VENTSPILS AUGSTSKOLA

Inženieru iela 101, LV-3601, Ventspils
e-pasts: venta@venta.lv
Tālrunis 63628303 Fakss (371)63629660
http://www.venta.lv

Ventspilī,

11.04.2018. Nr 1-146

Augstākās izglītības kvalitātes aģentūras (AIKA)
Studiju akreditācijas komisijai

Par bakalaura studiju programmas
"Datorzinātnes" īstenošanu angļu valodā

Lūdzu apstiprināt izmaiņas Ventspils Augstskolas (VeA) Informācijas Tehnoloģiju fakultātes īstenotajā studiju virzienā "Informācijas tehnoloģija, datortehnika, elektronika, telekomunikācijas, datorvadība un datorzinātne" bakalaura studiju programmas "Datorzinātnes" īstenošanai angļu valodā, kas tiek veiktas pamatojoties uz Ventspils Augstskolas Attīstības stratēģijas laika posmam no 2016. līdz 2020. gadam (apstiprināta 09.11.2016. ar Ventspils Augstskolas Senāta lēmumu Nr.16-93) studiju attīstības mērķiem: 1. "Palielināt uzņemto studentu skaitu un samazināt studentu atbirumu", 2. "Palielināt pilna laika ārvalstu studentu skaitu VeA" un 3.e. "Studiju programmu īstenošana svešvalodās", lai nodrošinātu iespēju ārvalstu studentiem apgūt VeA īstenotās studiju programmas angļu valodā.

Pielikumā:

1. Izraksts no Ventspils Augstskolas Senāta 2018. gada 4.aprīļa sēdes protokola ar lēmumu Nr. 18-36 par izmaiņu pieteikšanu Informāciju Tehnoloģiju Fakultātes bakalaura studiju programmā "Datorzinātnes" studiju programmas īstenošanai angļu valodā
2. Dokumentu kopums bakalaura studiju programmas "Datorzinātnes" izmaiņu pieteikuma iesniegšanai Akadēmiskās Informācijas Centram.

Ventspils Augstskolas rektors _____ K. Krēsliņš

E. Vītola
26552012

VENTSPILS AUGSTSKOLA

SENĀTS

LĒMUMS
Ventspilī

2018. gada 4. aprīlī Nr. 18 - 36

Par izmaiņām Informācijas tehnoloģiju fakultātes bakalaura studiju programmā "Datorzinātnes" studiju programmas īstenošanai angļu valodā

Noklausījies Ventspils Augstskolas Informācijas tehnoloģiju fakultātes dekāna Māra Ēlerta ziņojumu un ņemot vērā Informācijas tehnoloģijas fakultāte Domes 2018. gada 21. marta sēdes lēmumu Nr. 18-03-06

Ventspils Augstskolas Senāts

nolemj:

Apstiprināt Informācijas tehnoloģiju fakultātes īstenotās bakalaura studiju programmas "Datorzinātnes" būtisku izmaiņu veikšanai (studiju programmas īstenošanai angļu valodā) sagatavotos dokumentus un pilnvarot Esteri Vītolu tos iesniegt Akadēmiskās informācijas centram.

Pielikumā:
1. Izraksts no ITF Domes 2018. gada 21. marta sēdes protokola Nr. 18-03-06.
2. Dokumentu kopums bakalaura studiju programmas "Datorzinātnes" izmaiņu pieteikuma iesniegšanai Akadēmiskās informācijas centram.

Senāta priekšsēdētāja G. Hiļķeviča

E. Vītola

Kopijas:
1-mācību prorektorei
1 mācību daļai
1-IT fakultātei

4.eks.lietā

VENTSPILS AUGSTSKOLA

IZRAKSTS NO SENĀTA

SĒDES PROTOKOLA

04.04.2018. Ventspilī Nr. 5.

Sēdi vada: G. Hiļķeviča

Sēdē piedalās: senatori: V. Avotiņš, V. Balama, J. Baldunčiks, R. Didrihsons, G. Dreijers, M. Ēlerts, J. Freimanis, G. Hiļķeviča, S. Hiļķevičs, K. Krēsliņš, L. Ločmele, L. Resele, R. Rollande, I. Vizule, E. Vītola

Nepiedalās: I. Balode, A. Dubova, F. Kamiševs, A. Mažaika, S. Šama,

Sēdi protokolē: K. Matule

Sēdes sākums: plkst. 16:10

DARBA KĀRTĪBA:

***

10. Par Informācijas tehnoloģiju fakultātes realizētās akadēmiskās bakalaura studiju programmas "Datorzinātnes" izmaiņām studiju programmas īstenošanai angļu valodā (ziņo E. Vītola)

***

10. Par Informācijas tehnoloģiju fakultātes realizētās akadēmiskās bakalaura studiju programmas "Datorzinātnes" izmaiņām studiju programmas īstenošanai angļu valodā

***

Lēmums Nr. 18 – 36: Apstiprināt Informācijas tehnoloģiju fakultātes īstenotās bakalaura studiju programmas "Datorzinātnes" būtisku izmaiņu veikšanai (studiju programmas īstenošanai angļu valodā) sagatavotos dokumentus un pilnvarot Esteri Vītolu tos iesniegt Akadēmiskās informācijas centram.

