pre/Corequisites:			

1.8 Quality control

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-203	**METAL STRUCTURES I**	**3 + 2**	**COMPULSORY**	**VI**	**6,00**

Lecturer:	**Collaborators:**
Ass. Prof.DAMIR MARKULAK	**TIHOMIR ŠTEFIĆ, B.Sc. in Civil Engineering**

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Terms and definitions. Scope of course. Structural steel – steelmaking, classification, properties. Steel products. Introduction to steel design procedure – limit states and fundametal requirements. Desig situations. Introduction to Eurocode 3. Actions on structures – definitions and classification. Resitance of steel members. Ultimate limit state. Clasification of steel cros-sections. Resistance of steel sections. Tension members. Bucling resistance of members. Compression members. Beams. Members with combined axial force and moment. Serviceability limit states. Corrosion resistance of steel structural elements – general, protection methods. Fire resistance of steel structural elements – general, definitions, fire protection methods. Connecting devices – general, classification. Connection made with bolts, rivets or pins. Welded connections. Fabrication and erection of steel constructions. Another metals in civil engineering.

1.4 Competence

Steel structures are very important part of civil engineering structures because of their economical, technical a estetical properties. Development of new steel grades, high level of steel making control process,, predictable material properties, repetitive using, ease of repair, speed of erection e.t.c. are some of advatages of using ste construction material. Purpose of the course is introduction to design, fabrication and erection of steel structure

1.5 Obligatory sources

1. Androić, B., Dujmović, D., Džeba, I.: Metalne konstrukcije 1, IGH, Zagreb, 1994
2. Androić, B., Dujmović, D., Džeba, I.: Metalne konstrukcije 2, IAP, Zagreb, 1995
3. Markulak, D.: Čelične konstrukcije, dio I, Interna skripta, GF Osijek, Osijek 2004.
4. Markulak, D.: Čelične konstrukcije, dio II, Interna skripta, GF Osijek, Osijek 2004.

1.6 Additional sources

1. EN1993-1-1 (EC3): Design of steel structures, General rules and rules for buildings
2. Stahl im Hochbau, 14. Auflage, Band I, Teil II, Band II, Teil I
3. Thiele/Lohse: Stahlbau 1, B.G. Teubner, Stuttgart, 1993
4. Hunersen, Fritzshe: Stahlbau in Beispielen, Werner-verlag GmbH, Dusseldorf, 1993
5. Petersen, C: Sathlbau, Wieweg and Sohn, Wiesbaden, 1994

1.7 Exam

Exam:	Oral: Yes Written: Yes	Seminar: Yes
Pre/Corequisites: Attendance to lectures and exercise, positive Semestral project		

1.8 Quality control

Semestral project is divided into different phases, and students need to work on project continually during semester. Attendance to lectures and exercise will be also monitoring.

1 Course

1.1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.15-110	**CONSTRUCTION MANAGEMENT I**	**3 + 2**	**COMPULSORY**	**VI**	**6,00**
Lecturer: **Ass.Prof.SAŠA MARENJAK**		**Collaborators:** **M.Sc. ZLATA DOLAČEK**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**NO**

1.3 Course curricula

General therms. Main characteristics of construction process. Data needed for planning of construction. Site layout, transportation, energy, water and other utilities at site, temporary buildings and structures at site. Security, regulation.
Planning, resources, control cycle of execution. Work breakdown structures. Construction prices, costs, and estimation procedures. Designing simple but powerful cost control systems. Productivity, delays and disruptions, lost time and cost calculation.

1.4 Competence

In this module, students will develop knowledge and understanding of the essential principles of construction management. Topics will include emphasis on cost and time planning, organisation of construction, parties involved and their roles and responsibilities.

1.5 Obligatory sources

1. J.Marušić, Organizacija gradenja, FS, Zagreb, 1994.

1.6 Additional sources

1. J.Klepac, Organizacija građenja i uređenje gradilišta, FGZ, Zagreb, 1982.

1.7 Exam

Exam:	Oral: Yes Written: Yes	Seminar: no
Pre/Corequisites:		

1.8 Quality control

1 Course

1. 1 General data

Code	Course title	Hours	Status	Semester	ECTS
2.05-204	**MASONRY STRUCTURES I**	**2 + 1**	**COMPULSORY**	**VI**	**4,00**
Lecturer: **prof. STJEPAN TAKAČ**		**Collaborators:** **TIHOMIR ŠTEFIĆ B.Sc. in Civil Engineering**			

1.2 Instructional format

Lectures	Practical exercises	Experimental exercises	Seminar
YES	**YES**	**NO**	**YES**

1.3 Course curricula

Historical development of the masonry structures.Types of the masonry structures;of burned clay elements, of concrete blocks, of natural stones.
Material / elements of the masonry structures;wall elements, binder, reinforcement.
Elastic and mechanical properties of the wall elements.
Elastic and mechanical properties of the mortar.
Elastic and mechanical properties of the wall elements- and mortar–wall composites.
Structural details of the masonry structures.
Realisation of the masonry structures.

1.4 Competence

To understand basic elements of the masonry structures, to inform students about the main topics of the masonry structures (students' technical skills)

1.5 Obligatory sources

1. Takač, S: "Zidane konstrukcije", Sveučilišni udžbenik Sveučilišta J. J. Strossmayera u Osijeku, Osijek 2000.

1.6 Additional sources

1. Z. Sorić, Zidane konstrukcije, Sveučilišni udžbenik, Hrvatski savez građevinskih inženjera, Zagreb, 1999.

1.7 Exam

Exam: yes	Oral: yes	Written: yes	Seminar: yes
Pre/Corequisites: Elements of building construction II			

1.8 Quality control