UNIVERSITY OF DUNAÚJVÁROS

CURRICULUM & STUDY PROGRAM DESCRIPTION

COMPUTER SCIENCE ENGINEERING BSC



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Description of the Degree Study Program

Computer Science Engineering BSc (Computer Network Engineering Specialization, Software Technology Specialization)

The higher educational institution responsible for the study program	University of Dunaújváros
Identification number of higher educational institution	FI60345
Address of higher educational institution	Táncsics Mihály utca 1/A., 2400 Dunaújváros
Authorized head of the institution	Dr. István András, Rector
Responsible persons for the study program	
Responsible institute	Informatics Institute
Director of institute	Dr. Bálint Nagy, PhD
Programme leader	Dr. József Katona, PhD
Specializations (majors) and responsible persons	
Computer Network Engineering	Dr. Ferenc Leitold, PhD
Software Technology	Dr. István Kirchner, PhD
Main aspects of the study program	
Precondition of student application acceptance	 General Certificate of Education or a certificate of secondary school final exam, that certificate, which is required to start a higher educational study program in the home country of the student, The level of the required English language knowledge to start bachelor studies: IELTS 5.5
Level of educational program	undergraduate
Level of qualification	bachelor (BSc)
Description of qualification in the diploma in Hungarian	mérnökinformatikus alapképzési szakon
Description of qualification in the diploma in English	Computer Science Engineer
Scheme of Study	7 semesters (3 and a half year) full-time program
Credit points to be acquired	210

The objectives of the training and the professional competencies to be acquired	The aim of the training is to train engineering IT specialists who are able to perform the design and development tasks of the data and program systems of technical IT and information infrastructure systems and services, as well as to solve their installation and operation tasks. They are prepared to continue their studies in a master's degree.
Prerequisites of specialization	 The precondition for starting the chosen specialisation is the completion of the study and exam requirements of the the following subjects: Introduction to Programming Computer and Network Architectures Engineering Mathematics 1. Basics of Computer Sciences 1. Database System Windows Operating System Linux Operating Systems
Condition(s) for starting a specialization and the order of classification	In the semester specified in the curriculum, at least one specialization will be launched, which most students choose. Starting more than one specialization is possible only if it has been selected by at least 15 people.
Practical internship	The practical internship is an internship organized in a professional internship place in the 7th (last) semester, lasting at least eight weeks. Credit value: 0 credit.
Preconditions of the issue of university leaving certificate	The relevant section of § 36. of the UOD Examination and Study Regulations makes the following definition of the preconditions: "(1) The final certificate is the successful passing of the examinations prescribed in the curriculum and, in addition to the passing of the language examination, the preparation of the dissertation and the final examination, other study requirements and credit points (including compulsory and compulsory requirements). certifying the acquisition of all credit points for elective subjects), which certifies, without qualification or assessment, that the student has fully complied with the study and examination requirements prescribed in the curriculum, including the internship." The precondition for the issuance of the final certificate is stipulated in § 108 of Act CCIV of 2011: "(47) successful completion of the examinations prescribed in the curriculum and, with the exception of passing the language exam and the preparation of a dissertation (diploma thesis), the fulfilment of other study requirements and the acquisition of credit points prescribed in the training and the output requirements, met the examination

	requirement in all respects;"
Thesis	The dissertation is a solution of an engineering informatics task or a research task arising in a specific field, which can be prepared in two semesters under the guidance of internal and external consultants by studying additional literature based on the knowledge acquired by the student. With the dissertation, the candidate proves that he / she has acquired sufficient skills in the practical application of the acquired knowledge, is able to perform the tasks of an engineering informatics and is also proficient in other literature beyond the curriculum, which he / she is able to apply in a value- creating way.
Prerequisites of final exam	The precondition for admission to the final exam is the obtaining of the final certificate (dissertation) and the dissertation accepted for review.
Final exam	The final exam is a test and assessment of the knowledge, skills and abilities required to obtain a diploma, during which the student must also demonstrate that he or she can apply the knowledge learned. The final exam consists of the defense of the dissertation and the oral exam of the subjects specified in the curriculum.
Final exam subjects	 FE1: ISF-210 Database Systems ISF-213 Programming 1. ISR-118 Computer and Network Architectures FE2: Computer Network Engineering specialization: ISR-258 Computer Network Management 1. ISR-121 Network Operating Systems – Windows ISR-214 Network Operating Systems – Linux Software Technology Specialization: ISF-117 Software Development Technologies ISF-155 Programming 3. ISF-253 Web Programming
Average of certificate	The result of the diploma should be calculated as follows: (FEs + T + Cumulative GPA)/3. Arithmetic average of the marks of the final examination subject(s) (FEs), thesis (T) Grade of the final examination given by the Committee, the Cumulative Grade Point Average (GPA) of all credit points obtained during the entire study period, except for the preparation of the dissertation.
Qualification of certificate	excellent 4.51 – 5.00; good 3.51 – 4.50;

	satisfactory 2.51 – 3.50; adequate 2.00 – 2.50
Precondition of the issue of certificate	The precondition of the issue of certificate is to prove the completion of every study and exam requirement of the bachelor study program and to take a successful final exam.
The language of education	English
Physical education	1 hour per week every semester (full-time only)
Work schedule	Full-time (full-time)

Expected competencies

Knowledge:

- The student's knowledge of English reaches the level required for training, learning about the English language literature, understanding and processing the technical text, and performing professional tasks that can be provided with a professional qualification, as well as for continuous professional self-education.

The student

- knows the principles and methods of science (mathematics, physics, other natural sciences) necessary for cultivating his / her field of informatics.
- knows the operation of the hardware and software elements of IT systems, the technology of their implementation, how to solve the tasks arising from its operation, and the possibilities of connecting IT and other technical systems.
- has a basic knowledge and engineering approach to the processing of measured signals, modelling, simulation and control of systems and networks.
- knows the main programming paradigms, programming languages, development tools. His knowledge includes information systems modelling, database-based systems design, computer networking, operation and implementation, user interfaces and graphical applications, intelligent systems features, mobile application development features, advanced generalpurpose operating systems management, and IT security aspects.
- knows important software development methodologies, notation of IT plans and documentation.
- has basic data security knowledge.
- knows the vocabulary and expressions of the IT and engineering profession in Hungarian and English, at least at a basic level.

Ability:

The student

- uses the principles and methods of natural sciences (mathematics, physics, other natural sciences) necessary for the cultivation of the field of informatics in his engineering work aimed at the development of informatics systems.
- uses the knowledge gained during his studies, he is able to install and configure computer and telecommunication networks, troubleshoot network problems, operate and improve networks.

- is able to develop applications, client-server and WEB, program mobile systems, create multiplatform systems.
- has got the ability to develop enterprise information systems and implement previous developments.
- is able to specify and implement embedded systems using the knowledge gained during his studies.
- is able to acquire deeper knowledge in a technical IT field, to process the literature, and then to solve IT problems related to the field, based on the acquired basic knowledge.
- is able to perform analysis, specification, design, development and operational tasks in his / her field, apply development methodologies, debugging, testing and quality assurance procedures.
- collaborates with IT and electrical engineers during group work, as well as with representatives of other disciplines in the development of requirements analysis and solution of the given problem.

communicates professional issues in Hungarian and English and uses the formal language of informatics in a creative way.

 is constantly making efforts to train himself/ herself and keeping pace with the development of the IT profession.

Attitude:

The student

- authentically represents the professional principles of the engineering and IT fields.
- seeks to have an overview of the entire technical system beyond his/ her own area of work.
- is open to learning new skills, programming languages, procedures and their skill level. is open to learn about other fields using IT tools and to develop IT solutions in cooperation with experts in the field.
- makes its decision in full compliance with legal and ethical standards, even in decisionmaking situations requiring a complex approach.
- understands and feels the ethical principles and legal aspects of the profession.
- strives for efficient and quality work.
- keeps in mind and takes care of the security of the data and information of your employees and customers.

Autonomy and responsibility:

The student

- feels responsible for his / her independent and group IT systems analysis, development and operation.
- identifies the shortcomings of the applied technologies, the risks of the processes and initiates the measures to reduce them.
- has acquired the demanded expertise, he has a security-conscious attitude, keeps in mind the potential threats and attack possibilities, and prepares to prevent them.

Curriculum

Computer Science Engineering BSc																								
												Se	me	ster	s									
Subject code	Subject	Credit	Exam type		1			2			3		4			5			6			7		Pre subject
				Le	Р	La	Le	Р	La	Le	P L	a Le	P	La	Le	Р	La	Le	P	La I	Æ	1	La	
DUEN-ISF-111	Introduction to programming	5	MM	1	0	2																		
DUEN-ISR-118	Computer and Network Architectures	5	MM	2	0	1																		
DUEN-MUT-151	Engineering Physics	5	E	1	1	1																		
DUEN-TKM-150	Legal Knowledge	5	E	3	0	0																		
DUEN-IMA-152	Engineering Mathematics I. (Linear algebra and calculus)	5	E	0	3	0																		
DUEN-IMA-153	Basics of Computer Sciences 1.	5	MM	1	0	2																		
DUEN-ISF-213	Programming 1.	5	MM				1	0	2															DUEN-ISF-111
DUEN-ISR-257	Windows Operating System	5	E				1	0	2															
DUEN-ISF-210	Database systems	5	E				1	0	2															
DUEN-ISF-010	Informatics	5	MM				0	0	3															
DUEN-IMA-212	Engineering Mathematics 2	5	MM				0	0	3															DUEN-IMA-152
DUEN-IMA-213	Basics of Computer Sciences 2.	5	MM				2	0	1															DUEN-IMA-153
DUEN-ISF-113	Programming 2.	5	MM							1	0 2	-												DUEN-ISF-213
DUEN-ISR-159	Linux Operating System	5	E							1	0 2													
DUEN-ISF-112	Internet technologies	5	MM							0	0 3	-												
DUEN-ISR-119	Electronic and digital systems	5	MM							1	0 2	2												DUEN-MUT- 151
DUEN-IMA-110	Mathematics 3.	5	MM							0	3 ()	1									T		DUEN-IMA-152
DUEN-TKT-151	Economics 1.	5	E							1	2 0)	1									T		
DUEN-ISR-258	Computer network management 1.	5	MM							1		2	0	1							T	T		DUEN-ISR-118
DUEN-ISF-250	Basics of intelligent systems	5	MM									2	0	1										DUEN-ISF-111
DUEN-ISR-250	Information Security	5	ММ									2	0	0										DUEN-ISR-118, DUEN-IMA-153
DUEN-ISR-215	Embedded Systems	5	MM									1	0	2							Ť	1	1	DUEN-ISR-119
	Elective course	5	0									1	1	1										
	Elective course	5	0									1	1	1										
DUEN-TVV-122	Entrepreneurship	5	MM									T	1		1	2	0					Ť		
DUEN-TKM-120	Multimedia	5	MM										1		2	0	2					T		
DUEN-TVV-114	Management	5	MM										1		1	2	0							
	Knowledge to start working												1									T		
	Specialization	15											1									T		
DUEN-ISR-157	Measurement and control	5	E									T	1					2	0	1		Ť		DUEN-IMA-110
DUEN-IMA-251	Numerical methods	5	MM										1					2	0	1		T		DUEN-IMA-110
	Specialization	15											1											
	Elective course	5	0										1					1	1	1		T		
DUEN-ISF-090	Thesis 1 Methodology	0	NG										1					1	0	0		T		
	Specialization	10								1		T	1	Г							T	T		
	Elective course	5	0		1	t				1	+	t	T	Π		Γ	Π			T	1 1		1	
DUEN-ISF-094	Thesis 2.	15	NG									1	T	П						1	0 9	1	0	DUEN-ISF-090
DUEN-ISF-097	Professional practice	0	NG										t	П		F	П				0 0)	0	
	Week Lecture, Practice, Lab, Credit			8	4	6	5	0	13	4	5 9	8	2	7	4	4	2	6	1	3	1 1	0	1	
	Week total			Ť	18	Ť	- 1	18		1	.8		17	1.	-	10	-		10	-	1	2	-	
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COMPLITER NETWORK ENGINEERING SPECIALIZATION															U	9	Ŭ	0	9	Ŭ		5	•	
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	SPECIALIZATION																							
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			Evam									Sei	mes	ters	5									
Subject code	Subject	Credit	type	1	L		2			3			4			5			6			7		Pre subject
DUEN ICD 120	Communication of a	-	Б	Le I	L	Le	P	La	Le	Р	La	Le	Р	La	Le	P	La	Le	Р	La	Le	Р	La	DUEN ICD 250
DUEN-ISK-120	Computer network management 2.	5	E		_	-	-	-		-		-	-	_	1	0	2					-	_	DUEN-ISR-258
DUEN-ISK-121	Network Operating Systems – windows	5	MM		_	-	-	-		_	_	_	-	_	1	0	2				_	-	_	DUEN-ISR-257
DUEN-ISR-116	Script languages	5	MM		_	+-	-	-		_		-		_	1	0	2		0			-		DUEN-ISF-III
DUEN-ISR-214	Network Operating Systems – Linux	5	MM		_	_	_	-		_		_	_	_				1	0	2		_	_	DUEN-ISR-159
DUEN-ISF-217	11 project 1.	5	MM		_	_	_	-		_		_	_	_				1	0	2		_	_	
DUEN-IMA-214	Operational research and decision theory	5	MM		_	_	_	_						_				1	0	2	_	_		DUEN-IMA-152 or DUEN-IMA-151
DUEN-ISF-116	IT project 2.	5	MM																		0	0	2	DUEN-ISF-217, DUEN-ISF-213,
		-	-		_	_	_	-		_		_	_	_										DUEN-ISF-210
DUEN-ISR-155	Quality and auditing of IT systems	5	Е			_															1	0	2	<u></u>
	Week Lecture, Practice, Lab, Credit			0 () 0		0	0	0	0	0	0	0	0	3	0	6	3	0	6	1	0	4	
	Week total			0 0 0 0 9 9 5																				
	Credit total:			40																				
				S	JFI	WA	ARF	E TE	ECF	INC)L(DG	Y											
DUEN-ISF-117	Software Development Technologies	5	MM												1	0	2							DUEN-ISF-113
DUEN-ISF-155	Programming 3.	5	MM												1	0	2							DUEN-ISF-213
DUEN-ISR-116	Script languages	5	MM												1	0	2							DUEN-ISF-111
DUEN-ISF-253	Web programming	5	Е															0	0	3				DUEN-ISF-112
DUEN-ISF-217	IT project 1.	5	MM															1	0	2				
DUEN-IMA-214	Operational research and decision theory	5	MM															1	0	2				DUEN-IMA-152 or DUEN-IMA-151
DUEN-ISF-116	IT project 2.	5	MM																		0	0	2	DUEN-ISF-217, DUEN-ISF-213, DUEN-ISF-210
DUEN-ISR-155	Quality and auditing of IT systems	5	E																		1	0	2	
	Week Lecture, Practice, Lab, Credit			0 () ()		0	0	0	0	0	0	0	0	3	0	6	2	0	7	1	0	4	
	Week total		0 0 0 9 9 5							1														
	Credit total:												40											

E: exam, MM: midterm mark, NG: no grade

Description of the required subjects of Computer Science Engineering BSc

Introduction of Programming

G 1		In Hungarian	Bevezetés a pro	og	ramozásba				Level BSc						
Subject name		In English	Introduction ()f]	Programming	Subject code ISF-111									
Responsible Ed	ucational	unit name	Institute of In	fo	rmatics		•								
Name of the req	luired pre	liminary study							Subject code						
Tuno		Study load per	week (in hours))			Da	quiramont	Credit	Teaching					
Туре		Lecture	Practice		Lab		Re	quitement	Cieun	language					
Full time Part time	150/39 150/15	per Week 1 per Semester 5	per Week per Semester	0 0	per Week per Semester	2 10	-	Midterm Mark	5	English					
Course leader	1		Name	1	Dr. Zoltán Ki	rály	, ,		Position	associate					
			 Educational goals, development objectives The students will get to know the basics of structured programming. Training history, development goals based on it. 												
Training course	aims		 The students gets acquainted with algorithmic thinking mainly in the framework of science subjects. In secondary school, simpler programs have already been written in C or Pascal languages. The basic training method is followed, mastering the theory within the theoretical lessons. During the lab, students learn the skills of programming by writing short programs. The subject provides theoretical and practical knowledge. 												
			Lecture The lecture is provided to all students in a lecture room. The implementation of theoretical concepts in sample application are explained and presented.												
Typical transfer	methods		Practice												
				Different applications are implemented by the laboratory leader.											
			Lab	Т	he tasks are cre	ated	l on	n personal loca	al storage usin	g C#.					
				P	rojectors and co	ompi	uter	rs are used in	n every laboratory.						
			Misc.												
			Knowledge The students w	ill	get to										
			know the algorithm tools and the steps of the algorithm. know your programming environment. know the structured programming elements. know the algorithmic methods. know the basic data types and structures.												
			Ability The students w	ill	get to										
			know the algor	ith	nm tools and the	e stej	ps c	of the algorith	ım.						
Requirements (6	l study results)	know your programming environment. know the structured programming elements. know the algorithmic methods. learn to be able to specify short programs. be able to describe simple algorithms													
			learn to write e use Skill in the	as V	ier C # program	ns in # coi	nso	onsole mode. De panel							
			be familiar with the basic data types and structures.												
			Attitude												
			Interest in prog	gra	mming. Self-de	velo	opm	nent using the	available lite	rature in English.					

	The challenge of giving the solution (challenge).
	Autonomy and Responsibility
Short description of the subject content	Independent thinking and problem solving. Assess, accept, or reject the difficulty of the task. Standalone specification capability. Students become familiar with the basics of programming, the concepts of algorithm and software, and the basic tools needed for programming. During theoretical classes students will be introduced to the basic principles of algorithmization, simple data structures and function creation.
Forms of student activity	Solving individual tasks (homework) outside the classroom. Finding solutions and implementing them for assigned tasks.
Required reading and availability	
Recommended readings and availability	
Description of tasks/measurement procedures to be submitted	 One homework (compulsory application) Topic: A programming task which fits to the material of theory and practice. Date: The homework description is given on the 12th week. It must be finished until the last week of term-time. It must be defended in front of a committee during last week of term-time which is appointed by the leader of practice. It cannot be replaced! In case of unsuccessful presentation (e. g.: if the student is not aware of the operation of the presented program or it is found that the program has been copied), the application will be rejected.
Description and schedule of the midterm tests	Two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6 th week. 2 nd mid-term test: the week before the last week during term-time. Replacement/Correction The material of the whole semester. Invalidate the previously mid-term tests. Deadline: last week during term-time. Final grade (lecture total min. 61% and practice total. min. 61%): <60%: Fail (1) 61-70%: Pass (2) 71-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5) Lecture: 1. test (50 points) + 2. test (50 points) = 100 point (each min. 51%, total min. 61%) Laboratory: 1. test (30 points) + 2. test (30 points) + Homework (40 points) = 100 points (each min. 51%, total min. 61%)

Computer and Network Architectures

G 1		In Hungarian	Számítógép és l	há	lózati architektú	rák		Level	BSc							
Subject name		In English	Computer and	IN	letwork Archit	Subject code	ISR-118									
Responsible Edu	icational	unit name	Institute of Inf	1												
Name of the req	uired pre	liminary study				Subject code										
		Study load per	week (in hours)			C III	Teaching									
Туре		Lecture	Practice		Lab		Requirement	Credit	language							
Full time Part time	150/39 150/15	per Week 1 per Semester 5	per Week per Semester	0 0	per Week per Semester	2 10	Midterm Mark	5	English							
Course leader	100,10	<u>per semester e</u>	Name	v	Dr. Istvan Szal	00		Position	college associate professor							
Training course	aims		Educational goals, development objectives The students should become familiar with computer architecture, hardware architectures, and network architectures, configuring subnets and network terminals.													
			They should be able to replace computer components, install the Microsoft Windows operating system, and set up home, small business networking devices.													
			Lecture	L	ecture, in lecture	e ha	ll, using tablet, o	computer and	projector.							
			Practice													
Typical transfer	methods		Lab	C ar	omputer practic	e, p are.	projector and con	mputer use in	laboratories with							
			Misc.	Ē	-learning materia	al iı	n Moodle; Blend	led, hybrid lea	rning.							
			Knowledge				,		0							
Requirements (e	xpressed	study results)	Student knows networks work business device Ability Student should deploy Cisco 1 network. Attitude The student is technologies us professional tra Autonomy and The Student is 1 in the group. Students strive The study conte	tl s. l bo ho resection I F	he general princ Especially IBM e able to identify me and small-t quired to be op d in them. He l in them. He/Sh ing and self-edu Responsibility sponsible for the r quality work. t of theoretical c	en is pro	es of how com C compatible PC BM PC-compati iness devices, a for learning abo interested in no eeks to impleme ion.	puters, operat Cs and Cisco ble PC compo nd create a s out new opera ew operating nt lifelong lea y carried out in	ing systems, and home and small- ments, build PCs, simple local area ting systems and systems and the rning, continuous							
Short description	n of the s	ubject content	The evolution of computers. The main components of computers and the integration process (cards -> ICs -> SoC). Structure of processors (CISC / RISC, cores, threads, cache levels). Bus systems and sockets role, type (BCLK and bandwidth on motherboards). RAM / ROM types, differences between data size and bus size, timings. Containers and their interfaces (differences between versions). Video outputs (GPUs, memories, interface types) and peripherals (connector types). Power supplies structure (connectors, voltage levels, power calculation). Networking (protocols, interfaces), LAN / MAN / WAN, ISO OSI, TCP / IP. IP and ICMP versions and traffic management in general. General basics about UDP, TCP. The study content of laboratory practical classes: PC parts replacement, UEFI settings, upgrade opportunities. Microsoft Windows installation, partitioning, file systems, permissions. Registry usage, tools, installation, partitioning, Schedula testing Feldure desciperation.													