Pielikumā:

1. ***Izraksts no ITF Domes 2018. gada 21. marta sēdes protokola Nr. 18-03-06.***
2. ***Dokumentu kopums bakalaura studiju programmas "Datorzinātnes" izmaiņu pieteikuma iesniegšanai Akadēmiskās informācijas centram.***

***

Senāta sēdes vadītāja: G Hiļķeviča

Sēdes protokolētāja: K. Matule

IZRAKSTS PAREIZS:

VeA Senāta sekretāre

Matulek

K. Matule

Ventspilī 2018.gada 11. aprīlī

INFORMĀCIJAS TEHNOLOĢIJU FAKULTĀTE
VENTSPILS AUGSTSKOLA

Inženieru iela 101, Ventspils, LV-3601; tālr. 636 29 654; e-mail: *itf@venta.lv*

Izraksts no ITF domes sēdes

Ventspilī

2018. gada 21. martā Nr. 3

Sēdi vada: ITF domes priekšsēdētājs A. Krauze
Protokolē: ITF domes sekretāre: K. Matule
Piedalās: asoc. prof.: G. Hiļķeviča
docenti: M. Ēlerts, R. Rollande,
lektori: J. Šate, G. Neimanis
studenti: A. Lurins, K. Reinis Ozols, P. Bitāns, R. R. Vecmanis
vispārējais personāls: K. Matule

Dienas kārtība:

1. *
2. *
3. *
4. *
5. *
6. **Studiju programmas "Datorzinātnes" sagatavoto dokumentu kopumu apstiprināšana iesniegšanai AIC studiju programmas īstenošanai angļu valodā**
7. *
8. *

***

6. Studiju programmas "Datorzinātnes" sagatavoto dokumentu kopumu apstiprināšana iesniegšanai AIC studiju programmas īstenošanai angļu valodā

***

Lēmums Nr. 18-03-06: **Lūgt VeA Senātam apstiprināt studiju programmas "Datorzinātnes" dokumentu kopumu iesniegšanai Akadēmiskās informācijas centram būtisku izmaiņu veikšanai studiju programmā.**

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Izrakstu sagatavoja: ITF domes sekretāre K. Matule

VENTSPILS AUGSTSKOLA IT FAKULTĀTE LATVIJAS REPUBLIKA

VENTSPILS AUGSTSKOLA

INFORMĀCIJAS TEHNOLOĢIJU FAKULTĀTE

BAKALAURA STUDIJU PROGRAMMA

DATORZINĀTNES

DOKUMENTU KOPUMS
STUDIJU PROGRAMMAS IZMAIŅU PIETEIKŠANAI

Ventspils 2018

ATBALSTĪTS APSTIPRINĀŠANAI VeA SENĀTĀ
VeA ITF Domes sēdē 2018. g. 21. martā, lēmums Nr. 18-03-06
VeA ITF Domes priekšsēdētājs A. Krauze

APSTIPRINĀTS
VeA Senāta sēdē 2018. g. 4. aprīlī, lēmums Nr. 18-36
VeA Senāta priekšsēdētāja G. Hiļķeviča

SATURS

STUDIJU PROGRAMMAS APRAKSTS

Nosaukums angļu valodā	**Computer Science**
Nosaukums latviešu valodā	**Datorzinātnes**
Studiju programmas veids un līmenis	Bakalaura studijas
KP	120 KP
Kvalifikācija	Dabas zinātņu bakalaura grāds datorzinātnēs
Studiju veids	Pilna laika studijas
Studiju programmas kods	43481

STUDIJU PROGRAMMAS SATURS ANGĻU VALODĀ

No	Title in English	Title in Latvian	Credit Points	Lecturer
	Compulsory part	**Obligātā daļa**	**78**	
	Field basic guidelines (comp. part)	**Nozares pamatnostādnes (obl.d.)**	**30**	
1	Mathematical Analysis I	Matemātiskā analīze I	4	Hiļķeviča Gaļina Mihailova Jeļena
2	Mathematical Analysis II	Matemātiskā analīze II	2	Hiļķeviča Gaļina Mihailova Jeļena
3	Linear Algebra un Analytical Geometry I	Lineārā algebra un analītiskā ģeometrija II	2	Mihailova Jeļena
4	Linear Algebra un Analytical Geometry II	Lineārā algebra un analītiskā ģeometrija II	2	Mihailova Jeļena
5	Mathematical Logic	Matemātiskā loģika	2	Hiļķeviča Gaļina Mihailova Jeļena
6	Discrete Mathematics	Diskrētā matemātika	2	Hiļķeviča Gaļina Mihailova Jeļena
7	Data Structures and Algorithms	Datu struktūras un pamatalgoritmi	2	Šķirmante Karina
8	Theory of Algorithms	Algoritmu teorija	2	Briede Dace
9	Probability Theory and Mathematical Statistics	Varbūtību teorija un matemātiskā statistika	2	Mihailova Jeļena
10	Differential Equations	Diferenciālvienādojumi	2	Hiļķeviča Gaļina Mihailova Jeļena
11	Numerical Methods	Skaitliskās metodes	2	Hiļķeviča Gaļina Briede Dace
12	Optimisation Methods	Optimizācijas metodes	2	Vucāns Jānis
13	Object Oriented Modelling	Objektorientētā modelēšana	2	Rollande Raita
14	Modelling of Chaotic Processes	Haotisko procesu modelēšana	2	Žagars Juris
	Actual problems of the field (comp.part)	**Nozares aktuālās problēmas (obl.d.)**	**28**	
15	Basics of Computer Science	Datorzinātņu pamati	4	Hiļķevičs Sergejs Vītola Estere
16	Programming	Programmēšana	4	Vītola Estere
17	Object Oriented Programming	Objektorientētā programmēšana	4	Vītola Estere
18	JAVA Programming	Programmēšana tīmeklī (JAVA)	4	Šķirmante Karina
19	Visual Programming Languages	Vizuālās programmēšanas valodas	4	Caune Vairis
20	Information Systems Analysis and Design	IS analīze un projektēšana	4	Rollande Raita
21	Case Tools	Programmu izstrādes rīki un vides	4	Rollande Raita

