



MEDITERRANEAN UNIVERSITY PODGORICA
FACULTY OF INFORMATION TECHNOLOGIES

SUBJECT LIST
UNDERGRADUATE STUDIES

PROGRAMMING FUNDAMENTALS				
GENERAL INFORMATION				
Course code:	A102	Professor:	Tijana Vujičić, Associate prof.	
Course status:	Mandatory	Teaching Assistant:	Stanjević Vladimir, Msc	
Study year:	1.	Office hours:	By appointment	
Semester:	I (winter)	Study programme:	Academic studies Information Technology	
ECTS:	7			
SCHEDULE				
Lectures	Seminars		Lab	
48 (3 per week)	32 (2 per week)		16 (1 per week)	
STUDENTS' WORKLOAD				
	Weekly	During the semester	Total during the semester:	
Lectures	3:00 h	48:00 h	Lessons and final exam:	149:20 h
Seminars	2:00 h	32:00 h	Required preparation for enrolment and semester verification	18:40 h
Labs	1:00 h	16:00 h		
Individual work and utilizing office hours	3:20 h	53:20 h	Preparation for and taking exams in additional exam term	42:00 h
Total:	9:20 h	149:20 h	Total:	210:00 h
COURSE DESCRIPTION				
Prerequisites: N/A				
Objectives: Through course Programming fundamentals students are supposed to understand basic concepts of programming and to master object-oriented way of thinking. Particular focus will be on presenting object-oriented concept of programming with concrete Java programming language. The objective is that students acquire necessary knowledge on the level of programming concepts, as well as on practical level, and that they are trained to successfully continue with learning Java programming language through courses Object-oriented programming I and Object-oriented programming II.				
Teaching and learning methods: Lectures, seminars, mid-term exams, and final exam. Office hours.				
COURSE CONTENT				
Preparation week	Preparation and semester enrolment			
I week	Programming concepts			
II week	Programming environment for Java program development.			
III week	Data types and variables			
IV week	Algorithms, flowcharts, pseudo code			
V week	Actions, operators and instructions			
VI week	If and Switch statements			
VII week	One-week break			
VIII week	For and While loops			
IX week	Arrays			
X week	String			
XI week	Fundamentals of object-oriented programming, classes and objects			
XII week	Constructors and methods			
XIII week	Finding classes and objects in real examples			
XIV week	All materials synthesis			
XV week	All materials synthesis			
Final week	Final exam			
STUDENTS' OBLIGATIONS				
Students are obliged to attend lectures and seminars. They shall take mid-term exams, and final exam.				
LEARNING OUTCOMES				
Upon completion of this course, learners will be able to:				
<ul style="list-style-type: none"> - Understand basic algorithmic structures; - Understand theoretical background and fundamentals of object-oriented programming; - Use programming environment for Java program development.; - Code programs and solve concrete exercises; 				

- Recognize classes and objects in real examples;
- Analyze problems and identify way for solving those problems;
- Apply acquired knowledge to solve real-world problems.

LITERATURE

1. Schildt H. (2006): *Java J2SE 5: Kompletan priručnik*, Mikro Knjiga, ISBN: 86-7555-286-6
2. Eckel B. (2006): *Thinking in Java, 4th Edition*, Prentice-Hall PTR, ISBN-13: 978-0131872486, ISBN-10: 0131872486
3. Teaching materials available at the e-learning web site (<http://e-fit.unimediteran.net>)

ASSESSMENT AND GRADING

- Attending - 0 points
- Engagement in classes - 10 points
- Mid-term exam I - 25 points
- Mid-term exam II - 25 points
- Final exam - 40 points

A student has to pass (acquire more than 50%) each exam: Mid-term exam I, Mid-term exam II, Final exam.

Special Remark for the Course:

The teacher who has prepared the course information sheet:

Tijana Vujičić, Associate prof.