log, performance monitoring. PowerShell writing basic commands, scripts. Microsoft
Windows network configure. Network cable types, their preparation, testing. Home,
access and configure small business ISRs.
- Processing heard text with notes.
- Organize information.
- Independent solution of tasks.
- Solving tasks in groups.
- Tanenbaum, Andrew S.: Computer-architectures 2., edition, Panem Editor Co. Budapest, 2006.
- Tanenbaum, Andrew S Woodhull, Albert S.: Operating systems; Planning and
implementation, Panem Editor Co. Budapest, 2007
- Tanenbaum, Andrew S.: Computer networks (2. kiadás), edition, Panem Editor Co.
Budapest, 2004
Electronic content and learning material in Moodle and/or in Neptun systems.
During the semester, there are two in-house dissertations in the labs, the first is evaluated in lab immediately, the second evaluation's files created will be uploaded to the Moodle system. It is possible to remedy these results in the last practical
lesson (but you only have one time for all tasks then.)
- 1. in-house evaluation exam: Main components and assembly of computers - 2. in-house evaluation exam: Task simulation in Cisco PacketTracer

Engineering Physics

Subject name		In Hungarian	Méi	nöki Fizika	a		Level	BSc				
		In English	Enc	vineering P	Phy	rsics	Subject code	MUT-151				
Responsible Educational unit name			Inst	Institute of Engineering								
Name of the rea	uired pre	liminary study	1110		-6-	litering	Subject code					
r tunie of the req	unea pre	Study load per	weel	k (in hours))				Subject code	Teaching		
Туре		Lecture	Prac	ctice	,	Lab		Requirement	Credit	language		
Full time	150/39	per Week 1	per	Week	1	per Week	1					
Part time	150/15	per Semester 5	per	Semester	5	per Semester	5	Exam	5	English		
Course leader			Nar	ne	1	Dr. Miklós Ho	rvá	th	Position	c. professor		
			Edı	icational g	oal	ls, developmen	nt ob	ojectives	•	-		
Training course	aims		•	To under and gas 1 The prep	rsta meo ara	and and learn th chanics, thermo ation of the BS6	ne pr odyr c lev	rinciples of parti namics, optics, q vel Physics and c	cle mechanics uantum mecha other related su	, electricity, fluid nics, ıbjects.		
			Lec	ture	In	a classroom w	ith t	the use of projec	tor or compute	er in each lecture.		
			Pra	ctice	Fl fo	lipchart, blackb r problem solv	oaro ing.	d and other mult	timedia equipr	nent, group work		
Typical transfer	methods	5	Lab		Co ar	omputer praction	ce, p vare	projector and co	mputer use in	laboratories with		
			Mis	с.		propriate sorry	, ai e					
Requirements (expressed study results)			 Knowledge The students will Get acquainted with the principles of physics Have practice for problem solving in physics problems Have practice for measuring of basic physical quantities Ability The students should be Able to recognize the physical aspect of technical problems, Able to solve and calculate physical problems, Able to measure the physical parameters, able to use the instruments for measuring the basic physical parameters Attitude The student should be open to learning about and to accepting knowledge related to physics, and should be interested in new methods and tools related to the field. Autonomy and Responsibility									
Short description of the subject content Forms of student activity			Kinematics, axioms of mechanics, basic equation of dynamics, work, energy, power, linear momentum, and collisions, oscillatory motion, simple harmonic motion, damped oscillation, forced oscillation, resonance. Basic phenomena of fluid dynamics, buoyant forces, Archimedes' principle, continuity equation, Bernoulli equation. Thermodynamics, thermal expansion, work and heat, specific heat, latent heat, calorimetry, thermodynamic processes, First Law of thermodynamics, kinetic theory of gases, Second Law of thermodynamics, entropy and disorder, energy conservation. Electricity electrostatics, electric current, resistance, Ohm's law, network analysis, magnetic field, electromagnetic induction, alternating current circuits. Optics, geometric optics, propagation of light. Interference of light, single-slit diffraction, diffraction grating, photometry. Laboratory practices. Individual work, frontal class work, problem solving. lab exercises in small groups. Materials on MOODLE									
Required reading and availability			Alv SH/	in Halpern: AUM OUT	Be LII	eginning Physic NE SERIES Mo	cs I- cGra	II aw- Hill, ISBN ()-07-025653-5)		

Recommended readings and availability	Daniel Oman- Robert Oman: Physics for the Utterly Confused (McGraw- Hill Companies, ISBN: 0-07-048262-4) Daniel Oman- Robert Oman: How to solve Physics Problems (McGraw- Hill Companies, ISBN: 0-07-048166-0)
Description of tasks/measurement procedures to be submitted	All together 5 measuring reports on the laboratory exercises.
Description and schedule of the midterm tests	Midterm tests on weeks 7th and 13 th .

Legal Knowledge

a 1 .		In Hungarian		Jogi alapisme	re	tek	Level	BSc					
Subject name		In English		Legal Knowl	led	lge	Subject code	TKM-150					
Responsible Educational unit name			Institute of Social Sciences										
-				Department of Communication and Media									
Name of the rec	juired pre	eliminary stud	у						Subject code				
Type		Study load pe	er w	eek (in hours)				Requirement	Credit	Teaching			
		Lecture	-	Practice		Lab		1	cicuit	language			
Full time	150/39	per Week	3	per Week	0	per Week 0		Midterm Mork	5	English			
	150/15	per Semester	15	per Semester	U	per Semester 0		Ivial K		associate			
Course leader				Name		Dr. habil Orsoly	a	Falus	Position	professor			
Training course	aims			Educational f The goal of th Hungary, in t	go ne :he	oals, developmen course is to introc e European Unior	t d luo n a	bjectives ce the terminolo and from an inte	gy of law and ernational per	the rule of law in spective, as well.			
				Students will administratior community. T regulating bus	le n Tho sin	arn the principals in Hungary, in ey should be able ness life.	th to	f the Fundament e EU and the o understand lav	tal Law and th countries of vs and apply t	e basics of public the international he principle rules			
				Lecture Dra ati a a	In	a classroom with	i tl	ne use of project	tor or compute	er in each lecture.			
Typical transfer	methods	5		Lab	_								
				Misc	-								
Requirements (expressed study results)			Knowledge Students know • the type • how to • how pul • how leg contract Ability Students will • find, un • see the • establis Attitude They should legal solution Autonomy an They should appropriate la concerning th the system o	w: es, ur bl ga ts. be de str h be fc nd uw ier	terminology and aderstand and app ic administration al entities are es e able to: erstand and apply ructure of law, and operate a lega e open-minded, u or certain cases. I Responsibility se legal jargon alone. They sho n with correct app public administra	m ly we ta la la np prul plul plii	ain principles or rules, orks, blished and rea w, entity, create ba orejudiced and c operly and be d recognize leg cation of legal to on and be awa	f law, gistered, the sic contracts. creative to fin able to find al conflicts ar terms. They s re of the imp	content of basic d the appropriate and explain the nd exert a review hould understand portance of civic				
Short description of the subject content Forms of student activity				 The definition of law and the rule of law. The system of legal sources. Fundamental Law of Hungary. The National Assembly and the national referendum. The concept and principles of public administration. Bureaucracy. The concept of legal personality. The types of companies and company registration system. Basic types of economic contracts. Frontal work: 30 % Individual or group work: 35% Test: 15% 									
				 Communication situation exercises: 20% 									

Required reading and availability	 The Fundamental Law of Hungary (25 April 2011) (http://hunmedialaw.org/dokumentum/151/THE_FUNDAMENTAL_LAW OF_HUNGARY.pdf) Charles Szypszak: Understanding Law for Public Administration (http://samples.jbpub.com/9780763780111/80111_FMxx_Szypszak.pdf) Materials on MOODLE
Recommended readings and availability	 Sources and Scope of European Law (<u>http://www.europarl.europa.eu/ftu/pdf/enFTU_1.2.1.pdf</u>) Saylor Academy, 2012: Law for Entrepreneurs <u>https://saylordotorg.github.io/text_law-for-entrepreneurs/</u>
Description of tasks/measurement procedures to be submitted	On 7th week MIDTERM ESSAY,On 13th week presentation.
Description and schedule of the midterm tests	According to the predetermined items.

Subject name In Hur In Eng		In Hungarian	Mérnöki Mate	matil	ka 1	Level	BSc				
		In English	Engineering N	Math	ematics 1			Subject code	IMA-151		
Responsible Educational unit name			Institute of In	forn	natics	-					
Name of the required preliminary study						Subject code					
Study load per y		week (in hours)					Teaching			
Туре		Lecture	Practice		Lab		Requirement	Credit	language		
Full time	150/39	per Week 0	per Week	3	per Week 0)		_			
Part time	150/15	per Semester 0	per Semester	15	per Semester 0)	Exam	5	English		
Course leader			Name		Dr. Antal Joós	5		Position	associate professor		
Training course aims			Educational goals, development objectives The students should get to know the basics of calculus and linear algebra which are required to the special subjects, as well as improvement of mathematical knowledge to study specialized literature. Student knows and understands the most remarkable								
			relations, conn	ectio	ons, and set of ic	lea	as.				
	.1 1		Lecture Practice	Tea	ching in smal	11 10	groups, solvin	g computatio	nal and applied		
Typical transfer	methods	\$	Lab	еле	reises. Osing pi	J	ector, blackboai	u, calculator.			
			Mise			_					
			Knowlodgo								
Requirements (expressed study results)			The student should get to know methods and procedures required for solving mathematical tasks from economic areas. Student has enough knowledge referring mathematics, calculus, and linear algebra which are required by his/her special fie Ability The student should be able to apply the studied mathematical knowledge and activi The student is expected to be able to apply the studied methods and procedur Student is able to create an own solving-plan and argue. Student is able to organi his/her own learning procedure as well as to find and use different learning source Attitude Student should be willing to get acquainted with mathematical developments a innovations and their acceptance. Student is interested in new methods and meareferring to his/her specialization. Autonomy and Responsibility Students are expected to carry out their tasks by themselves, to think about different solutions and make suggestions. They take responsibility for their jobs						ed for solving of ledge referring to /her special field. edge and activity. and procedures. s able to organize learning sources. levelopments and thods and means hk about different obs.		
Short description	n of the s	subject content	The basics of linear algebra.The basics of calculus.								
Forms of student activity			 Directed learning of theoretical material 10 % Independent learning of theoretical material 30 % Directed exercise solving 30 % Independent exercise solving 30 % 								
Required reading and availability			 Lay, D. C.: Linear Algebra and its applications, 4th edition, Addison-Wesley, 2012. Stewart, J.: Complex Numbers, Additional Topic to Essential Calculus, 2nd edition, 2013, pp. 1-11. Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012. 								
Recommended	readings	and availability									
Description of t procedures to be	asks/mea e submitte	surement ed									

Engineering Mathematics 1.

	Two tests will be written during the practice sessions: Test 1 on week 6 (20 points, 45 minutes), Test 2 on week 12 (20 points, 45 minutes). Make up Tests on the week 13.
Description and schedule of the midterm tests	If the offered mark is not accepted, then the maximum scores of the written exam is 40.
	Conditions of final assessment from the 80 scores (40 test scores and 40 exam scores): 0-40 fail, 41-48 poor/pass, 49-56 satisfactory/fair, 57- good. If a student has at least 57 scores, then he/she can take an oral exam for the excellent mark.

Subject name In Hung		In Hungarian	Számítástudom	ány	alapjai 1	Level	BSc					
		In English	Basics of Com	pute	er Sciences 1	Subject code	IMA-153					
Responsible Educational unit name			Institute of Informatics									
Name of the rec	uired pre	liminary study		Subject code								
		Study load per	week (in hours)	_		Τ		, j	Teaching			
Туре		Lecture	Practice		Lab	-	Requirement	Credit	language			
Full time	150/39	per Week 1	per Week	0	per Week 2		Midterm	_				
Part time	150/15	per Semester 5	per Semester	0	per Semester 1	0	Mark	5	English			
Course leader		<u>. </u>	Name		Dr. Györgyi St	tra	auber	Position	c. professor			
Training course aims			Educational ge The aim of the r subjects of info Students will le serve as the bas	The aim of the module is to introduce the essential mathematical basics to the special subjects of informatics. Students will learn the basics of discrete mathematics and basic algorithms that will serve as the basis for their subsequent programming knowledge.								
			Lecture	Lec mee	ture with projec	to	r and blackboar	d or online co	urse using Teams			
Typical transfer	methods		Practice									
			Lab	In o teac	classrooms with ther's computer i	c is	computer work- connected to pr	stations for ev ojector.	very student. The			
			Misc.									
Requirements (expressed study results)			 The students should acquire such mathematical knowledge, which are necessary to understand additional IT subjects understand the principle of operation of basic algorithms, knows the possible ways of describing them. Ability The students should be able to read and understand mathematical texts; able to use mathematical knowledge in IT fields; able to further develop the known basic algorithms and integrate them into more complex programs. Attitude The students are required to have an open, inquisitive, constructive, efficient, and creative attitude to the course. Autonomy and Responsibility Taking responsibility, making decisions and managing tasks independently in the 									
Short description of the subject content			Sets, Set operations, Logic, Propositions, Relations and Their Properties, Representing Relations, Equivalence Relations, Partial Orderings, Functions, Properties of functions, Methods of Proof, Mathematical Induction, Algebraic structures, Information theory, Coding theory. Seminar: Numeral systems, number representation, basic algorithms.									
Forms of studer	t activity		 Lecture: 50% Self-dependent task solving: 50% 									
Required reading and availability			K.H. Kosen: Discrete Mathematics and its Applications, Mc-Graw Hill Book Company, 1999.									
Recommended	readings :	and availability										
Description of tasks/measurement procedures to be submitted			Midterm tests									

Basics of Computer Sciences 1

	•	1st midterm test: Week 5
Description and schedule of the midterm	•	2nd midterm test: Week 8
tests	•	3rd midterm test: Week 12
	•	Make-up test: Week 13

Programming 1.

Subject name		In Hungarian	Programozás 1.			Level	BSc					
		In English	Programming	1			Subject code	ISF-213				
Responsible Educational unit name			Institute of Informatics									
Name of the required preliminary study			Introduction to	Pro	gramming	Subject code	ISF-111					
		Study load per	week (in hours)				D	C III	Teaching			
Туре		Lecture	Practice		Lab		Requirement	Credit	language			
Full time	150/39	per Week 1	per Week	0	per Week	2	Midterm	F	E			
Part time	150/15	per Semester 5	per Semester	0	per Semester	10	Mark	5	English			
Course leader			Name		Dr. Jozsef Ka	ator	na	Position	associate professor			
			Educational go	oals,	, development	t ob	ojectives		1			
Training course	aims		To know the ba delegates, even codes.	sics ts, c	of OOP progra ollections, gen	amı lerio	ming, exception c programming,	handling, attri serialization, l	butes, reflections, LINQ and Unsafe			
			The subject pro of the knowleds	vide 2e th	es both theoret	ical varo	and practical kr	nowledge. It la ubiects.	ys the foundation			
				The	lecture is pro-	vide	ed to all students	s in a lecture ro	oom.			
			Lecture	The are	implementati explained and	on pre	of theoretical c	oncepts in sar	mple applications			
				Dro	iectors and tea	che	r's computers a	e used in ever	zy lactura			
Typical transfer	methods		Practice	110	jectors and tea	CIIC		ie used in ever	y lecture.			
i ypical transier	methous			Dif	ferent applicat	ion	s are implement	ed by the labor	ratory leader.			
			Lab	Lab The tasks are created on personal local storage using C#.								
				Pro	jectors and con	mpi	uters are used in	every laborate	ory.			
			Misc.									
			Knowledge									
			It is assured to know the advanced opportunities of C# (OOP, exception handling, reflection, delegates, events, collections, generic programming, serialization, LINQ and Unsafe codes) and students can design different UML static diagrams to write more efficient source codes. Ability									
Requirements (expressed study results)			Students are able to implement/make C# based applications or solutions which require exception handling, attributes, reflection, delegates, events, collection, generics, LINQ and serialization technologies and technics using object-oriented elements. They are capable of solving complex tasks or problems completely (design and create algorithms, implement an application, testing, debugging and make documentation). They can read and modify static UML diagrams to C# source code. They can understand a complex application and work on it even in a team. Attitude									
			Students are motivated to programming. They are open-minded to discover new corporate solutions, accept to principles of an organizational work and find easily their place in a project team. In case of self-sufficient jobs, all phases are done with the best possible mode and results. In teamwork, they make an effort to do a high-quality job and observe deadlines. Autonomy and Responsibility Students carry out their tasks by themselves, think about different solutions and make									
Short description of the subject content			 suggestions. They take responsibility for their jobs. The basic stages of software development Procedural vs. Object-Oriented Programming (OOP) The basic terms and concepts of object-oriented paradigm 									

	• UML
	class diagram (notations, camelCase, PascalCase, structure, access
	modifiers, examples)
	• object diagram (notations, structure, examples)
	• UML notations for stereotypes
	Association relationship
	• Generic classes and the inheritance
	• Exception handling
	• Attributes, reflections
	• Delegates and events
	• Collections
	• Generics programming
	• Serialization
	• LING to Object, LING to XML
	Unsare code
	• Processing the heard text and writing notes: 20%
Forms of student activity	• Organize information supported by tasks: 30%
	• Own tasks processing: 50%
	• John Sharp, <i>Microsoft Visual C# Step by Step (9th Edition)</i> , Microsoft Press, 2019
	2018. Tradien and D. Janihas, Due CH 7, With NET and NET Came Deductor CA.
B aguirad reading and availability	• Iroelsen and P. Japikse, Pro C# 7: with INET and INET Core. Berkeley, CA:
Required reading and availability	Apiess, 2017. M Soidl M Scholz C Huemer and C Kannel <i>UML @ classroom an</i>
	• M. Selui, M. Scholz, C. Huemer, and G. Kapper, OML @ Classroom un introduction to object oriented modelling. Cham: Springer, 2015
	 Flectronic curricultums are associated with C# available in the Moodle system
Recommended readings and availability	Electionic currentinis are associated with C# available in the Moodie system.
Recommended readings and availability	One homework (compulsory application)
	• Topic: A programming task which fits to the material of theory and practice
	 Date: The homework description is given on the 12th week. It must be finished
	until the last week of term-time
Description of tasks/measurement	• It must be defended in front of a committee during last week of term-time
procedures to be submitted	which is appointed by the leader of practice.
r	• It cannot be replaced!
	• In case of unsuccessful presentation (e. g.: if the student is not aware of the
	operation of the presented program or it is found that the program has been
	copied), the application will be rejected.
	Two mid-term tests/exams.
	1 st mid-term test: it is recommended on the 6 th week.
	2 nd mid-term test: the week before the last week during term-time.
	Replacement/Correction
	I ne material of the whole semester.
	Deadline: last week during term time
	Deadmie. last week during term-time.
Description and schedule of the midterm	Final grade (lecture total min 61% and practice total min 61%):
tests	<60%: Fail (1)
	61-70%: Pass (2)
	71-80%: Satisfactory (3)
	81-90%: Good (4)
	91-100%: Excellent (5)
	Lecture: 1. test (50 points) + 2. test (50 points) = 100 point (each min. 51%, total
	min. 61%)
	Laboratory: 1. test (30 points) + 2. test (30 points) + Homework (40 points) = 100
	points (each min. 51%, total min. 61%)

In Hungarian Windows operációs rendszer	Level	BSc								
In English Windows Operating Systems	Subject code	ISF-257								
Responsible Educational unit name Institute of Informatics	Institute of Informatics									
Name of the required preliminary study	Subject code									
Study load per week (in hours)	G III	Teaching								
Lecture Practice Lab Requirement	Credit	language								
Full time 150/39 per Week 1 per Week 0 per Week 2	5	English								
Part time 150/15 per Semester 5 per Semester 0 per Semester 10	5	Englisn								
Course leader Name Dr. György Ágoston	Position	c. professor								
Educational goals, development objectives Training course aims The aim of the course is to get acquainted with operating systems, promote and support their applevels. Students should get acquainted with the Windows, main attributes and possibilities. The automated tasks and own scripts.	Educational goals, development objectives The aim of the course is to get acquainted with the specialities of the Windows operating systems, promote and support their application at beginner and advanced levels. Students should get acquainted with the most important applications under Windows, main attributes and possibilities. They will be able to create their own automated tasks and own scripts									
Lecture Presentation in a lecture hall using	; a projector.									
Typical transfer methods										
Lab Computer lab, using a projector.										
Misc.										
 Knows the possibilities and tools of the IT f Has expertise and industry-specific knowled Knows the methods and procedures needed in the ICT field. Has the knowledge of speciappropriate to the IT field. Ability Able to perform routine operational tasks development tasks. Apply learned problem-solving methods a field tasks. Attitude The student should be interested in new methods and tools related to the strive to maintain the level of knowled continuous professional training and self-ed Autonomy and Responsibility Capability for a managed IT job, in which independently. Taking responsibility for his/her own word decisions, results). Independently making decisions on the de 	 Knows the possibilities and tools of the IT field. Has expertise and industry-specific knowledge of Windows. Knows the methods and procedures needed to solve common problems/tasks in the ICT field. Has the knowledge of specialist-specific tools to perform tasks appropriate to the IT field. Ability Able to perform routine operational tasks in the ICT field, perform planned development tasks. Apply learned problem-solving methods and procedures to perform his/her field tasks. Attitude The student should be interested in new methods and tools related to the field. strive to maintain the level of knowledge about Windows systems and continuous professional training and self-education. Autonomy and Responsibility Capability for a managed IT job, in which he/she performs his/her job tasks independently. Taking responsibility for his/her own work (for individual and team work decisions results) 									
 Plans and organizes it. History, development, general attributes, p and characteristics of Windows file sys hierarchy, structure and use of file ar management, general characteristics of proc Processes, threads, address spaces, ports, me memory, file systems. MS Windows: str system, registry, file system and registry pr management, task scheduling, sharing performance monitoring. PowerShell basic commands scripts 	 History, development, general attributes, philosophy of Windows. Structure and characteristics of Windows file systems, overview of the directory hierarchy, structure and use of file and directory references. Processes management, general characteristics of processes. Processes, threads, address spaces, ports, memory management, paging, virtual memory, file systems. MS Windows: structure, authorization system, file system, registry, file system and registry privileges, tools, users, services, disk management, task scheduling, sharing folders and printers, event log. performance monitoring. PowerShell basic commands, scripts. 									
- i o weishen busie commands, seripts.										