	Interdisciplinary aspects (comp.part)	**Starpnozaru aspekti (obl.daļa.)**	**20**	
22	Fundamentals of the Latvian Language I	Latviešu valodas pamati I	2	Ozoliņa Sintija
23	Fundamentals of the Latvian Language II	Latviešu valodas pamati II	2	Ozoliņa Sintija
24	Introduction to Business	Uzņēmējdarbības pamati	2	Hiļķevičs Sergejs
25	Fundamentals of Economics	Ekonomikas pamati	2	Smirnovs Dmitrijs
26	Basics of Information Technologies Law	Nozares tiesību pamati	2	Meijere sanita
27	Physics I	Fizika I	2	Cinīte Ilva
28	Physics II	Fizika II	2	Cinīte Ilva
29	Electronics	Elektronika	4	Krauze Aigars
30	Labour Safety and Environment and Civil Protection	Darba drošība un vides un civilā aizsardzība	2	Vītols Varis
	Compulsory elective courses	**Nozares ierobežotās izvēles kursi**	**26**	
31	Fundamentals of GIS and Digital Cartography	Digitālā kartogrāfija un GIS	(4)	Gulbe Linda
32	Computer Graphics	Datorgrafika	(2)	Sisojevs Aleksandrs
33	Operating Systems	Operētājsistēmas	4	Lemberskis Igors Neimanis Gints
34	Network Operating Systems	Tīklu operētājsistēmas	2	Neimanis Gints
35	Database Technologies	Datu bāzu tehnoloģijas	4	Neimanis Gints
36	Computer Systems Hardware and Architecture	Datorsistēmu arhitektūra un uzbūve	2	Dzalbs Jānis
37	Local Area Networks Designing and Administration	LAN projektēšana un administrēšana	4	Koloda Mārcis
38	WWW Technologies	Tīmekļa tehnoloģijas	2	Koloda Mārcis
39	Information Systems Security	IS drošība	(2)	Berežnojs Aleksandrs
40	Basics of Programmable Logic Controllers	Programmkontrolieru pamati		Gaigals Gatis
41	Mathematical modelling	Matemātiskā modelēšana	(4)	Kalniņš Juris Roberts
42	Introduction to computer processing of satellite images	Ievads satelītattēlu apstrādē	(4)	Gulbe Linda
43	AB SUITE programming environment	AB SUITE programmēšanas vide	(4)	Strods Elmārs
44	Web page programming	Web aplikāciju izstrāde	(2)	Traškovs Agris
	Internship and individual work	**Prakse un patstāvīgie darbi**	**10**	
	Internship	Prakse	(8)	
	Bachelor paper	Bakalaura darbs	10	
	Optional courses	**Izvēles kursi**	**6**	
		Total	**120**	

STUDIJU PROGRAMMAS PLĀNS ĪSTENOŠANAI ANGĻU VALODĀ

STUDY PLAN FOR ACADEMIC BACHELOR PROGRAMME "COMPUTER SCIENCE"

Program duration - 3 years, program scope 120 credit points

Field basic guidelines (comp. part)	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Mathematical Analysis I	4						4	Examination
Mathematical Analysis II		2					2	Examination
Linear Algebra un Analytical Geometry I	2						2	Examination
Linear Algebra un Analytical Geometry II		2					2	Examination
Mathematical Logic	2						2	Examination
Discrete Mathematics		2					2	Examination
Data Structures and Algorithms				2			2	Examination
Theory of Algorithms			2				2	Examination
Probability Theory and Mathematical Statistics			2				2	Examination
Differential Equations			2				2	Examination
Numerical Methods					2		2	Examination
Optimisation Methods				2			2	Examination
Object Oriented Modelling					2		2	Examination
Modeling of Chaotic Processes				2			2	Examination
Total CP (30)	8	6	6	6	4	0	**30**	
Amount of courses	3	3	3	3	2	0	14	

Actual problems of the field (comp.part)	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Basics of Computer Science	4						4	Examination
Programming		4					4	Examination
Object Oriented Programming			4				4	Examination
JAVA Programming				4			4	Examination
Visual Programming Languages					4		4	Examination
Information Systems Analysis and Design				4			4	Examination
Case Tools					4		4	Examination
Total CP (28)	4	4	4	8	8	0	**28**	
Amount of courses	1	1	1	2	2	0	7	

Interdisciplinary aspects (comp.part)	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Fundamentals of the Latvian Language I	2						2	Test
Fundamentals of the Latvian Language II		2					2	Test
Introduction to Business			2				2	Examination
Fundamentals of Economics				2			2	Test
Basics of Information Technologies Law					2		2	Examination
Physics I	2						2	Examination
Physics II		2					2	Examination

Electronics			4				4	Examination
Labour Safety and Environment and Civil Protection	2						2	Test
Total (20)	6	4	6	2	2	0	**20**	
Amount of courses	3	2	2	1	1	0	9	

Total amount of CP in comp. part (78)	18	14	16	16	14	0	**78**	
Amount of courses in comp. part (30)	7	6	6	6	5	0	30	

Compulsory elective courses	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Fundamentals of GIS and Digital Cartography			(2)	(2)			(4)	Examination
Computer Graphics				(2)			(2)	Examination
Operating Systems		4					4	Examination
Network Operating Systems				2			2	Examination
Database Technologies					4		4	Examination
Computer Systems Hardware and Architecture	2						2	Examination
Local Area Networks Designing and Administration			4				4	Examination
WWW Technologies				2			2	Examination
Information Systems Security						(2)	(2)	Examination
Basics of Programmable Logic Controllers					(2)		(2)	Test
Mathematical modelling						(4)	(4)	Test
Introduction to computer processing of satellite images						(4)	(4)	Examination
AB SUITE programming environment						(4)	(4)	Examination
Web page programming						(2)	(2)	Examination
Total (26)	2	4	4	4	4	8	**26**	

Internship and individual work	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Internship						(8)	(8)	Defence
Bachelor paper						10	10	Defence
Total (10)	0	0	0	0	0	10	**10**	

Optional courses	**1.t.**	**2.t.**	**3.t.**	**4.t.**	**5.t.**	**6.t.**	**Total**	**Form of evaluation**
Total (6)		2			2	2	**6**	Test

Total	**20**	**20**	**20**	**20**	**20**	**20**	**120**	

PRASĪBAS ATTIECĪBĀ UZ IEPRIEKŠĒJO IZGLĪTĪBU

Tiesības studēt akadēmiskajā bakalaura studiju programmā "Datorzinātnes" ("Computer science"), kas tiek īstenota angļu valodā, ir Latvijas Republikas (LR) pilsoņiem un personām ar LR nepilsoņa pasi, kā arī personām, kurām ir izsniegtas pastāvīgās uzturēšanās atļaujas. Ārzemnieki var studēt programmā saskaņā ar LR Augstskolu likuma 83. un 85. pantu.