OBJECT-ORIENTED PROGRAMMING I

GENERAL INFORMATION

Course code:	A102	Professor:	Tijana Vujičić, Associate prof.
Course status:	Mandatory	Teaching Assistant:	Stanjević Vladimir, Msc.
Study year:	1.	Office hours:	By appointment
Semester:	II (summer)	Study programme:	Academic studies Information Technology
ECTS:	7		

SCHEDULE

Lectures	Seminars	Lab
48 (3 per week)	32 (2 per week)	16 (1 per week)

STUDENTS' WORKLOAD

	Weekly	During the semester	Total during the semester:	
Lectures	3:00 h	48:00 h	Lessons and final exam:	149:20 h
Seminars	2:00 h	32:00 h	Required preparation for enrolment and semester verification	18:40 h
Labs	1:00 h	16:00 h		
Individual work and utilizing office hours	3:20 h	53:20 h	Preparation for and taking exams in additional exam term	42:00 h
Total:	9:20 h	149:20 h	Total:	210:00 h

COURSE DESCRIPTION

Prerequisites:

Programming fundamentals

Objectives:

Through course Object-oriented programming I students will learn basic concepts of Java programming language. The objective is that students acquire necessary knowledge of theoretical background and good practices of object-oriented programming through Java programming language. Students will master basic Java programming concepts and they will be trained to successfully continue with learning Java through course Object-oriented programming II.

Teaching and learning methods:

Lectures, seminars, mid-term exams, and final exam. Office hours.

COURSE CONTENT (LECTURES)

Preparation week	Preparation and semester enrolment
I week	Eclipse IDE
II week	Revision of previous knowledge
III week	Two dimensional arrays, first part
IV week	Two dimensional arrays, second part

V week	Java Class Library
VI week	All ground synthesis
VII week	One-week break
VIII week	Inheritance
IX week	Interfaces
X week	Abstract classes
XI week	Exceptions
XII week	Reading, Writing, and Creating files
XIII week	Advanced topics
XIV week	All ground synthesis
XV week	All ground synthesis
Final week	Final exam
STUDENTS' RESPONSIBILITIES	
Students are obliged to attend lectures and seminars. They shall take mid-term exams, and final exam.	
LEARNING OUTCOMES	
Upon completion of this course, learners will be able to:	
<ul style="list-style-type: none"> - Use Eclipse IDE for developing Java programs; - Use concepts of inheritance, interfaces and abstract classes; - Handle and crate exceptions; - Read, write, and create files using Java programming language; - Analyze problems and identify way for solving those problems; - Apply acquired knowledge to solve real-world problems. 	
LITERATURE	
<ol style="list-style-type: none"> 1. Schildt H. (2006): <i>Java J2SE 5: Kompletan priručnik</i>, Mikro Knjiga, ISBN: 86-7555-286-6 2. Eckel B. (2006): <i>Thinking in Java, 4th Edition</i>, Prentice-Hall PTR, ISBN-13: 978-0131872486, ISBN-10: 0131872486 3. Teaching materials available at the e-learning web site (http://e-fit.unimediteran.net) 	
ASSESSMENT AND GRADING	
<ul style="list-style-type: none"> - Attending - 0 points - Engagement in classes - 10 points - Mid-term exam I - 25 points - Mid-term exam II - 25 points - Final exam - 40 points 	
A student has to pass (acquire more than 50%) each exam: Mid-term exam I, Mid-term exam II, Final exam.	
Special Remark for the Course:	
The teacher who has prepared the course information sheet:	Tijana Vujičić, Associate prof.