Windows Operating Systems

	Organize information, independent solution of tasks.Solving tasks in teams.
Required reading and availability	Presentations used in lectures and during lab classes in PDF format in the Moodle.
Recommended readings and availability	
Description of tasks/measurement procedures to be submitted	Theoretical knowledge: oral answers based on a list-of-questions. Demonstration practical knowledge during lab classes by solving exercises.
Description and schedule of the midterm tests	1st midterm test: During 6th week, theories and exercises. 2nd midterm test: During 12th week, theories and exercises. Possibility of retake tests during the last (13th) week.

Database Systems

G 1		In Hungarian	Adatbáziskeze	elés		Level	BSc						
Subject name		In English	Database Sys	tems		Subject code	ISF-210						
Responsible Ed	ucational	unit name	Institute of Ir	ıforn	natics	5							
Name of the rec	uired pre	eliminary study				Subject code							
		Study load per	week (in hours	5)					Teaching				
Туре		Lecture	Practice	/	Lab		Requirement	Credit	language				
Full time	150/39	per Week 1	per Week	0	per Week	2		_					
Part time	150/15	per Semester 5	per Semester	0	per Semester	10	Exam	5	English				
Course leader		Name		Dr. Mariann	ı Vá	raljai	Position	college associate professor					
			Educational g	goals	, developmen	t ob	ojectives						
			The majority o database mana known and pra	of IT agem actice	systems deal ent system. It ed by an IT pro	with is ir ofes	data manageme nportant, therefo sional.	ent. The main to be the the use of the the use of the the use of the the use of the the the use of the	tool for that is the se of these is well				
Training course	aims		The aim of the the methods o semi-structure	e cou f solv d dat	rse is to intro ving tasks. Stu abases.	duc Iden	e students to the ts will be able to	e tasks of data o model data,	base systems and use relational and				
			The prerequis programming	site f skills	for effective and mathema	stuc atica	dy of the subj Il logic.	ect is the ex	sistence of basic				
			Knowledge of the subject is expected in all other subjects dealing with complex programming, system design and implementation tasks.										
			Lecture	Lec Onl ava	Lecture, in lecture hall, using computer and projector. Online learning materials (handbooks, lecture presentations etc.) are available for the students.								
Typical transfer	methods	,	Practice	Practice									
i ypicar transier	methods	,	Lab In classrooms with the use of projector and computer, students so individual tasks on the computers, using programs, with teach assistance. Computer based exercises, individual tasks.										
			Misc.										
			 Students know the operation and use of database systems. Students know database design methods, their capabilities and limitations. Ability Students can design and use databases independently. Students are able to collaborate Students are able to review analyze and solve complex tasks 										
 Students are able to review, analyze and solve complex tasks Attitude Students should be open to explore and embrace new database system technologies used in them. They should be interested in new technologies related to databases. They should strive for lifelong learning, continuous vocational traiself-training. Autonomy and Responsibility Students strive for efficient and quality work. The students should take responsibility for the professional activities 							e systems and the bases. onal training and activities carried						
Short descriptio	n of the s	subject content	Database design, modeling Overview of Data Modeling, ODL, E / R, UML. The relational data model. Transcribe ODL, E / R, and UML schema to relational schema. Functional										

	dependencies, their rules. Closes an attribute set and calculates it. Polyvalent dependencies. Normal forms, steps of normalization. Relational algebra.									
	Use of SQL.									
	Constraints, triggers. Embedded SQL, dynamic SQL. SQL injection and methods of									
	defense. Transaction, atomicity, handling dirty data. Problems with simultaneous									
	modifications, isolation levels.									
	Implementation of database systems, the problems solution. Steps for query									
	optimization. Error handling, logging methods.									
	Semi-structured data management. Distributed database systems. Multi-database									
	systems. Data warehouse, database association. OLAP, OLTP.									
	Practice: Using database systems. Practice methods of normal use and methods of									
	creating and correcting various error situations.									
Forms of student activity	Heard information processing by creating notes, systematization of information has led by tasks (40%) Self-processing (individual) tasks (60%), teamwork									
	 Jeffrey A. Hoffer – V. Ramesh – Heikki Topi: Modern Database Management, Pearson Education Inc., 2016 									
	• Hans-Petter Halvorsen: Introduction to Database Systems 2017									
Required reading and availability	Hans-Petter Halvorsen: Structured Query Language 2017									
	 DBMS – Database Management System Tutorials Point(I) Pvt.Ltd, 2015 									
	 w3schools References and Tutorial: 									
	https://www.w3schools.com/sql/default.asp									
Recommended readings and availability	Electronic literature in Moodle or in Neptun, and examples on the Internet.									
Description of tasks/measurement	Lecture: One theoretical test									
procedures to be submitted	Practise: At least 2 tests from the curriculum so far processed. Occasionally a 10-									
procedures to be submitted	minute-long test from the lecture material.									
	Midterm tests in general:									
Description and schedule of the midterm	• Lecture: Week 11.,									
tests	• Practise: Week 6., Week 12., Week 13 (re-take).									
	The exact time of tests can be modified by the practice supervisors according to the									
	progress in learning materials.									

Informatics

C.1.1		In Hungarian	Informatika			Level	BSc						
Subject name		In English	Informatics			Subject code	ISF-010						
Responsible Edu	ucational	unit name	Institute of Informatics										
Name of the req	uired pre	liminary study	Subject code										
	, î	Study load per	week (in hours)	_				~	Teaching				
Туре		Lecture	Practice		Lab		Requirement	Credit	language				
Full time Part time	150/39 150/15	per Week 0 per Semester 0	per Week per Semester	0 0	per Week per Semester	3 15	Midterm Mark	5	English				
Course leader		Name		Dr. Mariann	Vá	iraljai	Position	college associate professor					
			Educational go Students acquin defined IT liters	re b	, development asic IT skills (ECDL)	req	jectives juired for the ba	asic modules	of internationally				
Training course	aims		The students sh The students sh The students sh and create sprea The students sh They should be	In interacy (ECDL) lents should be able to manage graphical operating system surely. lents should be able to browse the Internet and send emails. lents should be able to prepare documents with a word processing progra its spreadsheet by using spreadsheet program. lents should be able to prepare and manage simple databases. oud be able to prepare simple presentations as well									
			Lecture										
Typical transfer methods			Practice In classrooms with the use of projector and computer, students solindividual tasks on the computers, using programs, with teach assistance. Computer based exercises, individual tasks.										
			N.:	videos etc.) are available for the students.									
Requirements (e	l study results)	Students are re informatics prir field of inforn specialist know Ability Students are ab complex system procedures effic Attitude Students are in consider their of to understand innovation area Autonomy and Students should operations carri	equi nationationationation ledge ble t n pr cien and	red to be fam les, rules, relation technology ge of specific to to perform pan oblems. They thy in expertly sted in new m professional c accommodat sponsibility ve for efficient	tialia ion: . T <u>bols</u> . T <u>bols</u> . T <u>bols</u> . T . T . T . T . T . T . T . T . T . T	ar with the gen ships and proced 'hey have adeq s for selecting to l activities indep ply their studied ks. hods and tools petences and ac professional, te	eral and spec lures of the use uate expertise pols and to carr pendently dur l problem solv related to IT tivities on refl echnological of The responsibl	ific mathematics, er programs in the e in the IT field ry out its tasks. ing solving more ving methods and section. Students ective way. Open development and					
Short descriptio	subject content	Operations carried out independently. Operating system management, files, folders, storage devices management. Virus Scan, AntiVirus, logging. Manage Compressed documents. Using Windows utilities (Paint, Notepad). Set up and use Internet browsers. Search the Internet. Set email clients and send, receive emails and attachments, handle address book, BCC, and important letter. Word processing program: Character and paragraph formatting, columns, tabs, use											

	headers and footers, special characters, bullets, numbering, create tables, applying styles, create mail merge and table of contents.
	Spreadsheet program: Fill charts with data, format, use references, formulas, functions, charts, create data tables, use database functions, prepare pivot tables. Database handling and management by database management software: Create data table, format, link data tables. Create queries (conditional selection, parameter, grouping, update, cross-table), forms, and reports.
	Making presentations by PowerPoint program.
Forms of student activity	Heard information processing by creating notes, systematization of information has led by tasks (40%) Self-processing (individual) tasks (60%)
Required reading and availability	 WORD 2010 All-In-One for Dummies by Doug Lowe with Ryan Williams, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) EXCEL 2010 All-In-One for Dummies by Greg Harvey, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) ACCESS 2010 All-In-One for Dummies by Margaret Levine Young, Alison Barrows, and Joseph C. Stockman, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) POWER POINT 2010 All-In-One for Dummies by Doug Lowe, Wiley Publishing Inc., 2010, Indianapolis, Indiana (free pdf on Internet) The Internet for Dummies 12th edition by John R. Levine – Margaret Levine Young, Wiley Publishing Inc, Indiana (free pdf on Internet) OFFICE 2010 All-in-one for Dummies by Peter Weverka, Wiley Publishing, Inc. Indiana (free pdf on Internet)
Recommended readings and availability	Electronic literature in Moodle or in Neptun. Microsoft Office Tutorial and examples (Internet).
Description of tasks/measurement procedures to be submitted	Assignment: Individual presentation making (Power Point or Prezi), presenting and uploading into Moodle. Deadline: Week 10.
Description and schedule of the midterm tests	Week 4., Week 8., Week 12., Week 13 (re-take).

Subject name In Hungaria		In Hungarian	Mér	nöki Mater	natik	ka 2	Level	BSc				
Subject name		In English	Eng	ineering N	Iath	ematics 2	Subject code	IMA-252				
Responsible Edu	ucational	unit name	Institute of Informatics									
Name of the req	uired pre	eliminary study		Subject code								
		Study load per	week	(in hours))					Teaching		
Lecture			Prac	tice		Lab	r	Requirement	Credit	language		
Full time	150/39	per Week 1	per '	Week	0	per Week 2		Enom	F	English		
Part time	150/15	per Semester 5	per S	Semester	0	per Semester 10)	Exam	5	English		
Course leader			Nan	ne		László Bognár,	C	CSc.	Position	c. professor		
Training course aims		Edu The stati obje anal	Educational goals, development objectives The purpose of the course is to make the students familiar with analysing data using statistical methods and tools. Having covered this course students understand the objective of probability and statistics, they know the different ways of gathering data.									
			worl	d situation	s bas	sed on samples of	f	data.				
			Lect	ure	The Stuc text	ese formal lectur dents are expected , slides or transpa	ire ed ar	es mostly aim to take persona encies.	at transferr l notes in addi	ing information. tion to the course		
T			Prac	tice	<u>.</u>	1	_	1 . 1 1	· 1 1 XX7			
i ypicai transfer	methods	5	Lab		exer anal exp	tents are expected rcises, feedback lysis with softw ected.	o va	n an assignmen re package pe	nt or practicir ersonal input	nether it is about ig statistical data will always be		
			Mis	с.								
Requirements (expressed study results)			 Students will demonstrate their ability to apply statistics in other fields at an appropriate level and demonstrate their ability to apply knowledge acquired from their major to real world models. Students will demonstrate mastery of data analysis and statistical concepts by communicating critically reasoned analysis through written and oral presentations. Students will acquire up-to-date skills and/or applications of computer use related to future career choices. Students will be able to read, interpret, and critically analyse journal articles in the related field. 									
Short description	n of the s	subject content	• During the course students will be engaged in the following topics: introduction, descriptive statistics, probability, random variable, method of estimation, test of hypotheses, simple linear regression.									
Forms of studen	t activity	,	 Frontal work 30% Individual or group work 50% Testing 20% 									
Required reading and availability			 James T. McClave, P. George Benson, Terry Sincich : Statistics for Business and Economics. Ed 12th. Pearson Education, Inc. 2014. Douglas C. Montgomery George C. Runger : Applied Statistics and Probability for Engineers. Ed 5th. John Wiley & Sons Inc. 2011. 									
Recommended readings and availability			1. http://onlinestatbook.com/2/index.html 2. STATISTICS FOR BUSINESS AND ECONOMICS TWELFTH EDITION James T. McClave Info Tech, Inc. University of Florida P. George Benson College of Charleston									

Engineering Mathematics 2

	Terry Sincich University of South Florida
	Copyright © 2014, 2011, 2008 Pearson Education, Inc. Publishing as Pearson, 75 Arlington Street, Boston, MA 02116.
	3. STUDENT'S SOLUTIONS MANUAL
	Nancy S. Boudreau Bowling Green State University
	Copyright © 2014, 2011, 2008 Pearson Education, Inc. Publishing as Pearson, 75 Arlington Street, Boston, MA 02116.
Description of tasks/measurement procedures to be submitted	
Description and schedule of the midterm tests	Continuous evaluation in the form of midterm tests.

G 1		In Hungarian		Számítástudor	mán	iy alapjai 2	Level	BSc						
Subject name		In English		Basics of Cor	npu	iter Sciences 2	Subject code	IMA-213						
Responsible Ed	ucational	unit name		Institute of Ir	nfor	rmatics								
Name of the rec	quired pre	liminary study		Basics of Con	IMA-153									
		Study load per	we	eek (in hours)	-				a li	Teaching				
Туре		Lecture		Practice		Lab		Requirement	Credit	language				
Full time	150/39	per Week 2	2	per Week	0	per Week 1		Midterm	_	.				
Part time	150/15	per Semester 1	0	per Semester	0	per Semester 5		Mark	5	English				
Course leader				Name		Dr. Györgyi Stı	ra	uber	Position	c. professor				
Course leader Training course aims Typical transfer methods				Name Educational s The aim of the informatics ar module, the s algorithms con Students will I formal langua, Lecture Practice Lab Misc. Knowledge The students a - know the mo- understand t application po Ability The students of	goal goal at the stud nsis lear ges. Wit Lec mee In c teac are 1 ost c the j ossit	Dr. Györgyi Sti ls, development odule is to acquai he algorithms th lent is expected ting of several ba n about the basic , and finite autom h the participati ture with project eting.	ra innaa i innaa innaa i innaa i i innaa i i i i	Auber bjectives at students with t can be connect to be able to sic elements. of syntactic ana ata. n of every stur r and blackboar omputer work- connected to pre- ctures. tion of more con- ired to	Position the basic data cted to them see and creat lysis of progra dent in the la d or online co stations for ev rojector.	c. professor structures used in At the end of the e more complex ams, the theory of arge lecture hall. urse using Teams very student. The hms, knows their				
Requirements (expressed	study results)		 have algoritilearned procection be able to frequencies be able to frequencies transformation transformati	hmi lure urth ram shou ive, nd F	ic thinking, apples, methods and cler develop the kis. ald have an constructive, eff Responsibility ility, making dec		the acquired k oncepts own algorithms cient, creative at	nowledge, sol	ve tasks, use the e them into more ependently in the				
Short descriptio	subject content		Data structures: queues, stacks, linked lists, graphs, trees Algorithms connected to the data structures, sorting algorithms, recursive algorithms. Formal languages and their operations, generative grammars and their classification, finite automata, Turing machines.											
Forms of studer	nt activity			Lecture: 50% Salf dependent task solving: 50%										
Required readir	ng and ava	ailability		Géza Horváth, Benedek Nagy: Formal Languages and Automata Theory Typotex Publishing, www.typotex.hu, ISBN: 978-963-279-344-3 Seymour Lipschutz: Data Structures, Revised First Edition, McGraw Hill, 2014										
Recommended	readings	and availability												
Description of t procedures to b	asks/mea e submitte	surement ed		Midterm tests										

Basics of Computer Sciences 2

	1st midterm test: Week 5
Description and schedule of the midterm	2nd midterm test: Week 8
tests	3rd midterm test: Week 12
	Make-up test: Week 13

Programming 2.

Subject name		In Hungarian		Programozás	2.				Level	BSc			
Subject name	Programmin	g 2		Subject code	ISF-113								
Responsible Ed	ucational	unit name		Institute of In	nfoi	matics				•			
Name of the required preliminary study				Programming	1			Subject code	ISF-213				
Tuno	_	Study load pe	er w	eek (in hours)				Doquirament	Cradit	Teaching			
Type		Lecture		Practice		Lab		Requirement	Credit	language			
Full time	150/39 150/15	per Week per Semester	1 5	per Week per Semester	0	per Week per Semester	2 10	Midterm Mark	5	English			
Course leader	100/10	per bennester	U	Name	•	Dr. József K	ato	na	Position	associate			
				Educational	ຕຸດຈ	ls developme	nt /	objectives		professor			
Training course aims			The aim of ti graphical pro- threaded soft programming network prog implement and they will be a custom contro The subject foundation of	he of grar twan twan tan gran tan gran di ma di	course is to p nming basis. re and use guage. Furthe ming and to anage service to create bu or building ext vides both the knowledge the lecture is pro-	It p the r ob pro app sine erna heor e fu vido	ent for students provides high sk e asynchronous ojective is to int ovide tools wit lications. Eventu ess applications, al libraries or co retical and pra urther software d ed to all student.	s several aspe cills to create opportunitie roduce studen h which they ually, transfer even implem mponents. ctical knowle levelopment si s in a lecture r	cts of visual ar parallel or mult s of the give ts to the basics of will be able so knowledge th aenting and usir edge. It lays th abjects.				
				Lecture The implementation of theoretical concepts in sample applications are explained and presented. Projectors and teacher's computers are used in every lecture.									
Typical transfer	r methods	5		Lab	Different applications are implemented by the laboratory leader. The tasks are implemented on our own local repository of the university in C# language. The created and used databases are stored and accessed on remote servers.								
				Projectors and computers are used in every laboratory.									
				Misc.									
Requirements (expressec	ł study results))	It is assured programming, programming, application in is provided. Ability Students can i advantage of t be able to net	to some second s	know the adv multi-threadin ervice applic mentation). K dement applica resources of pr rk programmi	ation ation ation ation ation ation	eed opportunitie parallelism, on developmen vledge of OOP a n using object-o essors with multi create and man	es of C# (visu asynchronou t and manag ind using it wi riented elemen ple cores and age services a	aal and graphica isness, networ gement, busines th high efficienc nts that try to tak threads. They wi s well implemen			
			Attitude Students are motivated to programming. They are open-minded to discover new corporate solutions, accept to principles of an organizational work and find easily their place in a project team. In case of self-sufficient jobs, all phases are done with the best possible mode and results. In teamwork, they make an effort to do a high- quality job and observe deadlines. Autonomy and Responsibility										

	Students carry out their tasks by themselves, think about different solutions and make suggestions. They take responsibility for their jobs.
Short description of the subject content	 Introduction to visual programming Implement multithreading application Possibilities of parallelization Language-level asynchronousness Network programming Implementing and managing service applications Basics of Graphic Programming Implement business applications
Forms of student activity	 Processing the heard text and writing notes: 20% Organize information supported by tasks: 30% Own tasks processing: 50%
Required reading and availability	 John Sharp, <i>Microsoft Visual C# Step by Step (9th Edition)</i>, Microsoft Press, 2018. Troelsen and P. Japikse, <i>Pro C# 7: With .NET and .NET Core</i>. Berkeley, CA: Apress, 2017. M. Seidl, M. Scholz, C. Huemer, and G. Kappel, <i>UML @ classroom an introduction to object-oriented modelling</i>. Cham: Springer, 2015. Electronic curriculums are associated with C# available in the Moodle system.
Recommended readings and availability	
Description of tasks/measurement procedures to be submitted	 One homework (compulsory application) Topic: A programming task which fits to the material of theory and practice. Date: The homework description is given on the 12th week. It must be finished until the last week of term-time. It must be defended in front of a committee during last week of term-time which is appointed by the leader of practice. It cannot be replaced! In case of unsuccessful presentation (e. g.: if the student is not aware of the operation of the presented program or it is found that the program has been copied), the application will be rejected.
Description and schedule of the midterm tests	Two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6 th week. 2 nd mid-term test: the week before the last week during term-time. Replacement/Correction The material of the whole semester. Invalidate the previously mid-term tests. Deadline: last week during term-time. Final grade (lecture total min. 61% and practice total. min. 61%): <60%: Fail (1) 61-70%: Pass (2) 71-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5) Lecture: 1. test (50 points) + 2. test (50 points) = 100 point (each min. 51%, total min. 61%) Laboratory: 1. test (30 points) + 2. test (30 points) + Homework (40 points) = 100 points (each min. 51%, total min. 61%)

Linux Operating Systems

C	In Hungarian		Linux operáci	ós r	endszerek	Level	BSc				
Subject name		In English		Linux Opera	ting	g Systems	Subject code	ISF-159			
Responsible Edu	ucational	unit name		Institute of I	nfor	matics					
Name of the req	uired pre	liminary study	/				Subject code				
T		Study load pe	r we	eek (in hours)			г) :	a th	Teaching	
Туре		Lecture		Practice		Lab	r	Requirement	Credit	language	
Full time	150/39	per Week	1	per Week	0	per Week 2		Fyom	5	Fnalish	
Part time	150/15	per Semester	5	per Semester	0	per Semester 10)	Exam	5	English	
Course leader				Name		Dr. György Ago	os	ton	Position	c. professor	
Training course aims			Educational goals, development objectives The aim of the course is to get acquainted with the peculiarities of Unix / Linux operating systems, promote and support their application at the beginner and advanced level. Students should get acquainted with the most important applications running under Unix/Linux, main features and possibilities. Be able to create own work environment, automated tasks, own scripts. Be able to work, think, perform tasks in a Linux operating system. The subject is a compulsory subject for all students studying in the field of ICT. It is recommended to place it into the middle of the whole study period. Lecture Presentation in a lecture hall using a projector.								
					Cor	nputer lab, using	g a	projector.			
Requirements (expressed study results)				 get to know the possibilities and tools of the ICT field. have a special and industry-specific knowledge of Unix/Linux systems. get to knows the methods and procedures needed to solve frequently occurrin problems/tasks in the ICT field. acquire the knowledge of the ICT-specific tools to perform tasks. Ability The students should be able to perform routine operational tasks in the ICT field, perform development subtasks according to plans. apply learned problem-solving methods and procedures to perform his/her field tasks. Attitude The students are required to be interested in new methods and tools related to the field. strive to maintain the level of knowledge about Unix/Linux systems an continuous professional training and self-education. Autonomy and Responsibility Capability for a managed IT job, in which he/she performs his/her job task independently. Taking responsibility for his/her own work (for individual and team worl decisions, results). Making independently decisions on the development of his own knowledge planing and organizing it. 							
Short description of the subject content				History, development, general features, concepts and operating philosophy of Unix/Linux. Structure and characteristics of Linux file systems, overview of the directory hierarchy, structure and use of file and directory references. Use of the "basic" authorization system and POSIX ACLs, management and identification of users. I/O redirection and I/O scheduling. Use regular expressions. Linux kernel 2.6 and later and its capabilities. Process management, general characteristics of processes. The Linux boot process. Linux network management. Structure and							
	operation of the X Window System. The best known Linux distributions and their features. Significance, capabilities and scope of use of Linux.										
---	---										
Forms of student activity	 Processing heard text with notes. Organize information, independent solution of tasks. Solving tasks in teams. 										
Required reading and availability	Presentations used during lectures and during lab classes in PDF format in the Moodle.										
Recommended readings and availability											
Description of tasks/measurement procedures to be submitted	Theoretical knowledge: oral answers based on a list-of-questions. Demonstration practical knowledge during lab classes by solving exercises.										
Description and schedule of the midterm tests	1st midterm test: During 6th week, theories and exercises. 2nd midterm test: During 12th week, theories and exercises. Possibility of retake tests during the last (13th) week.										