Programmā tiek uzņemti reflektanti, kuriem ir vispārējā vidējā izglītība vai profesionālā vidējā izglītība (3. kvalifikācijas līmenis saskaņā ar LR Profesionālās izglītības likuma 5. panta 3) apakšpunktu). Uzņemot studiju programmā, reflektantu kopējais vērtējums veidojas proporcionāli no divām daļām:

1) centralizētā eksāmena matemātikā kopvērtējuma (ja reflektants vidējo izglītību ir ieguvis LR) vai matemātikas vērtējuma noteikšanai ir jākārto Ventspils Augstskolas organizēts iestājpārbaudījums (ja reflektants vidējo izglītību ir ieguvis ārvalstīs) (50%)
2) centralizētā eksāmena angļu valodā kopvērtējuma (ja reflektants vidējo izglītību ir ieguvis LR) vai starptautiskas testēšanas institūcijas angļu valodā pārbaudījuma rezultāta (saskaņā ar MK noteikumiem Nr.543 "Noteikumi par svešvalodas centralizētā eksāmena vispārējās vidējās izglītības 5 programmā aizstāšanu ar starptautiskas testēšanas institūcijas pārbaudījumu svešvalodā"), vai angļu valodas vērtējuma noteikšanai ir jākārto Ventspils Augstskolas organizēts iestājpārbaudījums (ja reflektants vidējo izglītību ieguvis ārvalstīs un nav kārtots starptautiskas testēšanas institūcijas angļu valodas pārbaudījums) (50%).

Uzņemšanas kārtību nosaka VeA uzņemšanas noteikumi.

PIELIKUMI

1. Bakalaura studiju programmas "Datorzinātnes" (“Computer science”) īstenošanā angļu valodā iesaistītā akadēmiskā personāla saraksts ar katra docētāja apstiprinājumu īstenot minētos studiju kursus angļu valodā un apstiprinājums par B2 angļu valodas līmeņa atbilstību.
2. Bakalaura studiju programmas "Datorzinātnes" (“Computer science”) īstenošanā angļu valodā iesaistīto docētāju CV angļu valodā.
3. Studiju kursu apraksti angļu valodā Bakalaura studiju programmas "Datorzinātnes" (“Computer science”) īstenošanai angļu valodā.

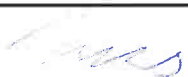
Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p. k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
1.	Gaļina Hiļķeviča	Dr. math.	Asociētā profesore, VeA	Ievēlēta	Mathematical Analysis I (*Matemātiskā analīze I*) Mathematical Analysis II (*Matemātiskā analīze II*) Mathematical Logic (*Matemātiskā loģika*) Discrete Mathematics (*Diskrētā matemātika*) Differential Equations (*Diferenciālvienādojumi*)		
2.	Juris Žagars	Dr. habyl. phys.	Vadošais pētnieks VeA IZI VSRC; Asociētais viesprofesors, VeA	Ievēlēts VeA VSRC; asociētais vies-profesors	Modeling of Chaotic Processes (*Haotisko procesu modelēšana*)		
3.	Karina Šķirmante	Mg.sc.comp.	Lektore, VeA	Ievēlēta	Data Structures and Algorithms (*Datu struktūras un pamatalgoritmi*) JAVA Programming (*Programmēšana tīmeklī (JAVA)*)		
4.	Dace Briede	Mg.sc.comp.	Vieslektore, VeA	Līgums/ vieslektore	Theory of Algorithms (*Algoritmu teorija*) Numerical Methods (Skaitliskās metodes)		

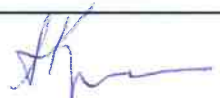
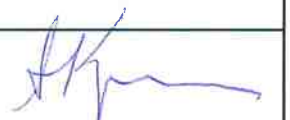
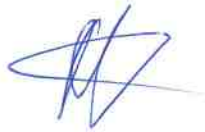
Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p. k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
5.	Jānis Vucāns	Dr. math.	Vadošais pētnieks VeA IZI VSRC; Viesprofesors, VeA	Ievēlēts VeA VSRC; vies-profesors	Optimisation Methods (*Optimizācijas metodes*)		
6.	Jeļena Mihailova	Mg.math.	Lektore, VeA	Ievēlēta	Mathematical Analysis I (*Matemātiskā analīze I*) Mathematical Analysis II (*Matemātiskā analīze II*) Linear Algebra un Analytical Geometry I (*Lineārā algebra un analītiskā ģeometrija I*) Linear Algebra un Analytical Geometry II (*Lineārā algebra un analītiskā ģeometrija II*) Mathematical Logic (*Matemātiskā loģika*) Discrete Mathematics (*Diskrētā matemātika*) Probability Theory and Mathematical Statistics (*Varbūtību teorija un matemātiskā statistika*) Differential Equations (*Diferenciālvienādojumi*)		

Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p. k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
7.	Sergejs Hiļkevičš	Dr. phys.	Profesors, VeA	Ievēlēts	Basics of Computer Science (*Datorzinātņu pamati*) Introduction to Business (*Uzņēmējdarbības pamati*)		
8.	Dmitrijs Smirnovs	Mg. soc.	Lektors, VeA	Ievēlēts	Fundamentals of Economics (*Ekonomikas pamati*)		
9.	Ilva Cinīte	Mg. phys.	Vieslektore, VeA	Līgums/ vieslektore	Physics I (*Fizika I*) Physics II (*Fizika II*)		
10.	Sintija Ozoliņa	Profesionālais maģistra grāds tulkošanā	Vieslektore, VeA	Līgums/ vieslektore	Fundamentals of the Latvian Language I (*Latviešu valodas pamati I*) Fundamentals of the Latvian Language II (*Latviešu valodas pamati II*)		
11.	Elmārs Strods	Mg. sc. ing.	Vecākais sistēmu analītiķis – konsultants, Baltic Technology Group	Līgums tiks noslēgts (vies-lektors)	AB SUITE programming environment (AB SUITE *programmēšanas vide*)		
12.	Dzalbs Jānis	Mg. sc. comp.	Vieslektors, VeA	Līgums/ vieslektors	Computer systems hardware and architecture (*Datorsistēmu arhitektūra un uzbūve*)		

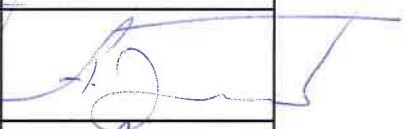
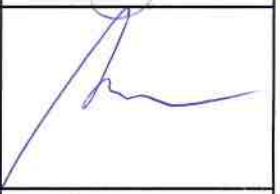
Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p.k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
13.	Aigars Krauze	Dr. sc. ing.	Docents, VeA	Ievēlēts	Electronics (*Elektronika*)		
14.	Vairis Caune	Mg.sc.comp.	Pētnieks, VeA VTPC; vieslektors, VeA	Ievēlēts Vea VTPC (pētnieks); vieslektors	Visual Programming Languages (*Vizuālās programmēšanas valodas*)		
15.	Mārcis Koloda	Mg. sc. comp.	Vieslektors, datorlaboratorijas vadītājs, VeA	Vieslektors	Designing and Administration of Local Area (*LAN projektēšana un administrēšana*) WWW Technologies (*Tīmekļa tehnoloģijas*)		
16.	Juris Roberts Kalniņš	Dr. habyl. phys.	Asociētais profesors, VeA	Ievēlēts	Mathematical modelling (*Matemātiskā modelēšana*)		
17.	Gatis Gaigals	Mg. sc. comp.	Pētnieks VeA IZI VSRC; vieslektors	Ievēlēts VeA IZI VSRC (pētnieks);	Basics of programmable logic controllers (*Programmkontrolieru pamati*)		

Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p. k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursuș angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
18.	Raita Rollande	Dr.sc.ing.	Docente, VeA	Ievēlēta	Object Oriented Modelling (*Objektorientētā modelēšana*) Information Systems Analysis and Design (*IS analīze un projektēšana*) Case Tools (*Programmu izstrādes rīki un vides*)		
19.	Estere Vītola	Mg.paed.	Lektore, VeA	Ievēlēta	Programming (*Programmēšana*) Object Oriented Programming (*Objektorientētā programmēšana*) Basics of Computer Science (*Datorzinātņu pamati*)		
20.	Gints Neimanis	Mg. soc.	Lektors, VeA	Ievēlēts	Operating systems (*Operētājsistēmas*) Network operating systems (*Tīklu operētājsistēmas*) Data base technologies (*Datu bāzu tehnoloģijas*)		
21.	Aleksandrs Sisojevs	Dr. sc. ing.	Vadošais pētnieks VeA IZI VSRC; viesdocents VeA	Ievēlēts VeA IZI VSRC (vadošais pētnieks); viesdocents	Computer graphics (*Datorgrafika*)		

Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p.k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
22.	Igors Lemberskis	Dr. sc. ing.	Vadošais pētnieks VeA IZI VSRC; viesprofesors, VeA	Ievēlēts VeA IZI VSRC (vadošais pētnieks); viesprofe-	Operating systems (*Operētājsistēmas*)		
23.	Aleksandrs Berežnojs	Dr. sc. ing.	Asociētais profesors, VeA	Ievēlēts	Information Systems Security (*IS drošība*)		
24.	Varis Vītols	Profesionālais maģistra grāds darba aizsardzībā	Vieslektors	Vieslektors	Labour Safety and Environment and Civil Protection (*Darba, vides un civilā aizsardzība*)		
25.	Linda Gulbe	Mg. sc. comp.	Lektore, VeA	Ievēlēta	Introduction to computer processing of satellite images (*Ievads satelītattēlu apstrādē*) Fundamentals of GIS and Digital Cartography (*Digitālā kartogrāfija un GIS*)		
26.	Agris Traškovs	Mg.sc.comp.	Lektors, VeA	Ievēlēts	Web page programming (WEB aplikāciju izstrāde)		

Bakalaura studiju programmas "Datorzinātnes" ("Computer Science") īstenošanā angļu valodā iesaistīto docētāju saraksts

N.p. k.	Vārds, uzvārds	Izglītība: akadēmiskais vai zinātniskais grāds	Amats, institūcija	Statuss (ievēlēts/ vieslektors utt.)	Īstenojamie studiju kursi	Paraksts par piekritību īstenot norādīto studiju kursu vai kursus angļu valodā	Paraksts par B2 angļu valodas līmeņa atbilstību
27.	Sanita Meijere	MBA	COO, SIA "PlayGineering Systems"; Vieslektore, VeA	Vieslektore	Basics of Information Technologies Law (*Nozares tiesību pamati*)		

AB Suite programmēšanas vide
(AB Suite Programming Environment)

Author	MSc, lecturer, Elmārs Strods
LAIS course code	
Form of evaluation	Exam
Academic credit points (ECTS credit points)	6 ECTS
The total number of contact lessons	64
The number of lectures	16
The number of practical classes	48
Prerequisites	English, some initial experience using Microsoft Visual Studio and SQL Server Management Studio
Part of the study programme	General education study courses

Study course objective

The study course objective is to give an initial overview of the Agile Business Suite programming environment that included the software environment for development and operation of computer-based information systems that model actual business systems. AB Suite System Modeler and Runtime are using Visual Studio .NET, SQL Server, .NET Framework on Windows.
The course provides training in the following areas:

- AB Suite philosophy and concepts;
- introduction to System Modeler;
- modes of operation;
- development environment and structure;
- system data items and attributes;
- logic commands;
- tools.