WEB DIZAJN			
OPŠTE INFORMACIJE			
Šifra predmeta:	A203	Profesor:	Prof. dr Snežana Šćepanović
Status predmeta:	Izborni	Saradnik:	Mr Biljana Stanić
Godina:	1.	Konsultacije:	Po dogovoru
Semestar:	II (ljetnji)	Studijski program:	Akadske osnovne studije: Informacione tehnologije
ECTS/CSPK:	6		
RASPORED SATI			
Predavanja	Vježbe		Laboratorije
48 (3 nedjeljno)	32 (2 nedjeljno)		16 (1 nedjeljno)
OPTEREĆENJE STUDENATA			
	Sedmično	Semestralno	Ukupno u toku semestra:
Predavanja	3:00 h	48:00 h	Nastava i završni ispit: 128:00 h
Vježbe	2:00 h	32:00 h	Neophodne pripreme za upis i ovjeru semestra 16:00 h
Laboratorije	1:00 h	16:00 h	
Samostalan rad i konsultacije	2:00 h	32:00 h	Priprema i polaganje ispita u popravnom ispitnom roku 36:00 h
Ukupno:	8:00 h	128:00 h	Ukupno: 180:00 h
OPIS PREDMETA			
Uslovljenost drugim predmetima: Nema formalne uslovljenosti drugim predmetima			
Ciljevi izučavanja predmeta: U okviru predmeta izučavaju se arhitektura i tehnologije WWW-a, kao najviše korišćenog Internet servisa. Studenti se upoznaju sa klijentskim tehnologijama za razvoj web aplikacija kao i metodama za razvoj i dizajniranje web sajtova. Nakon završetka studenti stiču teorijska i praktična znanja neophodna da samostalno projektuju i izrade web sajt primjenom XHTML i CSS web tehnologija.			
Metod nastave i savladanja gradiva: Predavanja, vježbe, domaći zadaci, kolokvijumi, praktičan projekat i završni ispit. Konsultacije.			
SADRŽAJ PREDMETA (PREDAVANJA)			
Pripremna nedjelja	Priprema i upis semestra		
I nedjelja	Uvod u Web – nastanak i razvoj. Klijent-server arhitektura Web-a. Pregled klijentskih i serverskih Web tehnologija. Standardi za web tehnologije.		
II nedjelja	Struktura web sajta. Metode za planiranje razvoja i sadržaja web sajta. Uvod u HTML: globalna struktura i sintaksa HTML dokumenata, izbor odgovarajućeg DTD-a, rad sa tipovima podataka.		
III nedjelja	Rad sa tekstom i listama. Strukturiranje teksta u HTML dokumentima. Efektivno korišćenje listi - rad sa atributima lista. Rad sa grafikom i multimedijom: dodavanje grafičkih, audio i video zapisa Web strani.		
IV nedjelja	Dodavanje hiperteksta i nezavisnih linkova. Upotreba elementa link za navigaciju. Rad sa tabelama: elementi i atributi.		
V nedjelja	Kreiranje Web formi. Elementi, atributi i kontrole. Upotreba atributa <i>method</i> i <i>action</i> . Uloga skrivenih polja.		
VI nedjelja	Optimizacija web sjta za pretraživače (SEO)		
VII nedjelja	Slobodna nedjelja		
VIII nedjelja	Uvod u CSS. Sintaksa. Elementi i atributi. Klase i pravila. <i>Responsive design</i> , Web alati <i>plug in</i> -ovi za kontrolu i praćenje razvoja web sajta.		
IX nedjelja	Izrada i formatiranje Web strana primjenom CSS-a. Primjena CSS pravila na tekst, boje i elemente pozadine Web strane.		
X nedjelja	CSS3 – Pozadine, okviri, gradienti, CSS3 šabloni za Web strane sa više kolona.		
XI nedjelja	CSS3 – Animacije, tranzicije, transformacije.		
XII nedjelja	Praktičan rad - završni projekat: Projektovanje web sajta.		
XIII nedjelja	Praktičan rad - završni projekat: Izrada web sajta primjenom CMS-a.		
XIV nedjelja	Praktičan rad - završni projekat: validacija, testiranje i optimizacija Web strana za pretraživače.		
XV nedjelja	Praktičan rad - završni projekat: postavljanje web sajta na web server. Izbor domena i web hostinga. Prijavljanje Web sajta na pretraživače.		
Završna nedjelja	Završni ispit		
OBAVEZE STUDENATA			
Student je obavezan da redovno prisustvuje nastavi i izvršava predispitne obaveze.			