Internet Technologies

Subject name		In Hungarian		Internet techr	noló	giák	Level	BSc					
		In English		Internet Tec	hno	logies	Subject code	ISF-112					
Responsible Educational unit name			Institute of Informatics										
Name of the req	uired pre	eliminary study											
T		Study load per	W W	eek (in hours)				р · ,	C I'	Teaching			
Туре		Lecture		Practice		Lab		Requirement	Credit	language			
Full time	150/39 150/15	per Week	0	per Week	0	per Week	3	Midterm Mark	5	English			
Course leader	130/13	per semester	0	Name	<u>v</u>	Dr. Mariann	1 <u>13</u> 1 Vá	iraljai	Position	college associate professor			
Training course aims				Educational While acquir thorough kno Students lear acquainted w	Educational goals, development objectives While acquiring the curriculum of Internet Technologies, students will acquire a thorough knowledge of website design. Students learn HTML and JavaScript language used in web design and are also acquainted with CSS technology.								
				Students will	be a	ible to develop	p we	eb pages.					
				Practice									
Typical transfer methods				Lab	Practice Students solve individual tasks on the computers, using pr with teacher assistance in classrooms with the use of project Lab computer. Computer based exercises, individual tasks. Online learning materials are also available during the process								
				Misc.									
Requirements (expressed study results)				 While ac a thorou Students in web d web pag Ability Students They ha know the Students browser, are also server en Attitude Students 	cquin gh k accessing ess. kno ve J e tec able viro	ing the curric nowledge of juaint themsel n and also lea ow the HTMI avaScript pro- chnological base able to crea produce event to apply the onment.	ulur web lves rn C lar bograt ackg ate t-dri knov new	n of Internet Teo site design. with the HTMI CSS technology. SS technology. SS technology. nguage and CSS mming skills to round of up-to- documents that ven (dynamic) will will a cquired will a cquired will a cquired will a cquired will a cquired	And JavaScri Students will I Stylesheets to complete the late web-desig can be interp websites and w during the co	dents will acquire ipt language used be able to develop o create websites. tasks. They also m. preted for a web veb content. They urse to a real web design. They are S technology, so			
Short description of the subject context				 Autonomy and Responsibility Students will be independent web site designers and developers that carries out their own job tasks, thinking and developing professional questions independently. A student decides independently on the development of his own knowledge, plans and organizes it. A student is responsible for the preparation, proper appearance and operation of the website entrusted to it. The development of World Wide Web 									
Shore descriptio	n or the s	subject content		- ne actorph			1						

	The development of HTML language, its basic concepts, and the use of HTML5
	language through the general description of the Internet. The structure of an HTML
	document and the HTML instructions.
	The concept and use of CSS. CSS3-based content formatting.
	Basics and application of JavaScript programming language. Accessing objects and
	their use with JavaScript. Use and possibilities of jQuery JavaScript library.
Former of student estivity	Heard information processing by creating notes, systematization of information has
Forms of student activity	led by tasks (40%) Self-processing (individual) tasks (60%)
	[1] Elizabeth Castro and Bruce Hyslop: HTML5 and CSS3, Seventh Edition:
	Visual QuickStart Guide Peachpit Press, 2012
	[2] Microsoft Corporation: HTML5 Step-by-step, O'Reilly Media Inc, 2011
	[3] Brian P. Hogan: HTML5 and CSS3 second edition – Level up with Today's
Required reading and availability	Web Technologies, Dallas Texas, 2013
	[4] Danny Goodman: JavaScript [™] Bible 4th Edition, Hungry Minds, Inc.New
	York, NY Cleveland, OH Indianapolis, IN, 2001
	[5] Paul Wilton, Jeremy McPeak: Beginning Java Script 4th Edition, Wiley
	Publishing, Inc., 2010
B acommonded readings and availability	Electronic literature in Moodle or in Neptun. Microsoft Office Tutorial and
Recommended readings and availability	examples (Internet).
Description of tasks/measurement	Assignment: own web development project
procedures to be submitted	Assignment. own web-development project.
	Test time: Week 7., Week 12., Week 13 (re-take).
	During the semester, students take 2 tests:
	Test 1: HTML5, CSS3 –
Description and schedule of the midterm	Test 2: JavaScript
tests	Their time: at the end of the certain topic.
lests	The eligibility for the semester is to achieve a result of at least 51% at each of
	both tests.
	Possibility of replacement and retake tests in the last week of the term and in the
	exam period.

Electronics and Digital Techniques

		In Hungarian		Elektronika é	s dig	gitális technik	Level	BSc						
Subject name	In English		Electronics a	and	Digital Techi	Subject code	ISR-119							
Responsible Educ	cational	unit name		Institute of Informatics										
Name of the requi	ired pre	liminary study	7	Engineering	phys	ics				Subject code	MUT-151			
Tuna		Study load pe	r we	eek (in hours)				D	aquirament	Credit	Teaching			
Type		Lecture		Practice		Lab		N	equitement	Clean	language			
Full time 1	50/39	per Week	1	per Week	0	per Week	2		Midterm	5	English			
Part time 1	50/15	per Semester	5	per Semester	0	per Semester	10)	Mark	D '4'				
Course leader				Name Educational	a 00	Dr. Peter Oc	iry ont		inativos	Position	Prof. of College			
Training course aims				Acquiring the basic knowledge of electronic and digital technology, getting to know the basic elements that play a role in the operation and management of these systems, which is necessary for acquiring the knowledge that builds on it. Having the basic knowledge, in connection with the hardware knowledge of IT and mechatronic systems, he / she acquires the performance of tasks of average complexity related to the operation, development and design of these systems										
					For Use	all students in of projector a	n a and	laı l te	ge lecture, boa eaching machin	rd lecture. le in all theore	tical lessons.			
				Lecture	In a slid	ddition to this es are availab	s, o le f	onl for	ine video-base students.	d curriculum,	notes and lecture			
					Additional consultation times were provided during the contact hours.									
Typical transfer n	nethods			Practice										
				Lab	In exercises, measurement and problem solving take place under guidance of practice leaders. Using a projector and a teaching machine in a practical lesson. In addition, the development of laboratory tasks is carried out wi the framework of contact hours and with the help of online simul programs.									
				WINC.										
Requirements (expressed study results)				 He / she cultivati He poss of meas network The study procedut The study connecti He know main the He know technologic operatio It is fun procedut At the a tools, in Can integration of the structure applied in the structure of the s	 He / she is familiar with the principles and methods of science recultivating his / her field of informatics. He possesses a basic knowledge and engineering approach to the pof measured signals, modeling, simulation and control of synnetworks. The student is required to know the general and specific rules, co procedures required for cultivating the technical field. The student is required to know the conceptual system, the most connections and theories related to his / her field. He knows the methods of acquiring knowledge and problem solv main theories of his field. He knows the operation of the hardware components of IT sy technology of their implementation, how to solve the tasks arisin operation, and the possibilities of connecting IT and other technical It is fundamentally familiar with system design principles and procedures, and operational processes. At the application level, he / she knows the measurement procedures, and operation and measuring equipment. 									

Ability

٠	He uses the principles and methods of science necessary for the cultivation of
	his specialty in his engineering work.

- He / she is able to perform a basic analysis of the disciplines that make up the knowledge system of the technical field, to formulate the connections synthetically and to perform adequate evaluation activities.
- Is able to apply the most important terminologies, theories and procedures of the given technical field when performing the tasks related to them.
- Able to plan, organize and conduct independent learning.
- Able to identify routine professional problems, explore and formulate the theoretical and practical background needed to solve them, and solve them (using practical operations in practice).
- Is able to understand and use the typical literature, computer technology and library resources of his / her field.
- He / she is able to apply the acquired IT knowledge in solving the tasks arising in his / her field.
- Able to create basic models of technical systems and processes.
- Able to communicate orally and in writing in his / her mother tongue in a professionally adequate manner.
- Able to diagnose failures, select remedial actions, solve repair technology tasks.
- Based on the acquired basic knowledge, he / she is able to acquire deeper knowledge in a technical / IT field independently, to process the literature, and then to solve technical / IT problems related to the field.
- Able to perform analysis, specification, design, development and operation tasks in his / her field, apply development methodologies and debugging procedures.
- He collaborates with IT specialists and electrical engineers during the group work, as well as with representatives of other fields in the development of requirements analysis and solution of the given problem.

Attitude

- It undertakes and authentically represents the social role of its profession, its fundamental relationship with the world.
- It is open to getting to know and accept professional, technological development and innovation in the technical field, and to mediate it authentically.
- He strives to solve problems in collaboration with others as much as possible.
- He has enough perseverance to perform practical activities.
- Applying the acquired technical knowledge, he strives to get to know the observable phenomena as thoroughly as possible, to describe and explain their laws.
- In the course of its work, it observes and continues to comply with the relevant safety, health, environmental, and quality assurance and control requirements.
- It authentically represents the professional principles of the engineering fields.
- In addition to his own area of work, he strives to see the entire technical system.
- Open to learning about new methods and procedures and mastering them at a skill level.
- It is open to learn about other fields and to develop IT solutions in cooperation with experts in the field.
- He understands and feels the ethical principles and legal aspects of the profession.
- It strives for efficient and quality work.

Autonomy and Responsibility

- Even in unexpected decision-making situations, he / she independently considers and develops comprehensive, fundamental professional issues on the basis of specific sources.
- In the course of his professional duties, he also cooperates with qualified specialists in other fields (primarily technical, as well as economic and legal).

	 She shares her experiences with her co-workers, thus helping them grow. He / she is responsible for the consequences of his / her technical analyzes, his / her proposals and decisions. He feels responsible for his independent and group-based IT systems analysis, development and operation. It identifies the shortcomings of the applied technologies, the risks of the processes and initiates the measures to reduce them. 						
Short description of the subject content	Electronic and digital mechatronics systems. Signals of these systems, their classification, processing, signal shaping, digitization, analog-to-digital, digital-to-analog conversion. Measurement, measuring instruments. Understanding analog and digital basic circuits and their applications.						
Short description of the subject content	Measurement of electrical signals, getting to know its measuring instruments, calculation of measurement error. Measurement of electrical quantities in direct current and alternating current networks. Measurement of electronic and digital basic circuits.						
Forms of student activity	Processing of heard text with notes, directed and independent processing of theoretical curriculum, problem solving with guidance and independently. Collection, processing and systematization of information related to professional topics.						
	Solving tasks, analyzing and processing case studies.						
Required reading and availability	Kövári, Attila, Jeges, Zoltán, Haluska, János: Villamosságtan, Dunaújvárosi Főiskola Kiadói Hivatala, 2007. Kövári Attila, Jeges Zoltán, Haluska János: Tanulási Útmutató a "Villamosságtan" Című Tantárgyhoz. Dunaújvárosi Főiskola Kiadói Hivatala, 2008. Odry Péter, Haluska János, Kővári Attila: Digitális Technika. Dunaújvárosi Főiskola Kiadói Hivatala, 2007. Odry Péter, Haluska János, Kővári Attila, Farkas Imre: Tanulási Útmutató a "Digitális Technika" Című Tantárgyhoz. Dunaújvárosi Főiskola Kiadói Hivatala, 2008. J. Crowe Barrie Hayes-Gill: "Introduction to Digital Electronics", ISBN: 9780340645703						
Recommended readings and availability	Puklus Zoltán: Elektronika gépészmérnököknek (http://jegyzet.sze.hu/index.php?felt=elektronika+g&fajl=keres) Hodossy László: Elektrotechnika (http://jegyzet.sze.hu/index.php?felt=elektr&fajl=keres)						
Description of tasks/measurement	According to what was said at the first lecture. Preparation of a report on						
procedures to be submitted	laboratory measurements according to the instructions of the laboratory manager.						
Description and schedule of the midterm tests	As stated in the first lecture. During the lecture, there are two indoor dissertations during the year, during the last week of education there is a possibility of replacement.						

Mathematics 3

		In Hungarian		Matematika 3			Level	BSc					
Subject name		In English		Mathematics	s 3		Subject code	IMA-110					
Responsible Educational unit name			Institute of I	nfor	matics								
Name of the req	uired pre	liminary study	/				Subject code						
Tuno		Study load pe	r we	eek (in hours)				Dequirement	Cradit	Teaching			
туре		Lecture		Practice		Lab		Requirement	Credit	language			
Full time	150/39	per Week	0	per Week	3	per Week)	Exam	5	English			
Part time	150/15	per Semester	0	per Semester	15	per Semester)			g			
Course leader				Name		Dr. Bálint Na	gy		Position	associate professor			
				Educational	goal	ls, developmer	nt (objectives					
Training course aims				To know the as improveme knows and un	basi ent o ders	cs of calculus f mathematical tands the most	wh kr rer	nich are required nowledge to stud markable relation	to the special y specialized l ns, connection	l subjects, as well literature. Student s, and set of ideas.			
				Dreatian	Таа	ahing in sma	11	anouna coluin	a commutatio	nal and annliad			
Typical transfer	methods			Practice	Tea	cning in sma reises Using p	II roi	groups, solvin	g computatio d calculator	nal and applied			
i ypicar transier	memous			Lab	CACI	tenses. Using p	. OJ	eetoi, blaekboai	d, calculator.				
				Misc.									
				Knowledge									
Requirements (expressed study results)				Student know from econom calculus whic Ability Student is abl is able to app own solving- procedure as Attitude Student is v innovations a referring to hi Autonomy an Students carr make suggest	e to il ar e to ily th plan well villin nd th is/he nd F	ethods and pro- eas. Student ha e required by h apply the stud he studied met and argue it. as to find and ng to get acc heir acceptance r specialization Responsibility at their tasks b. . They take res	ied ho St use n. y t	dures required for enough knowled ther special field d mathematical k ds and procedur udent is able to e different learns ainted with ma Student is interest themselves, thin nsibility for thei	er solving of m ge referring to	athematical tasks mathematics and l activity. Student able to create an her own learning evelopments and ethods and means ent solutions and			
Short description of the subject content				 Advanced chapters of calculus. Special differentiation rules. Hyperbolic functions. Tangents and Normals. Angle between Curves. Area. Arc Length, Volume, Surface, Center of Mass. Approximations. Ordinary differential equations. 									
Forms of student activity				 Directed learning of theoretical material 10 % Independent learning of theoretical material 30 % Directed exercise solving 30 % Independent exercise solving 30 % 									
Required reading and availability				Smith, R. T., Minton, R. B.: Calculus: Early transcendental functions, 4th edition, McGraw Hill, New York, 2012.									
Recommended	readings a	and availabilit	у										
Description of taprocedures to be	asks/meas submitte	surement ed											
Description and tests	schedule	of the midter	m	Two tests will be during the practice sessions: Test 1 on week 6 (50 points, 45 minutes), Test 2 on week 12 (50 points, 45 minutes). Make up Tests on the week 13. 0-50 fail, 51-60 poor/pass, 61-70 satisfactory/fair, 71-80- good. 81- excellent.									

Economics I

S-1-1		In Hungaria	1	Közgazdaság	tan 🛛	[.	Level	BSc					
Subject name		In English		Economics I			Subject code	TKT-151					
Responsible Edu	ucational	unit name		Institute of Social Sciences									
				Department	of E	Conomics							
Name of the req	uired pre	liminary stuc	ly				Τ	Subject code					
Type		Study load p	er w	eek (in hours))		Requirement	Credit	Teaching				
		Lecture	1.	Practice	-	Lab	1		language				
Full time	150/39	per week	1	per week	2	per Week 0	Exam	5	English				
Course leader	130/13	per Semester	5	Name.	10	József Fogarasi	Dr	Position	c professor				
				Educational	goa	ls, development	objectives	robition	c. protessor				
Training course aims			This course in The course in decision make focuses on ag	is an s spl cing ggreg	introduction to be between the su of individual con- gate level econom	economic conc tudy of microe nsumers and fi nic questions s	epts and basic conomics, whic rms, and macro ich as interest i	economic theory. ch focuses on the peconomics, with rates, government					
				the "economic dec	ic w	others. Perhaps r ay of thinking,"	an approach to	decision maki	I introduce you to ng that applies to				
				economists in	isioi	tigate. introduce	you to the basic	tools that we	use to analyze the				
				economy, and	d apj	ply these tools to	public policy is	ssues.					
				Lecture	In a	classroom with t	the use of proje	ctor or compute	er in each lecture.				
Tynical transfer	methods			Practice	In a	classroom with t	the use of proje	ctor or compute	r in each seminar.				
i ypicar transfer	methods			Lab									
				Misc.									
Requirements (expressed study results)			Students as p • the type • basic co • the steps Ability Students will • carry ou • formula • carry ou Attitude • Opennea the esser • Desire f Autonomy a In profession able to solve in a certain si	oten s, ter ncep s of a t bas t bas t add ss to ntial or cc nd I al qu prob	tial Economist kr rminology and mosts in Economics analysis in Economics able to: sic analysis synthetic relation equate evaluation authentic mediat characteristics of ontinuous self-edi Responsibility testions, the stude lems alone. They ion, they can deci	now: ain principles of omics whip a activities tion and transm f practical oper ucation in the f ents can play the can tackle pro ide if there is a	f Economics ission of the ov ation of the pro- teld of economi e role of a decisi blems as respor need to coopera	erall mindset and fession. cs. ion-maker and are usible persons, i.e. ate with others.					
Short description of the subject content				The science of economics. Introduction to economic thinking. Macro- and microeconomics. Positive and normative approach to economics. The basic concepts of economics. Coordination mechanisms in the economy. The market and its basic concepts. The operation of the market and price mechanisms. The market balance. The agents of mixed economy. The motivations, income and expenditures of household. The management of business organizations. Production factors and their markets. The concept of national economic performance, its most important statistical indicators. The concepts, conditions and measurement of economic growth. Economic development and sustainable growth. The state and the market									

	accoromy. The role and functions of the government. Globalization, international
	economy. The fole and functions of the government. Ofobalization, international
	trends and issues of the global economy.
	• Guided learning 17%
Forms of student activity	Individual learning 17%
romis of student activity	Guided task completion 17%
	Individual task completion 49%
	• Samuelson, Paul Anthony - Nordhaus, William D. Economics (2009)
Paguirad reading and availability	Mcgraw-Hill Publ.Comp.
Required reading and availability	Handouts from the lecturer
	Materials on MOODLE
	• Mankiw, Gregory Principles of Economics (2007) Sixth Edition, by Mason,
	Ohio: Thomson South-Western
Recommended readings and availability	• Begg, D., S. Fischer and R. Dornbusch Economics (2002) -7th Edition-
	(McGraw- Hill)
	Moffat, Mike: Online Microeconomics Textbook.
Description of tasks/measurement	Preparation and presentation of home assignments on pre-determined topics of
procedures to be submitted	micro and macroeconomics
Description and schedule of the midterm	The test usually lasts for one hour and covers everything taught up to the date of
tests	test. The question paper will consist of multiple choice questions and short essay
	questions.