Study results

Having acquired the study course, a student:

- Is capable of AB Suite technology to develop, deploy and operate small to very high-volume, transaction-based user applications that are responsive to business change
- Is able to use System Modeler Environment, programming language, debugger and testing possibilities as well as evaluate and make the decisions related to the implementation and usage of systems.

Organization mode of students' individual work

The independent work of students include:

- a regular learning of the course by using lecture materials, study literature, internet resources,
- homework assignment completion,
- course paper development,
- preparations for the tests and exams.

Evaluation of study results

The end result is made of:

- Laboratory works 30%
- Performance in classes 10%
- Exam 60%

Study course outline

No.	Title of the topic
1.	What is Developer?
2.	Using the model
3.	Using folders and dictionaries
4.	Introducing classes
5.	Testing your forms
6.	Defining events
7.	Introducing the runtime cycle
8.	Defining logic
9.	Controlling the runtime cycle
10.	Designing user interfaces
11.	Debugging your application
12.	Errors and feedback
13.	Simple data manipulation
14.	Using methods
15.	Using vanilla classes
16.	Defining profiles
17.	Advanced data manipulation
18.	Developing reports
19.	Developing advanced reports
20.	Designing user interfaces (Advanced)
21.	Using session-persistent attributes
22.	Deploying your application
23.	Introduction to Automated Test Tool

Study course schedule

No. of the class	Title of the topic	Type of class (lectures, seminars, practical classes, laboratory work), amount of academic hours
1.	What is Developer? Using the model Using folders and dictionaries Introducing classes Testing your forms Defining events Introducing the runtime cycle Defining logic Controlling the runtime cycle Designing user interfaces Debugging your application Errors and feedback Simple data manipulation Using methods	Lectures, 8
2.	Using vanilla classes Defining profiles Advanced data manipulation Developing reports Developing advanced reports Designing user interfaces (Advanced) Using session-persistent attributes Deploying your application Introduction to Automated Test Tool	Lectures, 8
3.	What is Developer? Using the model Using folders and dictionaries Introducing classes Testing your forms	Laboratory work, 8
4.	Defining events Introducing the runtime cycle Defining logic Controlling the runtime cycle	Laboratory work, 8
5.	Designing user interfaces Debugging your application Errors and feedback Simple data manipulation	Laboratory work, 8
6.	Using methods Using vanilla classes Defining profiles Advanced data manipulation	Laboratory work, 8
7.	Developing reports Developing advanced reports Designing user interfaces (Advanced)	Laboratory work, 8

No. of the class	Title of the topic	Type of class (lectures, seminars, practical classes, laboratory work), amount of academic hours
8.	Using session-persistent attributes Deploying your application Introduction to Automated Test Tool	Laboratory work, 8

Basic literature

- Agile Business Suite Getting Started with Developer Student Workbook 4725 9197-011 December 2016

Supplementary literature

- Agile Business Suite Programming Reference Manual 3826 5849-007 December 2016
- Agile Business Suite Developer User Guide 3826 5823-008 December 2016
- Agile Business Suite Developer User Guide-Revision A-Appendix A 3826 5823-008 December 2016
- Agile Business Suite Client Framework Programming Reference Manual 8230 0823-001 December 2016
- Agile Business Suite Component Enabler User Guide 3826 5872-008 December 2016

Other source of information

- http://www.unisys.com/

Theory of Algorithms

Author	Mg. Sc. Comp. D. Briede
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 KP (ECTS 3 KP)
Prerequisites	Mathematics, Computer Science Basics

Objective
The aim of the course is to introduce students to the most important properties of algorithms, complexity analysis and algorithm design techniques.

Learning outcomes
Upon successful completion of the course, the student will be able to select or create the most appropriate algorithm for a task, to analyze and evaluate the effectiveness of the algorithm.

Organization mode of students individual assignment
Systematic work during semester includes:

- regular learning using lecture materials, literature, internet resources,
- completion of home assignments,
- preparation for the exam,

weekly teacher consultations.

Evaluation of learning outcomes
Course assessment consists of two parts:

- average grade for the home assignments (30% of total grade)
- exam grade (70% of total grade)

During the semester students have to take two tests. If the result of each test is 7 or higher, the student can choose not to write the exam. In this case exam grade is replaced by the average grade for tests.

Course outline

1. **The concept of an algorithm.** Historical introduction. Formal definition of the algorithm. Expressing algorithms. Important problem types.
2. **Properties of algorithms.** Effectiveness, correctness, finiteness/termination, efficiency, complexity, clearness
3. **Mathematical fundamentals.** Role of mathematics in analysis of algorithms. Finite and infinite series. Theorem of geometric series, examples of its use. Logarithm, power, exponent. Function dominance, theorem of dominance. Concept of order of function. Limit – upper bound, lower bound. Order of function, comparison of different orders of functions. Asymptotic notations.
4. **Analysis of algorithm complexity**. Concept of order of growth. Basic efficiency classes (1, log(N), N, Nlog(N), N^2, N^3, 2^N). Mathematical induction. Recurrences.
5. **Recursive algorithms.** Recursive definition. Indirect recursion. Backtracking. Recursion tree. Mathematical analysis of recursive algorithms.
6. **Algorithm design techniques**. Brute force algorithms and exhaustive search. Divide and conquer. Dynamic programming. Greedy technique. Examples of different problems and algorithms