ISHODI UČENJA

Po završetku kursa Uvod u web tehnologije student će biti u mogućnosti da :

- Razumije osnove funkcionisanja Interneta, WWW i ulogu klijentskih i serverskih tehnologija u izradi web aplikacija;
- Odabere i razlikuje klijentske tehnologije te ih primijeni na način koji odgovara specifičnostima pojedinog projekta za izradu web aplikacije;
- Koristi klijentske tehnologije (HTML i CSS) u izradi interaktivnih web stranica;
- Razvija jednostavne web aplikacije primjenom savremenih Content Management System-a (CMS);
- Analizira i implementira metode za optimizaciju web strana za pretraživače;
- Predloži projektni plan i dizajn za izradu web aplikacije primjenom HTML-a i CSS-a.

LITERATURA

1. Duckett J. (2011): *HTML & CSS- Design to build web sites*, John Wiley & Sons, Inc. ISBN: 978-1-118-008188
online:http://www.wufai.edu.tw/information_technology_center/datasheet/HTML%20and%20CSS%20design%20and%20build%20websites.pdf
2. Robbins J.N. (2012): *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics (4th Ed.)*, O'Really, ISBN: 978-1449319274
3. Smith C.W. (2013): *Styling with CSS 3rd Edition*, New Riders, ISBN: 978-0321858474
4. Hill J., Brannan J.A. (2011): *HTML5 i CSS3*, CET, ISBN: 978-86-7991-355-5
5. Nastavni materijali dostupni na web stranici predmeta u okviru sistema za e-učenje (<http://e-fit.unimediteran.net>)

OBLICI PROVJERE ZNANJA I OCJENJIVANJE

Poeni koje studenti dobijaju za uspešno ispunjene obaveze:

- Prisustvo nastavi - 5 poena
- Prvi kolokvijum - 20 poena
- Drugi kolokvijum - 20 poena
- Domaći zadaci - 10 poena
- Završni ispit - 45 poena

Način ocjenjivanja:

Prisustvo nastavi: 5 poena

Studenti koji prisustvuju časovima predavanja i vježbi minimum 7 nedelja dobijaju 2 poena za prisustvo. U suprotnom studenti ne dobijaju poene za prisustvo.

Prvi kolokvijum: 20 poena

Prvi kolokvijum polaže se pismeno i predstavlja provjeru znanja HTML jezika.

Drugi kolokvijum: 20 poena

Dugi kolokvijum polaže se pismeno i predstavlja provjeru znanja iz CSS tehnologija.

Domaći zadaci: 10 poena

Tokom semestra vrši se kontinuirana provjerana znanja. Provjere znanja organizuju se isključivo tokom časova vježbi i/ili predavanja. Domaći zadaci (seminarski radovi) neće se ponavljati i nije ih moguće raditi naknadno.

Završni ispit: 45 poena

Završni ispit je obavezan za sve studente.

Završni projekat predstavlja realizaciju praktičnog projekta primjenom open source CMS-a uz implementaciju XHTML i CSS tehnologija. Projekat se radi individualno.

Završni ispit je položen ukoliko student sakupi minimum 23 poena.

Uslovi za položen ispit:

Tokom semestra student kumulativno sakuplja poene izradom kolokvijuma, domaćih zadataka i redovnim prisustvom.

Student mora položiti završni ispit, odnosno sakupiti minimum 23 poena na završnom ispitu.

Ispit je položen ukoliko student kumulativno sakupi minimum 51 poen polaganjem završnog ispita i sakupljanjem bodova tokom tokom semestra.