Network Management 1

Subject name In Hur In Eng		In Hungarian		Hálózat mene	dzs	elés	1	Level	BSc					
		In English	English		nag	eme	nt 1	Subject code	ISR-258					
Responsible Edu	ucational	unit name		Institute of I	nfoi	rmat	ics		1					
Name of the req	uired pre	liminary stud	y	Computer and	l ne	twor	k archite	s	Subject code	ISR-118				
T		Study load pe	er w	eek (in hours)							G I'	Teaching		
Type		Lecture		Practice		Lab			r	Requirement	Credit	language		
Full time	150/39	per Week	2	per Week	0	per '	Week	1		Evom	E	English		
Part time	150/15	per Semester	10	per Semester	0	per s	Semeste	r 5		Exam	5	English		
Course leader				Name		Dr.	Ferenc	Leito	ol	ld	Position	c. professor		
Training course aims			The students completing the subject know the basic operation and algorithms of computer networks, they become able to handle and create basic communication networks. They are able to see and understand the processes from the operation of the communication media to the basic operation of the devices of computer networks. This course focuses primarily on the basic functions of the first three layers of the ISO OSI standard, while their more complex parts as well as the upper layers are described in Network Management 2.											
				Lecture	Onl	ine	study m	ateri	ia	al (notes, lectur	re videos, lec	cture slides), test		
				Ecoture D	que	stion	is and co	nsul	lta	ations within the	e framework o	of a contact hour.		
				Practice								D 1 7		
Typical transfer methods				Lab	usii app con vide by l	ng licati tact l eos, l abor	compute ions. The hours or lecture state catory co	ers ne ha with lides nsult	1 ai n t 3, ta	with Wireshar ndover can tak the help of on-li test questions), ations held in th	the and Class the place in the ne study mater in the latter can be framework of	to Packet fracer ne framework of rial (notes, lecture ase supplemented of contact hours.		
				Misc.										
				Knowledge										
Requirements (expressed study results)			Using computers with Wireshark and Cisco PacketTracer applications. The handover can take place in the framework of contact hours or with the help of of line study material (notes, lecture videos, lecture slides, test questions), in the latt case supplemented by laboratory consultations held in the framework of contact hours. Ability They can configure Cisco IOS-based network devices, configure interfaces, X.22 type foundations, statistics, and RIPV2 dynamic routing configuration. Configure DHCP and NAT services. Attitude Open, inquisitive, constructive, efficient, creative. Autonomy and Responsibility								applications. The th the help of on- ions), in the latter ework of contact interfaces, X.25 ration. Configure			
Short description of the subject content			independently in the given field. Theory: Revival of ISO OSI and TCP / IP structure, parallelization. Tasks of each layer of the OSI model, typical procedures, their operation. Wired and wireless transmission											
			methods. IP and ICMP versions, X.25 detail and multicast. Label allocation methods. Traffic management in general and static dynamic traffic management. Control algorithms, protocols. Networking address translation. Basic protocols for higher layers.											
				Lab: Prerequisite for reviving subject knowledge. Network device operating structure of your system, getting to know basic commands. Connection methods, addressing										

	interfaces. Build an X.25 connection, default routing, practicing static traffic control. Dynamic exercise traffic management. DHCP and static address translation. Complex solving practice tasks.
Forms of student activity	Processing of heard text with notes Organizing information in a task-driven way Independent processing of tasks Solving a test task.
Required reading and availability	Tanenbaum, Andrew S .: Computer Networks (2nd edition)Coursework for the first two semesters of Cisco Certified Network Administrator training in Moodle.Moodle Electronic materials in Moodle or Neptun systems.
Recommended readings and availability	
Description of tasks/measurement procedures to be submitted	
Description and schedule of the midterm tests	During the semester, the course includes two in-house exams: one on theory and one on practice. Exams can be replaced 1 time separately.

In Hungarian Mesterséges intelligencia alapjai Level BSc Subject name In English **Basics of Artificial Intelligence** Subject code ISF-250 Responsible Educational unit name **Institute of Informatics** Name of the required preliminary study Subject code ISF-111 Introduction to programming Study load per week (in hours) Teaching Credit Туре Requirement language Lecture Practice Lab per Week Full time 150/39 per Week per Week 1 Exam 5 English per Semester 0 150/15 per Semester 10 per Semester 5 Part time associate Course leader Name Position Dr. Ákos Odry lecturer Educational goals, development objectives The aim of the course is to present both the fundamental techniques of artificial intelligence (AI) and the problems that can be effectively handled with algorithms that constitute AI. The course presents the AI models and algorithms, moreover their application in software environment for different real-world problems. Training course aims Throughout case studies the AI concepts, such as neural networks, fuzzy systems, genetic algorithms, and deep learning are demonstrated. These case studies foster the understanding of the techniques, moreover, hands-on experience is given about AI problems during the laboratory assignments. The subject provides both theoretical and practical knowledge. The lecture is provided to all students in a lecture room. Additionally, online video-based lectures, lecture notes and presentation materials are available for the students. Lecture The implementation of theoretical concepts in sample applications are explained and presented. Projectors and teacher's computers are used in every lecture. Practice Typical transfer methods Different applications are implemented by the laboratory leader. Each laboratory assignment addresses the concepts introduced during the lectures. Laboratory assignments describe the problem. The Lab students are required to employ the AI techniques introduced in the lectures. Online simulation environment is also available for testing AI problems. Projectors and computers are used in every laboratory. Misc. Knowledge It is assured to know the basics of AI problems and algorithms, identify the AI/soft computing techniques to be used in specific tasks, and the fundamental mathematical relations in AI algorithms. Ability Students are able to i) adapt fundamental techniques in AI problems ii) design and implement AI algorithms iii) establish learning mechanisms to mimic desired functionalities and approximate systems, iv) use soft computing tools to solve Requirements (expressed study results) problems from heuristic point of view, and v) elaborate optimization tasks. They are capable of solving complex tasks or problems completely. They can understand a complex application and work on it even in a team. Attitude Students are motivated to AI and soft computing-based concepts. They are openminded to discover both new and fundamental solutions to realize intelligent AIbased systems. They make relevant engineering deductions based on the observations of the system. In teamwork, they make an effort to do a high-quality job.

Basics of Artificial Intelligence

	Autonomy and Responsibility
	Students carry out their tasks by themselves, think about different solutions and make suggestions. They take responsibility for their jobs.
Short description of the subject content	 Introduction to AI, applications, machine learning Supervised learning, unsupervised learning, reinforcement learning Introduction to deep learning, single layer perceptron, multi-layer perceptron, backpropagation Neural networks (NNs), recurrent NNs, convolutional NNs Introduction to fuzzy systems, set theory, properties Fuzzy logic and set operations, fuzzy inference machines Fuzzy logic controllers (Mamdani, Sugeno) Introduction to genetic algorithms (Gas), the optimization problem Implementation of GA/Fuzzy/NN in real-world applications
Forms of student activity	 Processing the heard text and writing notes: 20% Organize information supported by tasks: 30% Own tasks processing: 50%
Required reading and availability	Electronic curriculums are associated with AI available in the Moodle system.
Recommended readings and availability	 Philip C. Jackson, <i>Introduction to Artificial Intelligence</i>, Dover Publications, 2013. Patrick D. Smith, <i>Hands-On Artificial Intelligence for Beginners: An introduction to AI concepts, algorithms, and their implementation</i>, Packt Publishing, 2018. Samir Roy, <i>Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms</i>, Pearson, 2013.
Description of tasks/measurement procedures to be submitted	 One homework (optional, only for motivated students) Topic: An AI task which fits to the material of theory and practice. It must be finished until the last week of term-time. It must be presented during last week of term-time which is appointed by the leader of practice.
Description and schedule of the midterm tests	As stated in the first lecture. Generally, two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6th week. 2 nd mid-term test: the week before the last week during term-time. Retake: last week The administration details are always discussed and specified in the first lecture. Final grade <50%: Fail (1) 51-65%: Pass (2) 66-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5)

Information Security

C		In Hungarian	Adatbiztonság	g, ac	latvédelem	Level	BSc				
Subject name		In English		Information S	Sec	urity	Subject code	ISR-250			
Responsible Edu	cational	unit name		Institute of Informatics							
Name of the req	uired pre	liminary study		Computer and	l net	twork architecture		Subject code	ISR-118		
Tumo		Study load per	we	ek (in hours)			Doguinomon	+	Cradit	Teaching	
Lecture		Lecture		Practice		Lab	Kequitemen	ι	Cleun	language	
Full time	150/26	per Week 2	2	per Week	0	per Week 0	Fyom		5	Fnalich	
Part time	150/10	per Semester 1	.0	per Semester	0	per Semester 0	Exam		5	English	
Course leader				Name		Dr. Ferenc Leito	old		Position	c. professor	
Training course aims				The training goal of the course covers the technical, human and legal aspects of nformation security. Familiarity with the principles, rules, procedures, data nanagement tools and methods for the collection, processing and use of personal data and the protection of data subjects. Overview of international and domestic regulations. Description of data protection IT solutions used in data management systems. Learn the principles of cryptography, both computer and network security sechnology, and security management, enterprise-level security solutions.							
				Lecture	que	stions and consul	ations withi	n th	e framework o	of a contact hour.	
Typical transfer	methods			Practice							
				Lab							
				Misc.							
Requirements (expressed study results)				He has basic important com of acquiring k fundamentally operational pr Ability The student sh systems and i perform analy her field, app assurance proce learning. Is ab and library re knowledge in able to comm professionally development methodologies electrical engi fields in the problem. He is of the IT profe Attitude	data necl nov / far occe / far occe / sis, ply cedu ble t solv num / add and s an nece / dev s co	a security knowl tions and theories vledge and proble niliar with system sses. Id be able to deve lement previous specification, des development mures. He should be o understand and rces of his / her ving tasks arising icate orally and equate manner. A d operation tasl d debugging proor rs during the grou relopment of req instantly training bon.	edge. Know related to h m solving o design prin elop security developmer sign, develop ethodologies able to plar use the typi field. He / in his / her in writing able to perfor so in his eedures. He p work, as y uirements a himself and	s th is / l f the ciple syss tts. omee s, d a, or cal she fiel in orm / h coll well naly keep	tems for enter The student s and operati ebugging, tes ganize and cor literature, con e is able to ap d. The student his / her mo analysis, spec ter field, app aborates with as with repress ysis and solut ping pace with	system, the most nows the methods s of his field. It is s, procedures, and prise information hould be able to onal tasks in his / ting and quality nduct independent puter technology poly the acquired t is required to be ther tongue in a cification, design, oly development IT specialists and centatives of other ion of the given	
				It strives to solve problems in collaboration with others as much as possible. Applying the acquired technical knowledge, he strives to get to know the observable phenomena as thoroughly as possible, to describe and explain their laws. Open to learning about new methods and procedures and mastering them at a skill level. It is open to learn about other fields and to develop IT solutions in cooperation with experts in the field. He / she understands and feels the ethical principles and legal aspects of the profession. It strives for efficient and quality work. He is constantly training himself and keeping pace with the development of the IT profession.							

	Autonomy and Responsibility
	With the expertise, he has a security-conscious attitude, keeps in mind potential
	threats and attack opportunities, and prepares to defend against them. In the course
	of his professional duties, he also cooperates with qualified specialists in other
	fields (primarily technical, as well as economic and legal). He / she is responsible
	for the consequences of his / her technical analyzes, his / her proposals and
	decisions. He feels responsible for his independent and group-based IT systems
	analysis, development and operation. It identifies the shortcomings of the applied technologies, the risks of the processes and initiates the measures to reduce them.
	Overview of cryptographic algorithms (simple, redundancy, freshness, symmetric,
	asymmetric, hash, PGP). Electronic signature and security issues. Operating
Short description of the subject content	system security, authentication, access protection, Windows and UNIX based
Short description of the subject content	operating system security. Application security. Network security. Pests. IT
	security development. Social engineering methods, defense options. Information
	security regulatory issues.
	Processing of heard text with notes, directed and independent processing of
Forms of student activity	theoretical curriculum, problem solving with guidance and independently.
r offils of student activity	Collecting, processing and organizing information related to a professional topic.
	Solving tasks, analyzing and processing case studies.
Required reading and availability	Moodle Electronic materials in Moodle or Neptun systems.
Recommended readings and availability	Stallings W., Brown L.: Computer Security, Prentice Hall, 2008
Description of tasks/measurement	
procedures to be submitted	
Description and schedule of the midterm	During the semester, the course includes two in-house exams: one on theory and
tests	one on practice. Exams can be replaced 1 time separately.

Embedded Systems

I		In Hungarian		Beágyazott re	ends	zerek	Level	BSc					
Subject name		In English		Embedded S	yste	ems	Subject code	ISR-215					
Responsible Ed	ucational	unit name		Institute of Informatics									
Name of the rec	juired pre	eliminary study	7	Electronics and	nd d	igital techniqu	ues			Subject code	ISR-119		
T		Study load pe	r w	eek (in hours)		<u> </u>		_	• ,	C III	Teaching		
Туре		Lecture		Practice		Lab		Red	quirement	Credit	language		
Full time	150/39	per Week	1	per Week	0	per Week	2		Midterm	-			
Part time	150/15	per Semester	5	per Semester	0	per Semester	10)	Mark	5	English		
Course leader				Name		Dr. Ákos Od	lry			Position	associate lecturer		
Training course aims				Educational	goa	ls, developm	ent	obj	ectives				
				The aim of the course is to present the basics of microcontrollers and their peripherals, moreover, to introduce basic methods needed for the development of intelligent embedded systems. The course gives an extensive knowledge to design and realize the hardware components of microcontroller-based systems and implement the associated embedded software system. Design phases, realization procedures and implementation methods are demonstrated with case studies.									
				The subject provides both theoretical and practical knowledge.									
				Lecture	The onli are The are Pro	lecture is pro ne video-base available for implementat explained and iectors and te:	vide ed le the s tion l pre	ed to ectu stud of esen er's	o all students ires, lecture r lents. theoretical c nted. computers at	in a lecture ro notes and press oncepts in sau	om. Additionally, entation materials mple applications v lecture.		
				Practice									
Typical transfer methods			Lab	Different applications are implemented by the laborator Each laboratory assignment addresses the concepts intr the lecture. Hardware components and Arduino develor are given to the students. Laboratory assignments desc The students are required to realize the hardware embedded software codes. Online simulation enviro available for testing the constructed embedded enviror						ratory leader. introduced during velopment boards describe problem. are and develop vironment is also ironment.			
					Projectors and computers are used in every laboratory.								
				Misc.									
Requirements (expressed study results)			It is assured to know the architecture of microcontrollers, the design implementation procedures of embedded systems and the embedded softw solutions for intelligent systems. Ability Students are able to i) select microcontrollers for dedicated autonomous tasks equip the system with sensors and actuators, iii) measure physical quantities process data in embedded system, iv) implement algorithms that oper- autonomously an embedded system. They are capable of solving complex task problems completely (design and realize hardware, create software for of acquisition, implement intelligent algorithms, testing, debugging and m documentation). They can understand a complex application and work on it e in a team. Attitude						the design and abedded software onomous tasks, ii) cal quantities and ns that operates complex tasks or oftware for data gging and make d work on it even				
				minded to discover both new and fundamental solutions in embedded systems.									

	They make relevant engineering deductions based on the observations of the
	system. In teamwork, they make an effort to do a high-quality job.
	Autonomy and Responsibility
	Students carry out their tasks by themselves, think about different solutions and make suggestions. They take responsibility for their jobs.
Short description of the subject content	 Introduction, microcontroller-based systems Digital outputs, digital inputs Asynchronous serial communication Analog inputs, PWM outputs Motor driving with transistors, H-bridges Position measurement with incremental encoders I2C, SPI serial communications Case studies, realization of complex embedded systems
Forms of student activity	 Processing the heard text and writing notes: 20% Organize information supported by tasks: 30% Own tasks processing: 50%
Required reading and availability	• Electronic curriculums are associated with both Arduino and embedded systems available in the Moodle system.
Recommended readings and availability	 Jeremy Blum, <i>Exploring Arduino: Tools and Techniques for Engineering Wizardry</i>, Wiley, 2019. David Russell, Mitchell Thornton, <i>Introduction to Embedded Systems: Using ANSI C and the Arduino Development Environment</i>, Morgan and Claypool Publishers, 2010. Simon Monk, <i>Programming Arduino: Getting Started with Sketches</i>, McGraw, Hill Education Tab. 2011.
Description of tasks/measurement procedures to be submitted	 One homework (optional, only for motivated students) Topic: An embedded systems task which fits to the material of theory and practice. It must be finished until the last week of term-time. It must be presented during last week of term-time which is appointed by the leader of practice.
Description and schedule of the midterm tests	As stated in the first fecture. Generally, two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6 th week. 2 nd mid-term test: the week before the last week during term-time. Retake: last week The administration details are always discussed and specified in the first lecture. Final grade
	<50%: Fail (1) 51-65%: Pass (2) 66-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5)

Entrepreneurship

In Hungarian		Vállalkozásta	an		Level	BSc						
Subject name		In English		Entrepreneu	ırsh	ір	Subject code	TVV-122				
Responsible Ed	ucational	unit name		Institute of Social Sciences								
				Department of Management and Enterprise Sciences								
Name of the rec	juired pre	liminary stud	у				-		Subject code			
Туре		Study load pe	er w	veek (in hours)				Requirement	Credit	Teaching		
Eull time	150/20	Lecture	1	Practice	2	Lad	+	NC 14 com		language		
Part time	150/39	per Week	5	per Week	2 10	per Veek 0	-	Materm	5	English		
Course leader	100/10	per bemester	J	Name	10	Dr. Andrea Ke	S7	zi-Szeremlei	Position	c. professor		
				Educational	goa	ls, development	0	bjectives		··· F- ····		
Training course aims			The learning establishing, issues. By the entrepreneuri	The learning material gives board knowledge in entrepreneurial skills such as establishing, operating and transforming firms, handling their assets and financial ssues. By the end of the course the students will be able to use their managerial, entrepreneurial and business legal knowledge in practice.								
				Lecture Dra ati a a	In a	classroom with	th	ne use of project	or or compute	er in each lecture.		
Typical transfer	methoda			Practice	Flip	inar rooms suita	rd hl	and other mu	iumeaia equij k	pment in smaller		
i ypical transfer	memous			Lab	sen	inar rooms suita	.01	ie ior group wor	ĸ			
				Misc.								
Requirements (expressed study results)			 Misc. Knowledge Students will know the basic terms of entrepreneurship, understand the effect mechanisms of operating firms, know the legal background of companies, their internal and external environments, know the economic systems, aims and strategies of firms. Ability Students will be able to use terms of this field professionally, to identify and determine the resources of companies, to understand the steps of company aims and strategies to understand and use the relevant literature. Attitude They are open and willing to discuss all points of the cases, as well as express the opinion, but without disclosing any important information about the circumstance of their own company. They have sensibility to find potentials for development. Autonomy and Responsibility Students feel responsibility for both their development and environment. The cooperate with each other. They have sensibility to find possible resolvin 						l and external ns. ell as express their the circumstances r development. ivironment. They ossible resolving			
Short description of the subject content			The value chain and creation of double value both for buyers and suppliers. The technical and economic connections of value chain. The customer value and logistic buyer satisfaction. The customer value and the internet. The supply chain: system (network) of business relationships. The role of suppliers. Potential suppliers and the internet. Evaluation of suppliers, the criteria of supplier evaluation in internet. Strategic procurement. The methods and importance of demand anticipation in production logistics. Resource planning systems with buyer's cooperation. Management of customer relationship (CRM). The criteria of CRM systems (soft wares). The importance of services and its logistic problems. International transport. Competitiveness and supply chain management.									

Forms of student activity	Case study analysis, Presentations, Individual work, Frontal class work, Essay writing
Required reading and availability	 William D. Bygrave - Andrew Zacharakis (2014): Entrepreneurship, 3rd Edition, John Wiley & Sons, DUE Library Materials on MOODLE
Recommended readings and availability	 Jerome Katz, Richard Green (2014) Entrepreneurial Small Business. 4th ed. McGraw-Hill International Ed., ISBN: 978-0078029424, DUE Library
Description of tasks/measurement procedures to be submitted	• Processing and analysis of 1 chosen case study (On week 8 th)
Description and schedule of the midterm tests	Midterm tests on weeks 7 th and 12 th . Supplementary test on week 13 th .