Week	Topic and subtopic	**Type** (lecture, seminar, laborato work)
1.-2.	The concept of an algorithm. Expressing algorithms. Properties of algorithms. Important problem types.	Lecture, seminar.
3.-4.	Problem of choosing an algorithms, cost of an algorithm. Analysis of algorithms. Concept of order of growth. O-notation, Ω-notation, Θ-notation. Basic efficiency classes.	Lecture, seminar.
5.-6.	Asymptotic notations. Using limits for comparing orders of growth. Recursive definition, recursion and mathematical analysis of recursive algorithms.	Lecture, seminar.
7.	First test	Test
8.-9.	Algorithm design techniques. Brute force and exhaustive search. Solving different problems by brute force method, examples of algorithms.	Lecture, seminar.
10.	Divide-and-conquer, examples of different problems and algorithms.	Lecture
11.	Decrease-and-conquer, examples of different problems and algorithms.	Seminar
12.-13.	Dynamic programming, examples of different problems and algorithms.	Lecture, seminar.
14.	Greedy technique, examples of different problems and algorithms.	Seminar
15.	Second test.	Test
16.	Sorting algorithms, their comparison.	Seminar

Basic literature

1. Anany Levitin, *Introduction to the Design and Analysis of Algorithms (3rd Edition)*

Supplementary literature

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, *Introduction to Algorithms*, The MIT Press, 2001.
2. Adam Drozdek, *Data Structures and Algorithms in C++*, *Second Edition*, Course Technology, 2000.
3. Douglas Baldwin, Greg W. Scragg, *Algorithms and Data Structures, The Science of Computing*, Charles River Media, 2004.
4. J. Kopitovs, S. Ivanova, *Datu struktūras un algoritmi: mācību grāmata., Rīga: Transporta un sakaru institūts, 2005*
5. А. В. Ахо, Д. Э. Хопкрофт, Д. Д. Ульман, *Структуры данных и алгоритмы,* Издательский дом «Вильямс», 2003
6. Н. Вирт, А*лгоритмы и структуры данных*, Невский диалект, 2008.
7. Robert L. Kruse, Alexander J. Ryba, *Data Structures and Program Design in C++,* Prentice Hall, 2000.

Software Development Tools and Environment

(CASE TOOLS)

Author	Dr.sc.ing., assistant professor Raita Rollande
LAIS code	
Form of evaluation	Exam, practical work
Credit point (ECTS credit points)	4 KP (6 ECTS)
Prerequisites	Programming, Database Technology, Information Systems Analysis and Design
Course group	Fundamental Principles
Objective	Purpose of the course is to introduce students to several wide used CASE tools, their application facilities in several software development life cycle phases and to acquire practical skills in software development tools.

Learning outcomes

- Understand the software development tools and environment role in system development.
- Be able to use a variety of software development tools for the software development life cycle.
- Obtain comprehensive knowledge of software development tools and environment usage.
- Be able to use project management, organizational analysis, business process analysis, database design, software testing tools, data warehouse design and costing software tools.
- Be able to choose an appropriate tool to automate the software development process.

Organization mode of students` individual assignment

- Practical works. A student on each topic executes laboratory work, which should be defended.
- Preparation for the exam.

Evaluation of learning outcomes

Practical works (60%); Exam (40%)

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Software development tools and environments. Explanation of CASE tools concepts. Advantages and disadvantages of using tools. General description of software development tools. Conceptual fundamental of CASE technologies. Tools evolution, model of the	Lecture

	software life cycle, tools content, structure and functional features. Software development project tools. General project management tools - *Microsoft Project, Microsoft Visio, Workbench, etc*.	
1.	Project management tool *Microsoft Project* in project management.	Practical lesson
2.	Project management tool *Microsoft Project* in project management using Waterfall and Agile project design method. IT project management tools - *Jira, Microsoft Visual Studio.*	Lecture
2.	IT project management tools - *Microsoft Project, Jira, Microsoft Visual Studio.*	Practical lesson
3.	CASE tools for Information Systems development. Classification of CASE tools. CASE tools classification by type, categories, and levels. Recently used CASE tools and their usage in several stages of software development.	Lecture
3.	1st practical work. Usage of IT project management tool in Agile project management.	Practical lesson
4.	CASE tools for diagram modelling. Entity Relationship Diagram – ERD, Data Flow Diagram - DFD, Work Flow Diagram - WFD, Organization Chart - ORG, Business Process Diagram – BPD.	Lecture
4.	2nd practical work. Student presentations about IT project management tools' functionality analysis.	Practical lesson
5.	Tools for Entity Relationship Diagram. Data base design tools, the tool options. The conceptual data model and physical data model. Code generation. Reverse engineering.	Lecture
5.	2nd practical work. Student presentations about IT project management tools' functionality analysis.	Practical lesson
6.	Data base design tools *Power Designer, ToadData Modeler* options in data base design.	Lecture
6.	3rd practical work. Diagrams: Organization Chart, Entity Relationship Diagram, Work Flow.	Practical lesson
7.	Business Process Modelling Language standard. Business Process Modelling Language notation (BPMN). BPMN tools.	Lecture
7.	4th practical work. Students' presentation about data base design tool *Power Designer and ToadData Modeler* usage in data base design.	Practical lesson
8.	Business Process Modelling. Business Process Modelling diagrams. *Grade* tool. Business Process Modelling language GRAPES-BM.	Lecture