Posebna naznaka za predmet: Nema

Nastavnik koji je pripremio podatke: Prof. dr Snežana Šćepanović

NETWORK INFORMATION TECHNOLOGIES				
GENERAL INFORMATION				
Course code:	A102	Professor:	Doc. dr Maja Delibašić	
Course status:	Mandatory	Teaching Assistant:		
Study year:	1.	Office hours:	By appointment	
Semester:	II (summer)	Study programme:	Academic studies Information Technology	
ECTS:	6			
SCHEDULE				
Lectures		Seminars		Lab
48 (3 per week)		32 (2 per week)		16 (1 per week)
STUDENTS' WORKLOAD				
	Weekly	During the semester	Total during the semester:	
Lectures	3:00 h	48:00 h	Lessons and final exam:	128:20 h
Seminars	2:00 h	32:00 h	Required preparation for enrolment and semester verification	16:00 h
Labs	1:00 h	16:00 h		
Individual work and utilizing office hours	2:00 h	32:00 h	Preparation for and taking exams in additional exam term	36:00 h
Total:	8:00 h	128:00 h	Total:	180:00 h
COURSE DESCRIPTION				
Prerequisites: None				
Objectives: Introducing students to the basic principles of signal transmission and processing, and identification of basic problems in signal transmission at a distance. Defining concepts important for understanding the functioning of modern telecommunication systems. Introduction to the architecture and organization of telecommunication networks. Measures to assess service performance.				
Teaching and learning methods: Lectures, homeworks, mid-term exams, and final exam. Office hours.				
COURSE CONTENT				
Preparation week	Preparation and semester enrolment			
I week	The concept, history and development of telecommunications. Development trends. Standardization. Networks classification according to size and purpose. Independent work 1.			
II week	General model of telecommunication system. Types of messages and signals. Basic signal characteristics.			
III week	Messages and signals generation and transmission. Digitalization. Independent work 2.			
IV week	Transfer media. Channel influence of on signal transmission. Noise. Signal processing. Independent work 3			
V week	Computer networks and the Internet. Network topologies. Network architecture. Independent work 4.			
VI week	Access network technologies. Commutation. Multiplexing. Independent work 5.			
VII week	Free week			
VIII week	Network performance evaluation measures. Quality of service. Independent work 6.			
IX week	Local computer network - standards, elements, significance.			
X week	Wireless LAN. Connecting LAN and WAN. Independent work 7.			
XI week	The concept of protocol. Multilayer models of the communication process. Data encapsulation. Network support in operating systems. Independent work 8.			
XII week	Application architecture. Independent work 9.			
XIII week	Network services. Division of services according to time requirements. Multimedia communications. Independent work 10.			
XIV week	Reliable data transmission mechanisms.			
XV week	Sources of errors. Error control. Error control protocols. Error detection and correction techniques.			
Final week	Final exam			
STUDENTS' OBLIGATIONS				
Students are obliged to attend lectures and seminars. They shall take mid-term exams, and final exam.				

LEARNING OUTCOMES

After passing the exam, the student will be able to:

- Describe the general principles of data generation and transmission
- Describe the basic types and characteristics of signals transmitted by a telecommunications system
- Describe computer network architecture and basic access network technologies
- Define the basic functions of network elements
- Describe the multi-layer structure of the communication process
- Implement a simple LAN
- Specify the mechanisms of reliable data transmission through an unreliable channel.
- Describe mechanisms to detect and correct errors.

LITERATURE

1. R. Vojinović (2017): *Osnovi telekomunikacionih sistema*, Univerzitet Mediteran, ISBN: 978-9940-514-52-5
2. Veinović M., Jevremović A. (2008): *Uvod u računarske mreže*, Univerzitet Singidunum, ISBN: 978-86-85891-018-2
3. Bonaventure O. (2011), *Computer Networking: Principles, Protocols and Practice*, Open Textbook Challenge, ISBN: 978-1-365-18583-0
4. Tanenbaum A. S., Wetherall D. J. (2010): *Computer Networks, 5th ed.*, Prentice Hall, ISBN: 9780132126953
5. Shay W. (2004): *Komunikacione tehnologije i mreže*, Kompjuter biblioteka, ISBN: 86-7310-310-X.
6. Teaching materials available at the e-learning web site (<http://e-fit.unimediteran.net>)

ASSESSMENT AND GRADING

- Attendance - 0 points
- Student engagement in classes - 10 points
- Mid-term exam I - 20 points
- Mid-term exam II - 20 points
- Final exam - 50 points

A student has to pass (acquire more than 50%) each exam: Mid-term exam I, Mid-term exam II, Final exam.

The teacher who prepared the course information sheet:

Maja Delibašić, Associate prof.