Multimedia

T T T		A 6 1.1 6 11			Laval DCa								
Subject name		In Hungarian		Multimédia			Level BSc						
-		In English		Multimedia					Subject code	TKM-120			
Responsible Ed	lucational	unit name		Institute of Social Sciences									
Name of the required preliminary study				Department of Communication and Media									
	quirea pre	Study load pe	y er w	eek (in hours)					Subject code	Teaching			
Туре		Lecture		Practice		Lab	-]	Requirement	Credit	language			
Full time	150/52	per Week	2	per Week	0	per Week 2		Midterm	_				
Part time	150/20	per Semester	10	per Semester	0	per Semester 10	0	Mark	5	English			
Course leader	1	u		Name		Dr Péter Ludik	ζ		Position	c. professor			
Training course aims				Educational Getting to kn to know the b Own design a program. Lecture	Betting to know the definition and characteristic properties of multimedia. Getting o know the basic properties of media and the possibilities of their application. Dwn design and production of media elements. Creating a standalone multimedia program. Lecture in a boardroom, using a projector and a computer, 34% of the								
Tunical transfor	r mathada			Practice	nou	18.							
i ypicai transie	rmethous	5		Lab	Ind	ependent task so	h	tion in a compu	ter lah in 66%	of the hours			
				Misc.	ma	ependent tusk so	10	tion in a compa		of the notifs.			
Requirements (expressed study results)			Knowledge The student s • the • the text filn • a m • the Ability The student s required for t and still imag graphics. Dig The student s for its implen Attitude The student is theoretical fo Critical, creat Autonomy a Capability to multimedia e	hou defi built t, im hou the ges, thou hou nent s rec und tive nd 1	ld get to know: nition and chara ding blocks of n lage, graphics, il rtual reality elen media production ics of multimedia ld be able to defi- production and e graphics). Digiti es and edits audio ld be able to plar ation, to implem quired to be oper ations, methods, and imaginative. Responsibility n an independen	int in t	eristics of multi iltimedia and the stration, sound, ents; of tools, development pre- e the parameter iting of source es an image, creater an own program at their own ideater to learning about ew results and i	media; eir relationshij moving image ograms s and services materials (tex ates and edits ial. Creates ar and select the a. t the use of co nnovations.	o to each other: e: animation, of software tools t, sound, moving vector and raster a animation. e means necessary mputer media, its				
Short description of the subject content			t	Definition and characteristics of multimedia. The building blocks of multimedia and their relationship to each other: text, image, graphics, illustration, sound, motion picture: animation, film, virtual reality elements. Tools for creating multimedia. Create a stand-alone interactive multimedia application with optimal use of media elements. Processing of heard text with notes 20%									
	activity			Independent	proc	essing of tasks 6	50	%					
Required readir	ng and ava	ailability		Tay Vaughan	: M	ultimedia: Makir	ıg	It Work; McGr	awHill 2011				

	Materials on MOODLE					
Recommended readings and availability	Student guide for using Neobook 5.0 / www.neosoft.com					
Recommended readings and availability	uthorware 7 - User Knowledge / www.adobe.com					
Description of tasks/measurement	Entering hourly tasks continuously max: 30 points					
procedures to be submitted	Independent program development with any topic max: 30 points					
Decomination and schedule of the midterm	Written test from the material of the lesson (12 pieces) continuously max 20					
tests	points					
	Written summary test from the theoretical parts max: 20 points					

Management

		In Hungarian		Menedzsmer	nt		Level	BSc				
Subject name		In English		Managemer	nt		Subject code	TVV-114				
Responsible Educational unit name		Institute of Social Sciences										
				Department of Management and Enterprise Sciences								
Name of the red	quired pre	eliminary study	у					Subject code				
Type		Study load pe	er we	eek (in hours))	1	Requirement	Credit	Teaching			
Type		Lecture	1	Practice	1	Lab	requirement	citati	language			
Full time	150/39	per Week	1	per Week	2	per Week 0	Midterm	5	English			
Part time	150/15	per Semester	5	per Semester	10	per Semester 0	Mark Daiogányi		0			
Course leader				Name		Dr. nadii Monik Molnár	ka Kajesanyi-	Position	Vice-rector			
				Goals, deve The module	opn prov	rides a compreher	nsive understand	ing of manage	ement and human			
				behavior in o enable studer organization	orgai nts to s, or	nizations for unde attain the compe even managers.	ergraduate stude etencies needed t	nts. The aim c to become effe	of the course is to active members of			
Training course	e aims			It is hard to i with organiz organization	magi ation al se	ine living in mode ns. The variabilit ttings and challen	ern society witho ty of organizati ges we regularly	ut participatin ons implies c face.	g in or interacting omplexity in the			
				The course introduces special management dimensions and techniques to help students gain expertise in management. Through this course, students will consider cases describing various organizational and management struggles. Students will see, how we can make sense of organizations and the challenges they face, and develop means of managing them in desired directions. Through this course, students will learn different organizational theories and interpret concrete organizational situations								
				Lecture	The	eory with example	es from the pract	ice (video lect	ures).			
				Practice Individual work (quizzes, cases, readings)								
Typical transfe	r methods	5		Lab			· · ·					
				Misc.								
Requirements (expressed study results))	 On completion of the course, students will be able to systematically identify important features of an organization and the even transforming it understand and manage organisational processes manage leadership tasks effectively analyze real-life management situations and problems, and present alternative solutions to deal with them 								
Short description	on of the s	subject conten	t									
Forms of stude	nt activity	r										
Required reading and availability				 https://moodle.uniduna.hu: Management– DUEN-TVV-114-EN – 2020-2021-1 Textbook.pdf: Daniel A. McFarland – Charles J. Gomez (2013): Organizational Analysis. Stanford University Mullins, L.J. (2008): Management and Organisational Behaviour; 8th ed. New Jersey: Prentice Hall. ISBN 978-0-273-70888-9. /Library code: 650 M93/ 								
Recommended readings and availability			 Robbins, S.P. (2005): Organizational Behavior; 12th ed. New Jersey: Prentice Hall. ISBN 0-13-164224-3. /Library code: 658 R76/ Champoux, J.E. (2001): Organizational Behavior - Using Film to Visualize Principles and Practices, 1st ed. South-Western College Publishing. ISBN: 0324048564 /Library code: 650 C15/ Champoux, J.E. (2006): Organizational Behavior: Integrating Individuals, Groups and Organizations, 3rd ed. Thomson Publishing. ISBN-10: 0324048505, ISBN-13: 9780324048506. /Library code: 658 C15/ McShane, S.L. – Von Glinow, M.A. (2006): Organizational Behavior. 4th ed. 									

Description of tasks/measurement	Turn it in exercise:									
procedures to be submitted	Deadline: week 12									
procedures to be submitted	For more detail, see the description of the assignment!									
	Turn it in exercise	20 points 20%								
	Topic quizzes (completion of each topic's quizzes in	20 points 20%								
	Moodle)	â								
	Final Exam (quiz: multiple choice questions)	60 points 60%								
Description and schedule of the midterm tests	Evaluation and Grades (according to the percentage given) 0 - 60 % 1 (Fail) 61 - 70 % 2 (Pass) 71 - 80 % 3 (Average) 81 - 90 % 4 (Good) 91 - 100 % 5 (Excellent) Attendance and make ups: according to the University's R (TVSz).): ules and regulations								

Measurement and Control

In Hungarian			March Call	<i>(</i>	(Level BSc					
Subject name		In Hungarian	Meres- es m	anyn	astecnnika	Level	BSC				
Responsible Edu	icational	unit name	Institute of	int a Info	na Control rmatics	Subject code ISK-200					
Name of the rea	uired pre	liminary study	Mathematics	3 3	matics	Subject code	IMA-110				
Name of the req	uneu pre	Study load per y	walk (in hours	<u>, , , , , , , , , , , , , , , , , , , </u>				Subject code	Taaahing		
Туре		Lecture	Practice)	Lab	_]	Requirement	Credit	language		
Full time	150/30	ner Week 2	nar Week	0	par Week 1	-			lungunge		
Part time	150/35	per Semester 10	per Semester 0 per Semester 5			Exam	5	English			
Course leader	150/15	per semester n	Name	Vame Dr. Ákos Odry Position associate							
			Educationa	l goa	lls, development	t c	objectives				
Training course aims			The aim of electromech concepts (e.; methods, me enable engir system ident the fundame closed-loop design and r of such cor Design pha demonstrate The subject	the anica g., th easur heers ifica ealiz ntrol asses, d with prov The onl are The are	course is to pre al systems. The f e characterization ement errors, sig to both establish tion approaches. control synthesis emarchitectures. e control algorith approaches are realization pr th case studies. <u>ides both theoret</u> e lecture is provide ine video-based available for the e implementation explained and pr	fir fir fir fir fir fir fir fir fir fir	ent the basics of rst part of the s of electrical syst al processing in mathematical m The second part tools that allow he course gives as, moreover, the lemonstrated th cedures and al and practical d to all students of the all students of the oretical c sented.	of measurement ubject covers tems, instrume analog and dig nodels of system of the subject engineers to an extensive k e implementation knowledge. in a lecture ro- notes and prese- oncepts in same	nt and control of the measurement nts, measurement gital domain) that ems and elaborate aims to introduce design intelligent nowledge to both ion and validation course program. on methods are om. Additionally, entation materials		
			Practice	Pro	jectors and teach	ne	r's computers a	re used in ever	ry lecture.		
Typical transfer	methods		Lab	Different applications are implemented by the laboratory l Each laboratory assignment addresses the concepts introdu the lectures. Laboratory assignments describe problem. Th are required to employ the measurement and control techniques introduced in the lectures. Online simulation er is also available for testing of closed-loop systems.					ratory leader. introduced during lem. The students control synthesis ation environment		
				Pro	jectors and comp	pu	iters are used in	every laboratory.			
			Misc.								
Requirements (expressed study results)			It is assured to know the basics of measurement techniques, the relationship between measurement and control problems and the fundamental mathematical relations in dynamical systems for controlling plants in closed loop. Ability Students are able to i) measure physical quantities and interpret measurements errors and noise sources, ii) understand signal components in analog and digita domain and outline signal processing iii) derive and analyze mathematical model in time and frequency domain, iv) design feedback loops to operate systems i desired set points, iv) implement algorithms that operate autonomously dynamica system. They are capable of solving complex tasks or problems completely. The can understand a complex application and work on it even in a team. Attitude								

C	Computer Science Engineering BSc
	Students are motivated to measurement and control concepts. They are open- minded to discover both new and fundamental solutions to measure and control dynamical systems. They make relevant engineering deductions based on the observations of the system. In teamwork, they make an effort to do a high-quality job.
	Autonomy and Responsibility
	Students carry out their tasks by themselves, think about different solutions and make suggestions. They take responsibility for their jobs.
	 Physical quantities, instruments, signal representations Characterization of measurements, measurement errors Fundamentals of systems and signals, analog to digital conversion, system models System transfer function, mathematical modeling, dynamical models
Short description of the subject content	 Introduction to filtration and signal processing Basics of control, open loop, closed-loop system model structures Dynamic response, pole locations, time domain specifications, stability PID control, equations of control, tuning Root-Locus design method, lead compensation, lag compensation Frequency-Response design, stability margins, Bode plot techniques State-space design, state feedback, estimator design Digital control, implementation methods
Forms of student activity	 Processing the heard text and writing notes: 20% Organize information supported by tasks: 30% Own tasks processing: 50%
Required reading and availability	Electronic curriculums are associated with measurement and control available in the Moodle system
Recommended readings and availability	 Gene F. Franklin. J. Davis Powell. Abbas F. Emami-Naeini, <i>Feedback Control of Dynamic Systems</i>, Pearson, 2019. William C. Dunn, <i>Fundamentals of Industrial Instrumentation and Process Control</i>, McGraw-Hill Education, 2018. Thomas A. Hughes. <i>Measurement and Control Basics</i>, ISA Press, 2002
Description of tasks/measurement procedures to be submitted	 One homework (optional, only for motivated students) Topic: A feedback control task which fits to the material of theory and practice. It must be finished until the last week of term-time. It must be presented during last week of term-time which is appointed by the leader of practice.
Description and schedule of the midterm tests	As stated in the first lecture. Generally, two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6 th week. 2 nd mid-term test: the week before the last week during term-time. Retake: last week The administration details are always discussed and specified in the first lecture. Final grade <50%: Fail (1) 51-65%: Pass (2) 66-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5)

Numerical Methods

C., 1, 1,		In Hungarian	Numerikus m	nóds	zerek	Level	BSc				
Subject name		In English	Measuremer	nt ar	nd Control	Subject code	IMA-251				
Responsible Edu	ucational	unit name	Institute of I	•							
Name of the req	uired pre	eliminary study	Mathematics	3		Subject code	IMA-110				
T		Study load per we	eek (in hours)			Caradita	Teaching				
Туре		Lecture	Practice		Lab	1	Requirement	Credit	language		
Full time	150/39	per Week 2	per Week	0	per Week 1		Midterm	5	English		
Part time	150/15	per Semester 10	per Semester	0	per Semester 5		Mark	5	English		
Course leader			Name Dr. Györgyi Strauber Position c. professor								
Training course	aims		Educational goals, development objectives The aim of the module is to acquaint students with the basic numerical methods.								
T i La C		Lecture	Wit Lec mee	th the participati ture with project eting.	io to:	n of every stu r and blackboar	dent in the la d or online co	arge lecture hall. urse using Teams			
l ypical transfer	methods	5	Lab	In o	classrooms with	C is	omputer work-	stations for ev	very student. The		
			Misc	ieac	ther s computer i	15	connected to pi	ojector.			
			Knowledge								
					quired						
			- to be able to develop programs using numerical methods. Ability								
			The student s	hou	ld						
			- have algori	thm	ic thinking, appl	ly	the acquired k	nowledge, so	lve tasks, use the		
Requirements (e	expressed	l study results)	- be able to f	furth	er develop the k	kn	own algorithm	s and integrat	e them into more		
		· ·····)	complex programs.								
			Attitude								
			An open, inquisitive, constructive, efficient and creative attitude is required from								
			Autonomy and Responsibility								
			Takes responsibility, decides and manages independently in the given field.								
			Solving of linear equation systems: Gauss-elimination, iterative methods								
			(Jacobi,	Gau	iss-Seidel)						
Short description	n of the s	subject content	 Interpola 	ation	n: Lagrange inter	po	olation, Hermite	e interpolation	, Trigonometric		
			Interpolation								
			Boundary value problem Finite differences Finite difference method								
			Lecture: 50%								
Forms of studen	t activity	7	• Self-dep	end	ent task solving:	5	0%				
			Won Yo	oung	Yang Chung-An	ng	g University, Ko	rea Wenwu C	ao Pennsylvania		
			State Un	niver	sity Tae-Sang Cl	hι	ung Chung-Ang	University, K	Corea John Morris		
Required readin	g and ava	ailability	The Uni	vers	ity of Auckland,	N	New Zealand:				
			Applied Numerical Methods Using Matlab								
			John Wiley & Sons, Inc., 2005								
Recommended readings and availability			 Numerical Methods with Applications Autar K Kaw, University of South Florida, Fown Eric Kalu, Florida, A&M 								
		University									
Description of taprocedures to be	asks/mea e su <u>bm</u> itte	surement ed	Midterm tests	5.							
Description and	schedule	e of the midterm	1st midterm t	est:	Week 6	_					
tests			2nd midterm test: Week 12								
1			iviake-up test	: We	eek 15						

Thesis Research 1. – Methodology Computer Science BSc

		In Hungarian		Szakdolgozat	t 1	Módszertan INF	Level	BSc				
Subject name		In English		Thesis Resea Science BSc	arch	1. –Methodolog	Subject code	ISF-090				
Responsible Ed	ducational	l unit name		Institute of Informatics								
Name of the re	quired pre	eliminary stud	у				Subject code					
T		Study load per v		eek (in hours)			D	• ,	G 1'	Teaching		
Type		Lecture		Practice		Lab	Req	uirement	Credit	language		
Full time	150/13	per Week	1	per Week	0	per Week 0	N	o Grada	0	Fnglish		
Part time	150/5	per Semester	5	per Semester	er Semester 0 per Semester 0 No Grade				U	English		
Course leader				Name		Dr. Bálint Nagy	y		Position	associate professor		
Training cours	e aims			Educational goals, development objectives The aim of the course is to prepare prospective IT professionals for IT decisions and the use of the results in practice.								
				Lecture	Usi	ng a projector						
Typical transfe	r methods	\$		Practice								
-) [-		Lab								
				Misc.								
Requirements (expressed study results)				He/she knows terminology a Ability The student knowledge sy The student s informatics, s Attitude The student is of thinking an It is character Autonomy a He/she condu issues and the It is character the given fiel	s the and : shou /ster /shou searc s req nd th rized nd 1 ncts 1 e giv rized d.	e most important applications that ald be able to sy n and connection ld be able to use the for related source wired to authentic the basic features of Responsibility his/her own reflect ren sources.	conte make synthe as of t e, und rces. cally of the conti conti	exts and the e them up. etically forr he IT field. erstand the convey and practical o nuous self-c	ories of the IT nulate, evalua typical literat transfer the co peration of his education. of comprehen y with qualifie	field and the te and apply the ure of the field of omprehensive way s open profession. sive, foundational		
Short descripti	on of the s	subject conten	t	Methods of concepts, met Data analysis	proc thod , pre	cessing the litera is and tools of engeparation of field	ature. ginee plans	Presentation ring and rest s, summary	on of the gen search work. of research	neral rules, basic		
Forms of stude	nt activity	7		Text inteProcessiAcquisit	erpro ng i tion	etation nformation indivi of discussion skil	idual lls an	ly and in gr d argument	oups ation techniqu	les		
 Lengyelné Molnár Tünde (2013): Kutatástervezés, http://mek.oszk.hu/14400/14492/pdf/14492.pdf MAJOROS Pál (2011): A kutatásmódszertan alapj trükkök: nem csak szakdolgozat-íróknak [Budapes 9789633945841 Guida to writing a thesis (MOODLE system) 								ezés, Eger, 16 df alapjai: tanács lapest], Perfek	8. sok, tippek, st. 250 p.ISBN			
Recommended	readings	and availabilit	y									
Description of	tasks/mea	surement										
procedures to b	e submitt	ed										

Description and schedule of the midterm tests

Thesis Research 2. – Computer Science BSc

		1	1						1		
Subject name		In Hungarian	Szakdolgozat	2	- MINFBSC	Level	BSc				
, , ,		In English	Thesis Resea	rch	2. – Computer	Subject code	ISF-094				
Responsible Ed	ucational	unit name	Institute of Informatics								
Name of the rec	juired pre	eliminary study	I hesis Research I. – Methodology Computer Subject code ISF-090 Science BSc								
		Study load per v	week (in hours)				C I'	Teaching			
Туре		Lecture	Practice		Lab	r	Requirement	Credit	language		
Full time	150/117	per Week 0	per Week	9	per Week 0		No Grade	15	Fnalish		
Part time	per Semester 0	per Semester	45	per Semester 0		no Grade	10	English			
Course leader			Name		Dr. Bálint Nagy	y		Position	associate professor		
Training course	aims	3	Educational a For independent the preparatio - to identify and - to solve and synthesize it - development - implementat - evaluation Lecture Practice Lab Misc. Knowledge	goa ent j n of nd i sol t of t of Usi	Is, development professional activ f the dissertation: dentify problems ve the problem, t a solution propo- , testing ng a projector	vit : s, 1 to	bjectives ty and written p to select the pro collect and sys il	presentation of oblem to be so tematize know	its results, ie for lved, ledge, to		
Requirements (expressed	l study results)	He/she knows terminology a Ability The students of and apply the They will be a search for rela Attitude The students a way of think profession. It is characteri Autonomy ar He/she condu foundational i It is characteri the given field	are ind ized ated ing ized ized	e most important applications that pleting the course owledge system a to use, understan sources. required to author and the basic and the sources.	en and fe n so an	ontexts and the nake them up.	eventee of the IT synthetically for of the IT field. rature of the fire and convey the practical opera education. the basis of y with qualifie	field and the ormulate, evaluate eld of informatics, ne comprehensive ation of its open		
Short description	on of the s	subject content	Presentation of	of th	e problem solvin	ıg	and acquaintai	nce with the re	levant		
Forms of stud-	t activit-	7	regulations of	the	university colleg	ge	·				
Required readir	it activity	ailability	Thesis prepar	atio	n guide (Moodle		vstem)				
Recommended	readings	and availability	Thesis prepara	auo		<u>, 5</u>	y storing				
Description of t	asks/mea	surement	Recording the	esis	data in the Thesi	S S	system.				
procedures to b	e submitt	ed	Submitting a t	thes	is.						
Description and	schedule	e of the midterm									
tests											

Field Practice – Computer Science BSc

Cubicat name		In Hungarian	Szakmai gyak	orla	at - MINFBSC		Level	BSc			
Subject name		In English	Thesis Resear	rch	2. – Computer S	Subject code	ISF-097				
Responsible Ec	lucational	unit name	Institute of In	ıfoı	rmatics	1 0	•				
Name of the re-	quired pre	eliminary study				Subject code					
T		Study load per	week (in hours)			Deminent	Cardit	Teaching			
Type		Lecture	Practice		Lab	Requirement	Credit	language			
Full time	150/0	per Week 0	per Week	0	per Week 0	No Grade	0	English			
Part time	150/0	per Semester 0	per Semester	0	per Semester 0						
Course leader			Name		Dr. Bálint Nagy	7	Position	associate professor			
Course leader Training course Typical transfe Requirements (e aims	s d study results)	Name Educational g By the end of the necessary of time, - to recco what has been - perform task process - repp presentation, i work process, Lecture Practice Lab Misc. Knowledge The student cc contexts and th They will know the field of inf Ability He / she is able synthetically a He has the skil he is required the is required the is required the is required the student w different profe Attitude The student is of thinking and It is character economics	goa the meason leas on the meason leas in the one of the one one of the one one one of the one one one one of the one of	Dr. Bálint Nagy Is, development internship, the st asures, to evaluate ize and to solve rned professional individual and t on your work, he style of an ecc eliminate. pleting the course ries of the IT fiel he basic methods natics. o formulate the kr to perform adequ to work independ be able to coopera be able to use his onal expectations uired to authentic the basic features of the basic	objectives udent will be ab e his / her results the problems of lly. Communicat eam work, - rep report in writi- conomist, - expl e will become fa d and the termin of acquiring knowledge system iate evaluation a ently; ate with others; e a variety of ress s / her professio of a given job. cally convey and of the practical of for continuous	Position le to plan his / s, - to complete f work organiz te effectively v ort on the prace ing and orally. ore errors and amiliar with the tology that main owledge and pre- n and connection ctivities. ources. nal knowledge transfer the con- peration of his self-education	her work, to take her work, to take his / her tasks on tations – to apply vith professionals, ctice / dissertation , supported by a omissions in the monitorial distribution her most important kes them up. roblem solving in ons of the IT field ons of the IT field e according to the mprehensive way s open profession. h in the field of			
			He/she is req technical issue It is characteri the given field	He/she is required to take into consideration the comprehensive, foundation technical issues and think over the given sources. It is characterized by cooperation and responsibility with qualified professionals in the given field							
			It takes responsibility for the views that underpin the profession.								
Short description	on of the s	subject content	The student completes the internship prescribed in the curriculum in an environment that meets the professional needs of the major and the specialization.								