WEB PROGRAMMING

GENERAL INFORMATION

Course code	ASI402	Professor:	Snežana Šćepanović, Full prof.
Course status	Obavezni	Assistant:	Ivan Knežević, Msc
Year:	2.	Consultations:	By appointment
Semester:	IV (summer)	Study program:	Academic undergraduate studies: Information Technology Module: Software Engineering
ECTS/CSPK:	7		

SCHEDULE

Lectures	Practice	Laboratory
48 (3 weekly)	32 (2 weekly)	16 (1 weekly)

STUDENT WORKLOAD

	By week	By semester	Total during the semester:	
Lectures	3:00 h	48:00 h	Teaching and final exam:	149:20 h
Practice	2:00 h	32:00 h	Necessary preparations for enrollment and certification of the semester	18:40 h
Laboratory	1:00 h	16:00 h		
Independent work and consultations	3:20 h	53:20 h	Exam preparation and taking in the remedial exam period	42:00 h
Total:	9:20 h	149:20 h	Total:	210:00 h

COURSE DESCRIPTION

Conditionality to other subjects:

It is necessary that students have attended and passed the course Introduction to Web Technologies and Web design.

Course objectives:

Within the course, students are introduced to the basics of client-server architecture of distributed systems, and acquire advanced knowledge in the field of JavaScript and PHP programming on the client

side. Upon completion, students acquire theoretical and practical knowledge needed to create and develop dynamic web applications using modern CMS tools, JavaScript, PHP and web 2.0 technologies (blog, RSS, wiki, audio and video podcasts, multimedia and mapping web services).

Teaching methods :
Lectures, exercises, homework, colloquia and final exam. Consultations.

COURSE CONTENT (LECTURES)

Preparation week	Semester preparation and enrollment
I week	Basic characteristics of client server architecture. Introduction to JavaScript. JavaScript: Lexical structure, data types and values. Variable. Expressions and operators. Reserved words.
II week	JavaScript: Functions, loops (for and while), conditions (if, switch) and calling functions through triggers (events) Javascript: working with strings, strings, and objects (date, math). Use of Regular Expressions.
III week	JavaScript: DOM elements
IV week	Java script library. jQuery: Basic syntax. jQuery: work with HTML (get, set, add, remove, css, dimensions).
V week	jQuery: Effects and working with effects (hide / show, fade, slide, animate) and their concatenation.
VI week	Other JavaScript libraries.
VII week	Free week
VIII week	Introduction to PHP. Defining variables and constants. Data types. PHP: arrays, functions, data transfer (GET and POST).
IX week	PHP and Mysql, creating a database using PHP, connecting to an existing database. Basic CRUD operations.
X week	Combining jQuery / Javascript, PHP and MySQL to create web applications.
XI week	AJAX - basic concepts, technologies and applications in creating web applications. Basic aspects of web application security.
XII week	Practical work - Final project
XIII week	Practical work - final project: application of jQuery / Javascript, PHP and MySQL for web application development Software tool: PHPStorm (JetBrains)
XIV week	Practical work - Final project: application of AJAX for web application development Software tool: PHPStorm (JetBrains)
XV week	Practical work - final project: application of AJAX for web application development Software tool: PHPStorm (JetBrains)
Final week	Final exam

STUDENTS' OBLIGATIONS

Students are required to attend classes, exercises and laboratories. Students do assignments, seminar papers, colloquia and final exam.

LEARNING OUTCOMES

Upon completion of the Web technology course the student will be able to:

- Understands the basic concepts and technological aspects of client server web system architecture;
- Selects the most efficient form of client-server architecture and the optimal model of database organization that meets the specifics of each project for creating a web application;
- Uses modern Content Management Systems (CMS) to create client-server web applications and connect all components of the web application - individual web pages and MySQL database;
- Apply and combine JavaScript and PHP functions with CSS syntax to create interface design, dynamic web content and web application functionality;
- Apply and combine HTML forms, JavaScript, PHP and CSS for data entry and verification and protection of content entered into the database;
- Tests the weaknesses of the web application and applies changes to improve protection and functionality;
- Apply the acquired knowledge for the development of usable and accessible web applications.

LITERATURE

1. Meloni J.C. (2016): PHP7, MySQL and JavaScript (7th Ed.), Pearson Education, ISBN 978-86-7310-522-2
2. Ullman L. (2016): PHP for the Web, Pearson Education, ISBN: 978-0134291253
3. Welling L., Thomson L. (2017): PHP and MySQL web development, Pearson Education, ISBN-13: 978- 0321833891
4. Easton C. (2013): Advanced Java Script, 3rd edition, Wordware Publishing, ISBN: 978-1-59822-033-9 online: [ftp://ftp.micronet-rostov.ru/linux-support/books/programming/JavaScript/\[Wordware\]%20%20Advanced%20Javascript.%203rd](ftp://ftp.micronet-rostov.ru/linux-support/books/programming/JavaScript/[Wordware]%20%20Advanced%20Javascript.%203rd)

[%20ed.%20-%20\[Easttom\].pdf](#)

5. Scripts and material from exercises and lectures, online: <http://e-fit.unimediteran.net/course/view.php?id=66>

ASSESSMENT AND GRADING

Points that students receive for successfully completed obligations:

- Attendance: 5 points
- First colloquium: 20 points
- Second colloquium: 20 points
- Homework: 10 points
- Final exam: 45 points

Assessment method

Attendance

A student who attends lectures and exercises for a minimum of 7 weeks receives 2 points for attendance.

First colloquium: 20 points

The first colloquium is taken in writing and is a test of knowledge of JavaScript.

Second colloquium: 20 points

The long colloquium is taken in writing and represents a test of knowledge of PHP.

Homework: 10 points

During the semester, continuous tested knowledge is performed. Knowledge tests are organized exclusively during classes and / or lectures. Homework (seminar papers) will not be repeated and it is not possible to do them later.

Final exam: 45 points

The final exam (project) is mandatory for all students.

The final project is an independent realization of the client server web application through a practical project. The project is done using open source CMS with the implementation of client and server web technologies (XHTML, CSS, JavaScript and PHP).

The final exam is passed if the student collects a minimum of 23 points.

Conditions for passing the exam

During the semester, the student cumulatively collects points by doing colloquiums, homework and regular attendance.

The student must pass the final exam, ie collect a minimum of 23 points in the final exam

The exam is passed if the student cumulatively collects a minimum of 51 points by taking the final exam and during the semester.

Special indication for the subject: N/A

The teacher who prepared the course information sheet:

Snežana Šćepanović, Full prof.

COMPUTER NETWORK DESIGN

GENERAL INFORMATION

Course code:	AIK401	Professor:	Doc. dr Maja Delibašić
Course status:	Elective	Teaching Assistant:	
Study year:	2.	Office hours:	By appointment
Semester:	IV (summer)	Study programme:	Academic undergraduate studies
ECTS:	7		Information Technology

SCHEDULE

Lectures	Seminars	Lab
48 (3 per week)	32 (2 per week)	16 (1 per week)

STUDENTS' WORKLOAD

	Weekly	During the semester	Total during the semester:	
Lectures	3:00 h	48:00 h	Lessons and final exam:	149:20 h
Seminars	2:00 h	32:00 h	Required preparation for enrolment and semester verification	18:40 h
Labs	1:00 h	16:00 h		
Individual work and utilizing office hours	3:20 h	53:20 h	Preparation for and taking exams in additional exam term	42:00 h
Total:	9:20 h	149:20 h	Total:	210:00 h