	The student's practical professional work is assisted by the appointment of an
	internship supervisor, the provision of data collection, literature research and
	consultation.
Forms of student activity	Individual and social problem solving and work in the professional internship place.
Required reading and availability	
Recommended readings and availability	Reading (at least 10) domestic and foreign literature related to the topic of our specialization and the dissertation, getting to know it, synthesizing it, solving IT
	problems.
Description of tasks/measurement	Internshin report
procedures to be submitted	
Description and schedule of the midterm	
tests	

Description of the required subjects of Computer Science Engineering BSc specialization

Network Management 2

In Hungar			l	Hálózat mene	edzs	elés 2.	Level BSc					
Subject name	In Eng	lish		Network Ma	inag	ement 2	Subject code	ISR-120				
Responsible Education	al unit na	me		Institute of Informatics								
Name of the required p	reliminar	y stud	у	Network Management 1.						Subject code	ISR-258	
Type	Study 1	load pe	er w	eek (in hours))			R	equirement	Credit	Teaching	
	Lecture	e		Practice	-	Lab	1-		equiterione.	circuit	language	
Full time 150/39 Part time 150/15	per We	eek mester	1	per Week	0	per Week	2	_	Exam	5	English	
Course leader	per ser	litester	5	Name	U	Dr Ferenc I	eit	ماد	d	Position	c professor	
Training course aims	Educational The students computer net networks. Th the commun networks. Th the ISO OSI Lecture Practice Lab	Value protector ferror protector Educational goals, development objectives The students completing the subject know the basic operation and algorithms of computer networks, they become able to handle and create basic communication networks. They are able to see and understand the processes from the operation of he communication media to the basic operation of the devices of computer networks. The course covers knowledge of the more complex parts of the layers of he ISO OSI standard. Lecture Online study material (notes, lecture videos, lecture slides), test questions and consultations within the framework of a contact hour. Practice Using computers with Wireshark and Cisco PacketTracer applications. The handover can take place in the framework of contact hours or with the help of on-line study material (notes, lecture										
Requirements (expressed study results)				videos, lecture slides, test questions), in the latter case supplemented by laboratory consultations held in the framework of contact hours. Misc. Knowledge Students completing the course are going to be familiar with ISO OSI and TCP / IP models, its layers and functions, and the operation of basic procedures. Characteristics of wired and wireless transmission media, modulation methods used. The essential differences between the different switching modes, the X.25 protocol and the operation of the IPv4 and IPv6 protocols (and their ICMP protocols), the address allocation options. The purpose and method of traffic control, as well as the operation and configuration of the RIPv2 dynamic control protocol. IP-based address translation. Ability They can configure Cisco IOS-based network devices, configure interfaces, X.25 type foundations, statistics, and RIPV2 dynamic routing configuration. Configure DHCP and NAT services. Attitude Open, inquisitive, constructive, efficient, creative. Autonomy and Responsibility								
Short description of the	Lecture: ISO OSI and TCP / IP structure, reviving certain layer tasks, typical procedures and their operation of the OSI model. Spanning tree protocol. Virtual LANs, trunk connections, VTP. OSPF traffic management protocol. Dynamic address translation. Relationship and typical functions and applications of the display layer.											

	Firewalls and authentication (802.1x, Radius, TACACS). Graphic management
	interfaces use. Operation of DNS, VPN, SNMP, MIB, CIM, VoIP protocols.
	Lab:
	Revival of previous studies. PPP configuration and spanning tree protocol.
	Configuring VLANs and trunks, subinterfaces. Port security, control of VLANs on
	trunks, VTP. Dynamic NAT and PAT, OSPF configuration. Creating ACLs.
	Graphical interface and SSH configuration.
Forms of student activity	Processing of heard text with notes Organizing information in a task-driven way
Forms of student activity	Independent processing of tasks Solving a test task.
	Tanenbaum, Andrew S .: Computer Networks (2nd edition)
Required reading and availability	Coursework for the last two (3rd and 4th) semesters of Cisco Certified Network Administrator training in Moodle.
	Lab: Revival of previous studies. PPP configuration and spanning tree proto Configuring VLANs and trunks, subinterfaces. Port security, control of VLANs trunks, VTP. Dynamic NAT and PAT, OSPF configuration. Creating AC Graphical interface and SSH configuration. Processing of heard text with notes Organizing information in a task-driven v Independent processing of tasks Solving a test task. Tanenbaum, Andrew S .: Computer Networks (2nd edition) Coursework for the last two (3rd and 4th) semesters of Cisco Certified Networ Administrator training in Moodle. Moodle Electronic materials in Moodle or Neptun systems. nd availability urement d of the midterm During the semester, the course includes two in-house exams: one on theory ar one on practice. Exams can be replaced 1 time separately.
Recommended readings and availability	
Description of tasks/measurement	
procedures to be submitted	
Description and schedule of the midterm	During the semester, the course includes two in-house exams: one on theory and
tests	one on practice. Exams can be replaced 1 time separately.

Network Operating Systems – Windows

Subject name		In Hungarian	Hálózati	operácić	os rendszerek –	Level	BSc						
Subject name		In English	Network	Corat	ing Systems –	Subject code	ISR-121						
Responsible Edu	ıcational	unit name	Institute	Institute of Informatics									
Name of the req	uired pre	liminary study	Windows	s operati	ng system	Subject code	ISR-257						
Tuno		Study load per w	veek (in ho	ours)		Cradit	Teaching						
Type		Lecture	Practice		Lab		Kequitement	Cleun	language				
Full time	150/39	per Week 1	per Weel	k 0	per Week 2	2	Midterm	5	Fnalish				
Part time	150/15	per Semester 5	per Seme	ester 0	per Semester 1	5	English						
Course leader			Name	Name Dr. György Agoston Position c. professor									
Training course	aims		The aim of and related related to Directory Windows policies,	The aim of the course is to get acquainted with Windows Server operating systems and related technologies. During the semester, students can learn the terminology related to the operation of domain systems, learn about the most important Active Directory services. They are able to create a domain environment, centrally control Windows systems through the management and configuration of AD objects, group policies, server roles, and services.									
			Lecture	Cor	nputer lab, usin	g a	a projector.						
Typical transfer	methods		Practice										
Typical damster	ine the us		Lab	Cor	nputer lab, usin	g a	a projector.						
Typical transfer methods Requirements (expressed study results)			Misc. Knowled The studd get hav get / ta hav to t Ability The studd be dev app fiel Attitude The studd be stric cor Autonom Cap ind Tal dec Ma	dge ent shou to know we expert to know we expert to know we expert to know usks in th ent shou able to p velopmen oly learn ld tasks. ent is rec intereste we to n ntinuous ny and I pability i lependen king resp cisions, r aking dec <u>ns and o</u>	ld the possibilitie tise and industry the methods a le ICT field. nowledge of spe- eld. ld erform routine of nt tasks. ed problem-sol quired to ad in new methon naintain the lever professional trac Responsibility for a managed I ty. ponsibility for he esults). cisions independ rganizes it.	es a y-s nd ecia opo vii ods vel ain IT his der	and tools of the procedures nee alist-specific too erational tasks in ng methods and of knowledge ing and self-edu job, in which he /her own work	IT field. Ige of Window ded to solve c ols to perform the ICT field I procedures to ed to the field. about Wind cation. e/she performs (for individua lopment of his	vs Server. ommon problems tasks appropriate , perform planned o perform his/her ows Servers and s his/her job tasks l and team work, s own knowledge,				
Short descriptio	n of the s	ubject content	Understanding the basic concepts related to network operating systems, ways of virtualization (server, application, desktop, storage, display). Get to know the basic concepts of cloud computing related to the topic (Software as a Service, Platform as a Service, Infrastructure as a Service, Storege as a Service). The main features of the current edition of Windows Server, installation methods, installation. Post-installation steps, local server settings. Features and structure of Active Directory directory service. AD database, operational levels. Naming and identifying AD objects, object classes. Global catalog, directory partitions. Functionality levels. Commissioning a domain controller, using AD Administrative Tools. Creating AD objects, group management. Features of Storage Spaces service, Creation and										

	management of Storage Pool, creation of fault-tolerant storage volume.							
	ACL) User rights and privileges delegation of control Group Policies							
	management templates. Group Policies vs. Local policies. Inheritance factors							
	influencing inheritance. Evaluate group policies, order of implementation, undate							
	Group Policy levels. Starter GPO, Validate the creation of Group Policies. Run							
	scheduled tasks scripts (PowerShell Batch) from Group Policy Shares Sharing							
	and file system level permissions. Resulting rights Disk quotas local quota							
	configuration. Quota configuration policies. Use a shared library as a drive with							
	central quota management. The process of name resolution under Windows. DNA							
	records, zone types, zone characteristics. AD integrated DNA. DNA search zones.							
	Deployment of DNS role, important DNS server features. Creation of DNA search							
	zone, management of DNS records. DHCP service operation, basic concepts.							
	DHCP address allocation process, DHCP lease renewal process. DHCP Scope							
	types. DHCP Failover Cluster, Multi-site DHCP. Creating a DHCP Scope. IIS,							
	WSUS, WDS services and basic concepts.							
	Guided and independent processing of theoretical curriculum, Problem solving							
Forms of student activity	with guidance and independently.							
	Collection and processing of information related to a professional topic.							
	Presentation and other teaching materials in the Moodle.							
Required reading and availability	Microsoft TechNet (online)							
	Microsoft Docs (online)							
Decommonded medings and quailability	William Panek: MCSA Windows Server 2016 Complete Study Guide: Exam 70-							
Recommended readings and availability	740, Exam 70-741, Exam 70-742 and Composite Upgrade Exam 70-743							
Description of tasks/measurement procedures to be submitted								
Description and schedule of the midterm	Only one midterm test, during the 12th week (contains theoretical and practical							
tests	part).							
10515	Possibility of retake tests during the last (13th) week and during Exam period.							

Script Language

C		In Hungarian		Szkript	t nyelv	vek		Level	BSc						
Subject name		In English		Script Language							Subject code	ISR-116			
Responsible Ed	ucational	l unit	name	e		Institute of Informatics									
Name of the rec	luired pre	elimi	nary s	study									Subject code		
Type		Stuc	dy loa	id pei	: we	eek (in I	hours))			R	equirement	Credit	Teaching	
турс		Lec	ture			Practic	e		Lab		1.	equitement	croan	language	
Full time Part time	150/39 150/15	per per	Week Seme	ster	<u>0</u> 0	per We per Ser	ek nester	3 15	per Week per Seme	ter 0	-	Exam	5	English	
Course leader		-				Name			Dr. Bálir	t Nagy	y		Position	Associate Professor	
Training course	aims					Educa To kno	Educational goals, development objectives								
					Lecture Practic	e	Теа	ching in	small	0 0	roups solvin	g computatio	nal and applied		
Typical transfer	methods	5				T ractic	C	exe	rcises. Us	ing proj	jec	tor, blackboar	d, calculator.		
						Lab				_					
						Knowl	odge								
Requirements (expressed study results)						 S taken the second second	asks. 7 de omy a	nd I	Responsib	ility	w n	nethods and p	rocedures req	uired for solving	
Short description of the subject content						 python language basics python IDEs (pyCharm, spyder) built-in basic modules (os, sys, csv, zip, etc.) threading basic network functions (socket, http, xml-rpc) basic database management on sqllite3 (db2api) ORM (sqlalchemy) scientific use (numpy / scipy / pandas) GUI programming (OT + pvot) 									
 Directed learning of theoretical material 10 % Independent learning of theoretical material 30 % Directed exercise solving 30 % Independent exercise solving 30 % 															
Required readin	g and ava	ailab	ility												
Recommended	readings a	and a	availa	bility	1										
Description of t procedures to b	asks/meas e submitte	sure: ed	ment												
Description and tests	schedule	e of t	he mi	dterr	n	Two tests will be during the practice sessions: Test 1 on week 6 (50 points, 45 minutes), Test 2 on week 12 (50 points, 45 minutes). Make up Tests on the week 13. 0-50 fail, 51-60 poor/pass, 61-70 satisfactory/fair, 71-80- good. 81- excellent.									
Network Operating Systems – Linux

Subject name			Hálózati ope	ráció	ós re	ndszerek	Level BSc						
Subject name		In English		Network Op	oerat	ting	Systems	Subject code ISR-214					
Responsible Ed	ucational	l unit name		Institute of I	Info	rma	tics						
Name of the rec	juired pro	eliminary study	у	Linux operat	ing s	syste	m				Subject code	ISR-159	
Type		Study load pe	r we	eek (in hours))				_F	Requirement	Credit	Teaching	
- 5 F -		Lecture		Practice		Lab						language	
Full time	150/39	per Week	1	per Week	0	per	Week	2	~	Midterm	5	English	
Part time	150/15	per Semester	5	per Semester	0	per	Semester		0	Mark	Desition	a nucleasan	
Course leader				Fducational	σna	Dr. de d	<u>Gyorgy</u> evelopm	Ag ent	t n	hiectives	FOSITIOII	c. professor	
Training course aims				The aim of the configuration applications, managing the tuning network tuning network.	The aim of the course is to acquaint the student with the installation process and onfiguration of the Linux operating system. The student should be able to install pplications, both from source and through pre-built packages. Be involved in nanaging the operating system and network connection, installing, monitoring, and uning network services.								
				Des et	1 ne	e leci	ure intro	auc	ces	s theoretical con	icepts using pi	ractical examples.	
Typical transfer methods				Lab	In a Ind Inst	a con lepen tall, 1	nputer lat dent task use, and o	o, u so con	isii olut ofig	ng a projector of tion under the gure the Linux of the times and the times of times of the times of the times of t	luring every la guidance of lab operating syste	b class. poratory teachers. em.	
				Misc.									
Requirements (expressed study results))	Knowledge The student i elearn th learn cc learn h Ability The student s be able be able be able be able Mttitude Interess Self-de The co Autonomy a Indepe	s rec ne st omn ow t shou t to i t to i t in l evelo mpu nd l nder , acc	quire eps t non l to ad ld nstal mana nstal Linu ppme <u>llsion</u> Resp nt thi cept o	ed to o install t Linux adr minister I l a Linux ge users l and con x system ent using t to give a consibilit nking and or reject t	the nin key on fig adu the a so y d pu he	Li nist 7 n oer a l gur mi av olu dif	inux operating tration commar etwork services ating system. Linux operating e applications. nistration. vailable English tion (challenge blem solving.	system. hds. s in Linux. g system, contr h literature (so e). ask.	rol user rights. urces).	
Short descriptio	on of the s	subject content	t	mounting file systems. Software package management. Manage users and cont their permissions. Linux kernel capabilities and administration of the Linux b process. Network configuration, network communication filtering. Install a configure key Linux networking features. Guided and independent processing of theoretical curriculum, Problem solv with midance and independently.								value and LVM, users and control of the Linux boot ering. Install and Problem solving	
			Collection and processing of information related to a professional topic.										
Required readin	ig and av	ailability		Teaching ma	teria	ıls in	the Moo	dle	<u>).</u>				
Recommended	readings	and availabilit	у	Theory (* 11		1.1	1			- h 1'	t = f =	Demen ((
procedures to be	asks/mea e submitt	isurement ed		[Theoretical knowledge: oral answers based on a list-of-questions. Demonstrat practical knowledge during lab classes by solving exercises.								. Demonstration	

Description and schedule of the midterm	Midterm tests: during 6th and 12th weeks.
tests	Retake midterm test: during 13th week.

IT Project 1

G 1		In Hungarian		Informatika pro	ojel	kt 1.	Level	BSc					
Subject name		In English		IT Project 1				Subject code	ISF-217				
Responsible Ed	ucational	unit name		Institute of Inf	for	matics							
Name of the rec	quired pre	eliminary study	1							Subject code			
		Study load pe	r w	eek (in hours)				L.	•	a li	Teaching		
Туре		Lecture		Practice		Lab		Re	equirement	Credit	language		
Full time	150/39	per Week	1	per Week 0		per Week	2		Midterm	-	F 19 1		
Part time	150/15	per Semester	5	per Semester 0	1	per Semester	10		Mark	5	English		
Course leader	•			Name		Dr. Györgyi	Str	au	ber	Position	c. professor		
Training course aims				Educational ge The aim of the which are necess of project contri- project made re	Educational goals, development objectives The aim of the course is to acquire such technical and methodological knowledge, which are necessary to complete an informatical project successfully. Presentation of project control and implementation procedures to the students in the frames of project made real in groupwork with 3-4 members.								
Typical transfer methods				Lecture L m Practice	ect	ture with proting.	jecto	on or a	and blackboar	d or online co	urse using Teams		
				Lab Ir te	n c eac	lassrooms w her's comput	ith o er is	cor s co	nputer work- onnected to pr	stations for ev ojector.	very student. The		
				Misc.									
Requirements (expressed study results)				 The student should acquire such technical and methodological knowledge which are necessary to complete and manage an informatical project successfully. Ability The student should be able to take an independent role in a project, able to manage a small project, able to use the project management tools and technics Attitude The student is required to be interested in new methods and tools related to the field. open, inquisitive, constructive, efficient, creative. Autonomy and Responsibility 									
Short description of the subject content				 feasibility study, the project definition plan, contract types, tendering, projec control, evaluation. The life-cycle of the development. Project phases. Project planning. Resource handling in the projects. Resource allocation. Project realisation organisational forms. Cost handling of projects. Project analysis. Risk handling: risk types, risk handling methods and techniques. The documentation of the project. Handling quality in the informational projects. Project management methodologies (PRINCE 2, PMI) Softwares supporting the project management (MS Project). Making a project in the laboratory in team-work. 									
Forms of studer	nt activity	,		Self-dependent Teamwork: 409	ta: %	sk solving: 3	0%						
Required readir	ng and ava	ailability		Gary R. Heerke Microsoft Proje 2010	ens ect	: Project Mar 2010; Step b	nage y St	ene tep	t, McGraw-H , Microsoft Pr	III Companies ess, Redmond	USA, 2002, , Washington,		

	Guidelines for Managing Projects; Department for Business, Innovation and Skills, London UK, 2010						
Recommended readings and availability	Adrienne Watt: Project Management; The Open University of Hong Kong, 2012						
	Wouter Baars: Project Management Handbook, Data Archiving and Networked						
	ervices, The Hague, 2006						
Description of tasks/massurement	Midterm test (at the end of the semester)						
procedures to be submitted	Evaluation of compulsory lecture quizzes and computer-based and practical tasks						
procedures to be submitted	during the semester.						
Description and schedule of the midterm	Theoretical evaluation: Week 12 and essays every week						
tests	Practical evaluation: Week 11.						
iesis	Project (teamwork): Week 4, Week 12. and Status report every week.						

Operations Research and Decision Making

		In Hungarian		Operációkuta	tás é	és dö	intéselm	Level	BSc						
Subject name		In English		Operations I	Rese	arcl	h and De	Subject code IMA-214							
Responsible Edu	ucational	unit name		Institute of I	nfoi	rmat	tics		-	- Training	Subject cour				
Name of the req	uired pre	liminary study	7	Mathematics	1 or	Eng	gineering	Mat	th	ematics 1	Subject code	IMA-151(2)			
		Study load pe	r we	eek (in hours)	-	<u> </u>		,	T		~ j	Teaching			
Туре		Lecture		Practice		Lab			F	Requirement	Credit	language			
Full time	150/39	per Week	1	per Week	0	per	per Week 2		T	Midterm	_				
Part time	150/15	per Semester	5	per Semester	0	per	Semeste	r 10		Mark	5	English			
Course leader		*		Name		Dr.	András	Zacl	h	ár	Position	professor			
Training course aims				Educational Basic aim of t the students simulation teo provides both	Basic aim of the Operations Research and Decision Making course is to familiarize he students with the most important methods of mathematical modeling and simulation techniques to assist and improve the managerial decisions. The subject provides both theoretical and practical knowledge										
				Lecture	The The are	e lect e imp expl	ture is pr plementa ained an	ovide tion d pre	ec c es	d to all students of theoretical co ented.	s in a lecture re oncepts in sar	oom. nple applications			
Typical transfer	methode			Practice	D:0	c	. 1.				11 4 11				
i ypical transfer	methous				Diff	terer	it applies	ations	IS	are implemente	ed by the labor	ratory leader.			
				Lab	The	e tasl	ks are cre	eated	lc	on personal loca	al storage usin	g Excel Solver.			
					Projectors and computers are used in every laboratory.										
				Misc.											
Requirements (expressed study results)				The subject er used to assis suitable math different kind Ability Students are These tools programming arising in diff Attitude Students are important to discover new and observe c Autonomy a Students carr make suggest	nsur t the emaa l of c able are pro eren solu lead nd H y ou	es to a decis e to a bblen tt are tivat cessi ution <u>lines</u> Resp at th s. Th	o provide odern m l models sion prob use spec very eff ns. With a of mar ed to lo ful mana as. In tea 3. oonsibilit eir tasks ey take n	e knov anagg s to c olems cific f cectiv this aufac gical ageria mwo ty by t	tce a a ctr a a l a a l b or l	vledge about the rial decisions. uantitatively de pols implement component of bility the stude aring, economic and construction decision mak k, they make an eemselves, thin sibility for thei	e different moo The students escribe the ari ted in the Excel of the Excel nt can create of cal and transpo ve thinking w ing. They are n effort to do a k about differ r jobs.	lelling techniques can develop the sing problems in cel called Solver. to solve linear optimal decisions ortation problems. that is inevitably open-minded to a high-quality job			
Short descriptio	n of the s	ubject content		 make suggestions. They take responsibility for their jobs. The basic concept of decision making Introduction to linear programming (LP) models Main components of linear programming models The basic terms and concepts of mathematical modelling Most important mathematical tools of LP modelling. Linear space, vector space, linear independency Concept of vector base, elementary base transformation Application of base transformations to vectors and matrices. Processing the heard text and writing notes: 10% Organize information supported by tasks: 20% 											
on bradent activity				Own tas	ks so	oluti	ons: 70%	6		, <u>-</u> 07					