COURSE DESCRIPTION

Prerequisites: None	
Objectives: During the study of the course, students will learn to identify real requirements for the implementation of computer networks in business and other real environments. By identifying the requirements, they will be able to plan network services and define a service quality policy. Students will be able to choose the necessary equipment to build a network infrastructure. They will completely master the planning of the address space and the design of the logical network architecture, which they will be able to upgrade with all the necessary services for the successful functioning of the business network architecture. At the same time, they will acquire the knowledge necessary for the adoption of network security policies, and thus complete the entire corporate network organization.	
Teaching and learning methods: Lectures, homeworks, mid-term exams, and final exam. Office hours.	
COURSE CONTENT	
Preparation week	Preparation and semester enrolment
I week	Identification of requirements and selection of networking models in enterprise computer networks. Service planning and defining service quality policy. Practical work: Designing a computer network of a company.
II week	Selection of network infrastructure equipment. Rules and standards for the implementation of network services in e-business. Practical work: Port configuration, network virtualization and traffic aggregation at the network interface layer: VLAN, EtherChannel, LACP.
III week	Computer network address space planning for IPv4 and IPv6. Designing a logical network architecture. Practical work: Planning the address space and using the DHCP protocol for assigning network addresses.
IV week	Defining port types, logical separation and traffic aggregation at the network interface layer. Design of redundancy, reliability and load distribution by layers. Practical work: Implementation of solutions for routing traffic in the network and connecting with other networks: OSPF and BGP.
V week	Selection of protocols for internal and external traffic routing in computer networks of companies. Practical work: Configuration of redundancy and load distribution on the network interface layer: STP, MSTP and on the network layer: HSRP, VRRP.
VI week	NTP service design. Practical work: Simulation of NTP service.
VII week	One week break
VIII week	Requirements analysis and design of VPN services for e-business. Defining protection policy and selection of firewall technology. Practical work: Configuring redundancy and load distribution on the application layer: DNS load balancing, PROXY servers.
IX week	Model selection and design of enterprise computer network management system: log analysis, SNMP, TR-069. Designing a converged enterprise network. Practical work: Monitoring the performance of the company's computer network: Cacti, MRTG.
X week	Protocols for service convergence and traffic engineering: MPLS, RVSP. Design and implementation of software-defined networks in companies. Practical work: Implementation of VPN service on the network interface layer: PPTP, on the network and application layer: L2TP, IPSec.
XI week	Requirements analysis and design of virtual infrastructure for electronic business of the company. Practical work: Configuration of multimedia services in the computer network of the company: SIP, Asterisk, CallManager, middleware platform.
XII week	Methods for computer network virtualization. Practical work: Design of network solutions for multicast traffic.
XIII week	Network virtualization in practice. Practical work: simulation of real working conditions with virtual networks.
XIV week	Specifics of computer network design in data centers. Methods for testing and evaluation of network services. Practical work: Configuration of virtual machines and network interfaces in Linux and cloud environment: Open Switch, Open Daylight, Open Stack, Mininet.
XV week	Audit in computer networks of companies and public institutions.

	Practical work: Designing a company data center: TIA 942. Evaluation of developed solutions.
Final week	Final exam
STUDENTS' OBLIGATIONS	
Students are obliged to attend lectures and seminars. They shall take mid-term exams, and final exam.	
LEARNING OUTCOMES	
After passing the Computer Network Design exam, the students will be able to:	
<ul style="list-style-type: none"> - Identify the elements of computer networks of the company, explains their purpose and compares the basic characteristics; - Understand the business principles of companies and network services within them; - Identify and describe the structure of a real computer network of a large company; - Define computer network protection policies; - Classify different types of network services; - Evaluate and test network parameters and services; - Apply the acquired knowledge in the following subjects. 	
LITERATURE	
<ol style="list-style-type: none"> 1. Toy M. (2015): <i>Networks and Services Management</i>, Wiley-IEEE Press, ISBN-10: 1118837592. 2. Kempf J., Zhang Y., Mishra R., Beheshti N., <i>Zeppelin</i> (2013): <i>A third generation data center network virtualization technology based on SDN and MPLS</i>, Cloud networking, IEEE 2nd International Conference on Cloud Networking (CloudNet), DOI:10.1109/CloudNet.2013.6710551 3. Wilkins S. (2011): <i>Designing for Cisco Internetwork Solutions (DESGN)</i>, Cisco Press, ISBN-13: 978-1-58720-424-1 4. Teaching materials available at the e-learning web site (http://e-fit.unimediteran.net) 	
ASSESSMENT AND GRADING	
<ul style="list-style-type: none"> - Attending - 0 points - Engagement in classes - 10 points - Mid-term exam I - 20 points - Mid-term exam II - 20 points - Final exam - 50 points <p>A student has to pass (acquire more than 50%) each exam: Mid-term exam I, Mid-term exam II, Final exam.</p>	
Special Remark for the Course:	
The teacher who has prepared the course information sheet:	Maja Delibašić, Associate prof.