Required reading and availability	Saul J. Gass, Linear Programming, Methods and Applications
	• Michael W. Carter, Camille C. Price, Ghaith Rabadi, Operations Research: A
	Practical Introduction
Recommended readings and availability	• Gerald Lieberman, Frederick S Hillier, Introduction to Operations Research
	• E. W. Martin, Jr, Mathematics for Decision Making
	Thomas L. Saatz, , Mathematical Principles of Decision Making
	One homework (compulsory application)
	• Topic: A linear programming task which fits to the material of theory and
	practice.
Description of tasks/measurement	• Date: The homework description is given on the 7th week. It must be
procedures to be submitted	finished until the last week of term-time.
	• In case of unsuccessful presentation (e.g.: if the student is not aware of the
	operation of the presented program or it is found that the program has been
	copied), the application will be rejected.
	Two mid-term tests/exams.
	mid-term test: the last week during term-time.
	Panlacement/Correction
	The material of the whole semester
	Invalidate the previously mid term tests
	Deadline: last week during term-time
Description and schedule of the midterm	Deadmie. last week during term-time.
tests	Final grade (lecture total min 61% and practice total min 61%).
	<50%: Fail (1)
	51-60%: Pass (2)
	61-70%: Satisfactory (3)
	71-80%: Good (4)
	81-100%: Excellent (5)
	Lecture: test: 100 point (min. 51%)

IT Project 2

Subject name		In Hungarian	Informatika p	oroje	ekt 2.	Level	BSc						
Subject name		In English	IT Project 2					Subject code	ISF-159				
Responsible Ed	ucational	unit name	Institute of I	nfo	rmatics								
			IT Project 1				ISF-217						
Name of the rec	uired pre	eliminary study	Programming	g 1		Subject code	ISF-213						
			Database syst	tem			ISF-210						
		Study load per w	veek (in hours)			a l'	Teaching						
Туре		Lecture	Practice		Lab		Requirement	Credit	language				
Full time	150/26	per Week 0	per Week	0	per Week	2	Midterm	-	E P.b				
Part time	150/10	per Semester 0	per Semester	0	per Semester	10	Mark	2	English				
Course leader			Name		Dr. Györgyi S	Str	auber	Position	c. professor				
Training course	aims		Educational The aim of th which are neo	goa ne co cessa	ls, development ourse is to acque ary to complete	nt o nire	objectives such technical a informatical pr	and methodolo oject successf	ogical knowledge, ully.				
			Lecture										
T 1 1			Practice	-				1 0					
Typical transfer	Typical transfer methods			Lab in classrooms with computer work-stations for every student, in team work of 3-4 members.									
			Misc.										
Requirements (o	l study results)	 The stu which success Ability The student s able to able to able to able to Attitude The student i interest open, in Autonomy a He takes resp 	iden are <u>sfull</u> hou take mar <u>use</u> s rec red i <u>nqui</u> nd l	t should acquir necessary to y. Id be an independen age a small pro- the project man quired to be n new methods sitive, construct Responsibility	nt r oje nag s an ctiv	such technical a omplete and m role in a project, ct, gement tools and nd tools related t re, efficient, created d manages indep	and methodold anage an infe l technics o the field; ative.	e given field					
Short descriptio	n of the s	subject content	Elaboration of project 1" sup	of th	e professional ised by a consu	pa 1lta	rt of the project int in the framew	t task that star ork of team of	ted in course "IT r individual work.				
Forms of studer	t activity	7	Self-depende	nt ta	sk solving and	l/or	Teamwork						
Required readin	g and av	ailability	Literature of	subj	ects related to	the	topic of the pro	ject task					
Recommended	readings	and availability											
Description of t procedures to be	asks/mea e submitt	surement ed	Presentation	Presentation of the project task.									
Description and tests	schedule	e of the midterm	According to	wha	at was said at th	he f	first lecture.						

Quality and Auditing of IT Systems

Subject name		In Hungarian	Informatikai auditja	rend	lszerek minősé	Level	BSc							
5		In English	Quality and	Aud	liting of IT Sy	ste	ems	Subject code	ISF-155					
Responsible Ed	ucational	unit name	Institute of	Info	rmatics			5						
Name of the req	uired pre	liminary study				Subject code								
		Study load per y	veek (in hours))			[Teaching					
Туре		Lecture	Practice	/	Lab		Requirement	Credit	language					
Full time	150/39	ner Week 2	ner Week	1	ner Week	0			0.0					
Part time	150/15	per Semester 10	per Semester	. 5	per Veen per Semester	0	Exam	5	English					
Course leader	100/10	per bemester 10	Name		Dr. Ferenc La	eita	bld	Position	c. professor					
			Educational	Educational goals, development objectives										
Training course aims			The student s realistic risks risks of com audit of IT s development	The student should be able to evaluate the effectiveness of control solutions and the realistic risks associated with the use of IT. Students should get acquainted with the risks of computer applications, the basic goals and tasks of quality assurance and audit of IT systems. Get acquainted with the control and testing tasks of system development										
		Lecture Practice	Onl que The wit	ine study mat stions and cons handover can h the help of or	teri sul ta n-li	al (notes, lectu tations within th ke place in the ine study materia	re videos, leo e framework of framework of al (notes, lectu	ture slides), test of a contact hour. contact hours or re videos, lecture						
Typical transfer methods				slides, test questions), in the latter case supplemented by laborations held in the framework of contact hours.										
		Lab												
		Misc.												
Requirements (expressed study results)			The student s risks of com audit of IT s system devel Ability The student i assurance an Attitude Open, inquis Autonomy a He takes resp Software qui	The student should gain knowledge about security-critical systems. He knows the risks of computer applications, the basic goals and tasks of quality assurance and audit of IT systems. He should be familiar with the control and testing tasks of system development. Ability The student is required to be able to assess risks. Able to participate in the quality assurance and audit of IT systems. Able to perform basic software testing tasks. Attitude Open, inquisitive, constructive, efficient, creative. Autonomy and Responsibility He takes responsibility, decides and manages independently in the given field.										
Short descriptio	n of the s	subject content	testing, softw	vare	testing. testing	str	ategies. Case stu	idies.	audit. 11 systems					
Forms of studen	t activity		Processing of heard text with notes, directed and independent processing of theoretical curriculum, problem solving with guidance and independently. Collecting, processing and organizing information related to a professional topic Solving tasks, analyzing and processing case studies.											
Required readin	g and ava	ailability	Moodle Electronic materials in Moodle or Neptun systems.											
Recommended 1	readings	and availability												
Description of ta procedures to be	asks/mea e submitte	surement ed	According to completed fr	o sub om t	ject requirement he practical part	nt. rt (During the cours testing of IT sys	se, an assignm tems).	ent must be					
Description and	schedule	of the midterm	During the se	emes	ter, the course	inc	cludes one in-ho	use exam, whi	ch can be					
tests			replaced 1 tin	me se	eparately.									

Software Development Technologies

Subject nome	In Hungarian					si technológiá	Level BSc						
Subject name		In English		Software Dev	velo	pment Techi	Subject code ISF-117						
Responsible Edu	ucational	unit name		Institute of I	nfoi	rmatics							
Name of the req	uired pre	eliminary study	,	Programming	2			Subject code ISF-113					
Tuno		Study load per	r w	eek (in hours)				Doquirom	ont	Cradit	Teaching		
Type		Lecture		Practice		Lab		Kequitein	em	Cleun	language		
Full time	150/39	per Week	1	per Week	0	per Week	2	Midte	rm	5	English		
Part time	150/15	per Semester	5	per Semester	0	per Semester	10	Mar	k	-	8		
Course leader				Name Dr. Jozsef Katona Position associate professor									
Training course aims				The aim of the course is to acquaint the student with the basics of Windows Presentation Foundation (WPF) and Xamarin.Forms programming, among others, as well as to be able to effectively design and build graphical application architecture (MVC, MVP and MVVM), apply SOLID principles and be a web service for communication. Another goal is to introduce the student to the whole process of software development, methods, models, and to introduce them to UML diagrams that will enable requirement specification and object-oriented design, including structure modelling, state management, and execution modelling. In addition to specification and requirements management and design, be familiar with implementation techniques, configuration management, verification and validation, software evolution, and effective unit testing based on Test-Driven Development (TDD).									
				software development lifecycle and solve the tasks of each phase in a team or even on your own, using the techniques, technologies, paradigms and opportunities learned within the subject. The course also imparts theoretical and practical knowledge that will form the basis for further programming-related subjects.									
				Lecture	The The are Pro	e lecture is pro implementat explained and jectors and te	ovide tion l pre ache	ed to all st of theore sented.	tical c	s in a lecture re oncepts in sar	oom. mple applications ty lecture		
				Practice	110	jeetors and te	aente	r s compe	iters a		j locture.		
Tunical transfor	mathada				Dif	ferent applica	tion	s are imple	ement	ed by the labo	ratory leader		
Typical transfer	methods	•		Lab	The univ and	e tasks are in versity in C#1 accessed on t	mple lang remo	emented o uage. The ote servers	on our create	r own local i and used da	repository of the tabases are stored		
					Pro	jectors and co	mpı	iters are u	every laboratory.				
				Misc.									
Requirements (expressed study results)				The student is required to gain knowledge of C # language Windows Presentation Foundation (WPF) and Xamarin.Forms capabilities (design patterns, S.O.L.I.D. principles, web service, platform-dependent and independent implementation, test control development, and unit testing). He has knowledge of UML views and applies the models with high efficiency. Ability The student should be able to see the entire software development lifecycle and solve the tasks of each phase in a team or even independently, using the techniques, technologies, paradigms and opportunities learned within the framework of the subject.									

	Attitude Students are motivated to programming. They are open-minded to discover new corporate solutions, accept to principles of an organizational work and find easily
	the best possible mode and results. In teamwork, they make an effort to do a high- quality job and observe deadlines
	Autonomy and Responsibility
Short description of the subject content	 Students carry out their tasks by themselves, think about different solutions and make suggestions. They take responsibility for their jobs. Software development process, methods and models Specification and requirement management Structural modelling Object-oriented design: state management Object-oriented design: implementation Design of software systems Windows Presentation Foundation (WPF) basics WPF resource management Architecture of graphical interface and WPF applications Xamarin basics Development of a platform-independent and platform-specific application Use of Web Services The S.O.L.I.D. principles Implementation Configuration management Verification and validation Software evolution
Forms of student activity	 Processing the heard text and writing notes: 20% Organize information supported by tasks: 30% Own tasks processing: 50%
Required reading and availability	 Own dasks processing. 50% Matthew MacDonald, Pro WPF 4.5 in C#: Windows Presentation Foundation in .NET 4.5 4th edition. Apress, 2012. Arnaud Weil, Learn WPF MVVM - XAML, C# and the MVVM pattern, 2017. Richard Murch, The Software Development Lifecycle. 2012. M. Seidl, M. Scholz, C. Huemer, G. Kappel, UML @ Classroom: An Introduction to Object-Oriented Modeling. Springer International Publishing, 2015. Hermes Dan, Mazloumi Nima, Building Xamarin.Forms Mobile Apps Using XAML. Apress, 2019. Arnaud Weil, Xamarin Mobile Application Development: Cross-Platform C# and Xamarin.Forms Fundamentals, Apress, 2015. Electronic curriculums are associated with C# available in the Moodle system.
Recommended readings and availability	
Description of tasks/measurement procedures to be submitted	 One homework (compulsory application) Topic: A programming task which fits to the material of theory and practice. Date: The homework description is given on the 12th week. It must be finished until the last week of term-time. It must be defended in front of a committee during last week of term-time which is appointed by the leader of practice. It cannot be replaced! In case of unsuccessful presentation (e. g.: if the student is not aware of the operation of the presented program or it is found that the program has been copied), the application will be rejected.
Description and schedule of the midterm tests	Two mid-term tests/exams. 1^{st} mid-term test: it is recommended on the 6 th week. 2^{nd} mid-term test: the week before the last week during term-time.

Replacement/Correction
The material of the whole semester.
Invalidate the previously mid-term tests.
Deadline: last week during term-time.
Final grade (lecture total min. 61% and practice total. min. 61%):
<00%: FdII (1)
01-70%: Pass (2) 71. 200(): Set: for storm (2)
71-80%: Satisfactory (3)
81-90%: Good (4)
91-100%: Excellent (5)
Lecture: 1. test (50 points) + 2. test (50 points) = 100 point (each min. 51%, total
min. 61%)
Laboratory: 1. test (30 points) + 2. test (30 points) + Homework (40 points) =
100 points (each min. 51%, total min. 61%)

Programming 3.

Responsible Educational Name of the required prel Type	In English unit name liminary study Study load pe Lecture per Week per Semester	/ r we	Programmin Institute of I Programming eek (in hours) Practice	ng 3 nfor 2	matics				Subject code	ISF-155				
Responsible Educational Name of the required prel Type	unit name liminary study Study load pe Lecture per Week per Semester	/ r we	Institute of I Programming eek (in hours) Practice	nfor g 2	matics									
Name of the required prel Type Full time 150/30	liminary study Study load pe Lecture per Week per Semester	/ rwe	Programming eek (in hours) Practice	g 2		·								
Type	Study load pe Lecture per Week	r we	eek (in hours) Practice			Subject code	ISF-113							
Type	Lecture per Week		Practice					Teaching						
Full time 150/30	per Week				Lab		Re	equirement	Credit	language				
1 un unic 130/37	ner Semester	1	per Week	0	per Week	2		Midterm	ر	E l'alı				
Part time 150/15	per semester	5	per Semester	0	per Semester	10		Mark	5	English				
Course leader			Name		Dr. Jozsef K	ator	na		Position	associate professor				
			Educational goals, development objectives											
Training course aims		The aim of the course is to present for students several aspects of visual and graphical programming basis. It provides high skills to create parallel or multithreaded software and use the asynchronous opportunities of the Java programming language. Further objective is to introduce students to the basics of network programming and to provide tools with which they will be able to implement and manage service applications. Eventually, transfer so knowledge that they will be able to create business applications, even implementing and using custom controls or building external libraries or components. The subject provides both theoretical and practical knowledge. It lays the												
			IOUNDALION OF	The	lecture is pro	vid	iru ed	to all students	in a lecture r	nom				
		Lecture	The are	implementat explained and	ion I pre	of ese	f theoretical conted.	oncepts in sa	mple applications					
			Projectors and teacher's computers are used in every lecture.											
			Practice											
Typical transfer methods				Diff	erent applica	tion	s a	are implemente	ed by the labor	ratory leader.				
			Lab The tasks are implemented on our own local repository of t university in Java language. The created and used databases a stored and accessed on remote servers.											
				Projectors and computers are used in every laboratory.										
			Misc.											
			Knowledge											
Requirements (expressed	1	The students are required to learns about advanced Java language elements, version control techniques, JUnit testing techniques, and complete project development. (Java Syntax, OOP Overview, Lambda Expressions, Data Structures, Collection Framework, GIT Versioning, Using GITHUB, JUnit Tests, Database Management, Serialization, Java Patterns, Knowledge of Graphical User Interface, Bug Management). The subject is about designing and implementing complex software. The student applies the knowledge of the previous subjects.												
		The students should be capable of implement a complex software development in Java programming language, using object-oriented and functional programming techniques. He should be capable of completing a software development project (specification, design, UML, Use-Case diagrams, database design, screen design, implementation, task writing in Java, testing, debugging and handling, documentation). Effective in designing, reading and converting static UML diagrams to Java. Understands the operation of a more sophisticated Java program and is able to work effectively in												

	Attitude			
	Motivated towards programming. He is open to new software development solutions, accepts the principles of teamwork and finds his place in the project team. In the case of self-employment, perform all phases of the work to the best of your ability. He also strives for quality work and meeting deadlines during teamwork. Autonomy and Responsibility			
	He / she independently solves the tasks assigned to him / her, thinks about possible solutions and develops proposals. He takes responsibility for his project work.			
Short description of the subject content	 Java technology, JRE Java program development, JDK, NetBeans Java syntax, OOP, functionality, lamda expressions Data structures, collection framework SWING, Creating a graphical user interface, using graphical objects Java DB, database management Use version control management, GIT, GITHUB throughout the project JUnit, creating and running tests Error handling, repair process Project planning and implementation 			
Forms of student activity	 Processing of heard text with notes 20% Systematisation of information 30% Self-processing of tasks 50% 			
Required reading and availability	 Java Design Patterns: A Hands-On Experience with Real-World Examples ISBN-13: 978-1484240779 Java-based electronic learning materials produced and compiled by educators. Access via Moodle. Effecitive Java. ISBN-13: 978-0134685991 			
Recommended readings and availability	 Version Control with Git: Powerful tools and techniques for colLaboratoryative software development. ISBN-13: 978-0596520120 Effecitive Java. ISBN-13: 978-0134685991. The Definitive Guide to Java Swing, ISBN-13: 978-1590594476 Database Programming with JDBC and Java, ISBN-13: 978-1565922709 Pragmatic Unit Testing in Java 8 with JUnit, ISBN -13: 978-1941222591 			
Description of tasks/measurement procedures to be submitted	 Software project developed in teamwork (Required Program) Topic: Solving programming problems that fit theory and Seminar. Timeline: Everyone will receive a description of what to submit in Week 2. Preparing for the final week is an extracurricular task; You must personally present in front of a committee at a time determined by the supervisor, but during the final week of the term. Submitting project work cannot be make up for! In case of unsuccessful presentation (if the student is not aware of the functioning of the submitted program or it turns out that the program has been copied), the project work will be rejected. 			
Description and schedule of the midterm tests	Two mid-term tests/exams. 1 st mid-term test: at a time agreed with the practice leaders. 2 nd mid-term test: the week before the last week during term-time. Replacement/Correction The material of the whole semester. Invalidate the previously mid-term tests. Deadline: last week during term-time. Final grade (lecture total min. 61% and practice total. min. 61%): <60%: Fail (1) 61-70%: Pass (2) 71-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5) Lecture: 1 test (25 points) + 2 test (25 points) = 50 point (each min. 51%)			

Laboratory: Project Task (50 points).
100 points (each min. 51%)

Web Programming

Subject name In Hungar In English Responsible Educational unit name		In Hungarian		Web programozás						Level	BSc	
		In English		Web Programming						Subject code	ISF-253	
		unit name		Institute of Informatics								
Name of the required preliminary study									Subject code			
Туре		Study load per	r w	eek (in hours)	_		_	ь ·			Teaching	
		Lecture		Practice		Lab		Requirement		Credit	language	
Full time	150/39	per Week	0	per Week	0	per Week	3	Midter	m	=	En altab	
Part time	150/15	per Semester	0	per Semester	0	per Semester	15	Mark		5	English	
Course leader				Name		Dr. Zoltán K	Cirá	ly		Position	associate professor	
Training course aims			Educational goals, development objectives The student will know the elements of web-based server-side programming and become familiar with a poorly typed language. Use and integrate previously familiar user-based scripting languages and databases into a PHP program.									
			The student will know the elements of web-based server-side programming and become familiar with a poorly typed language. Use and integrate previously familiar user-based scripting languages and databases into a PHP program.									
				Lecture								
				Practice	E					·		
Typical transfer	methods	5		. .	Exe	ercises solving	exe	ercises durii	ng ex	tercises.		
				Lab	Tas a pi	asks are implemented in PHP, on the University web serv projector and a teacher's machine in every class.						
				Misc.		•						
				Knowledge								
Requirements (expressed study results)				 know the basic PHP instructions. learn how to use PHP's built-in functions. know the basics of PHP OOP. learn the PHP database management capabilities with MySQL and XML data. Learn basic PHP security steps. Ability The students should be able to specify complex programs. be able to encode complex programs in PHP, HTML, JavaScript. 								
				 be able to use databases with PHP. be able to implement dynamic websites / portals based on a specific specification. 								
				Attitude								
				Interest in programming. Self-development using the available literature in Hungarian and English.								
			The challenge of giving the solution (challenge).									
			Autonomy and Responsibility									
				Independent thinking and problem solving.								
				Assess, accept, or reject the difficulty of the task.								
				Standalone specification capability.								
Short description of the subject content			Students become familiar with the server-side PHP programming language, learn how to build complete websites / portals based on the specification, and use their experience in programming, database management, and networking technology. The course includes short and major programs. Students are required to make									

	projects. In the theoretical classes they learn the rules of web development and in practice they learn how to create dynamic web pages.					
Forms of student activity	Solving individual tasks (homeworks) outside the classroom. Finding solutions and implementing them for assigned tasks.					
Required reading and availability	w3cschool.com • https://www.w3schools.com/php/default.asp					
Recommended readings and availability						
Description of tasks/measurement procedures to be submitted	 One homework (compulsory application) Topic: A programming task which fits to the material of theory and practice. Date: The homework description is given on the 12th week. It must be finished until the last week of term-time. It must be defended in front of a committee during last week of term-time which is appointed by the leader of practice. It cannot be replaced! In case of unsuccessful presentation (e. g.: if the student is not aware of the operation of the presented program or it is found that the program has been copied), the application will be rejected. 					
Description and schedule of the midterm tests	Two mid-term tests/exams. 1 st mid-term test: it is recommended on the 6 th week. 2 nd mid-term test: the week before the last week during term-time. Replacement/Correction The material of the whole semester. Invalidate the previously mid-term tests. Deadline: last week during term-time. Final grade (lecture total min. 61% and practice total. min. 61%): <60%: Fail (1) 61-70%: Pass (2) 71-80%: Satisfactory (3) 81-90%: Good (4) 91-100%: Excellent (5) Lecture: 1. test (50 points) + 2. test (50 points) = 100 point (each min. 51%, total min. 61%) Laboratory: 1. test (30 points) + 2. test (30 points) + Homework (40 points) = 100 points (each min. 51%, total min. 61%)					