8.	Practical work with business process modelling tool *Grade*.	Practical lesson
9.	Business process modelling tools *Bizagi* and *ArisExpress* for business process modelling using BPMN.	Lecture
9.	Business process modelling with tools *Bizagi* and *ArisExpress.*	Practical lesson
10.	Data Warehouse Design. Data warehouse structures. Data Warehouse design. Data Online Analytical Processing (OLAP). Cube structure. Cube creation using external data sources, query, multiple data sources.	Lecture
10.	5th practical work. Business process modelling with tools *Bizagi* and *ArisExpress.*	Practical lesson
11.	Business intelligence tools, retrieving data from different data sources and processing. Simple and complex report creation. *Crystal Report* and *MS Excel* business intelligence tools, dashboard development.	Lecture
11.	Practical work with business intelligence tools: retrieving data, data analysis and output.	Practical lesson
12.	Prototyping tools for a simple and interactive prototyping.	Lecture
12.	6th practical work. Business intelligence tools.	Practical lesson
13.	Automated generation of user interface. Applications frameworks of data-driven user interface generation. Data model specification. Analysis of application framework. Application framework comparison. Other applications frameworks.	Lecture
13.	7th practical work. Prototyping tools: *Lumzy, Pencil*, *Justinmind prototyping*, *Balsamiq Mockups*, *InVision, Marvel.*	Practical lesson
14.	Automated generation of user interface. Applications frameworks of data-driven user interface generation. Data model specification. Analysis of application framework. Application framework comparison. Other applications frameworks.	Lecture
14.	Automated generation of user interface with *LightSwitch*.	Practical lesson
15.	Software cost assessment tools. General review of *s* tools.	Lecture
15.	8th practical work. Automated generation of user interface with *LightSwitch*.	Practical lesson
16.	Software testing and debugging tools. Test modelling tools, GUI test driver and get/perform again tools, loading and performance tool, Non-GUI test drivers and test managers, other test implementation tools, test evolution tools, static analyze tools, defect tracing tools, Website test tools, their description. Summary.	Lecture
16.	9th practical work. Software cost assessment tools.	Practical lesson

Basic literature

1. Bārzdiņš J., Tenteris J., Viļums Ē., Biznesmodelēšanas valoda GRAPES – BM 4.0. un tas lietošana. Rīga:Dati, 1998.
2. T. C. Lethbridge and R. Laganiere, Object-Oriented Software Engineering: Practical Software Development using UML and Java, McGraw-HiH, 2002
3. William R. Duncan. A Guide to the Project Management Body of Knowledge, Project Management Institute, 1996.
4. http://www.cigital.com/marick
5. http://www.citforum.ru
6. http://www.c-sharpcorner.com/UploadFile/nipuntomar/7002/
7. http://www.gradetools.com/grade40/gramata/bmv.htm
8. http://www.msproject.com/
9. http://www.npd-solutions.com/case.html
10. http://www.osiris.sunderland.ac.uk/sst/casehome.html
11. http://www.processimprovement.com/case_list.html
12. http://www.selectbs.com/analysis-and-design/select-architect
13. http://www.softstarsystems.com/
14. http://www.softwareqatest.com/qatfag1.html
15. http://www.spc.ca/products/estimate/
16. http://www.spr.com/
17. http://www.theecommercesolution.com/usefull_links/case_tools.php

Supplementary literature

Other sources of information

Labour Safety, Environment and Civil Protection

Author	Lecturer, Master of Environmental sciences, doctor of chemical sciences Ilga Zīlniece Lecturer, Master of Labor Protection. Varis Vītols
Course Code	
Form of evaluation	Test
Credit point (ECTS credit points)	2CP (3 ECTS points)
Prerequisites	-

Objective

1. The objective of this course is to provide knowledge of any possible work environment risks, work environment conditions harmful for health and special conditions which may affect a worker's safety and health during performance of work and possible impacts on people as a result of their influence. To maintain systematic perception to help evaluate risks in human life and health (social) aspect.
2. The objective of this course is to provide knowledge about the possible disasters and industrial accidents caused by nature and human activity. To maintain systematic perception to help evaluate risks in both human life and health (social) and destruction or damage of material values (material), and also environmental influence (ecological) aspects.

Learning outcomes

Labour protection

As a result of the course, the student acquires the skills in working with normative acts, can practically apply the labour protection activity plan development technology, calculation of evacuation exit number and time, applying risk evaluation methods, and also can define work environment conditions harmful for health and necessary protection activities to prevent their influence.

Environment

Students are able to characterize the impact of human activity on the environment, explain the type of impacts, formulate the nature of the problems, the evaluation and research possibilities, be able to formulate attitudes and actions for solving environmental issues and choose the appropriate strategies and actions. Able to recommend examples for better and practical analysis of the influence of various factors (legislation, decision-making, production, economy, public environmental awareness) and solutions for environmental protection and preservation of nature's quality. Able to critically analyze the causal relationships of environmental problems, apply systemic thinking.

Civil protection

As a result of the course, the student acquires the skills in working with normative acts, can practically apply the civil defence calculation technology, evaluate the object in the context of civil defence planning criteria, and develop a merchant civil defence plan.

Organization of students individual assignment

1. Studying the typical documentation regarding planning, health check, training, and risk determination, the documentation on environmental quality and environmental impact assessment, the merchants, institution and organization, and also self-government civil defence plan development technology.

2. Studying the risk evaluation methods, human impact to the environment, specially protected natural values, analysis of technogenic (man-induced) and natural disasters occurred in Latvia.

3. Studying the normative acts.

4. Studying the theoretical literature.

5. Preparing for the final test.

Evaluation of learning outcomes

Lecture attendance shall be at least 75% of total attendance; successfully passed final test at the end of the course

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, practice, laboratory work)
	Labour protection	
1	National labour protection policy and responsibility, the risk factors of work environment, special conditions. Negative impacts of work environment	Lecture, Practice
2	The risk factors of work environment, special conditions. Training in labour protection issues Internal supervision of work environment, health checks due to risks in work environment	Lecture, Practice
3	Work equipment, the basics of work place setup, work with workstation display. Safety signs on workplaces. Individual protection equipment, collective protection measures	Lecture, Practice

4	Work environment risk factor evaluation. First aid in case of work accident. Investigation and recording of work accidents	Lecture, Practice
	Environment	
5	Environmental science, environmental policy, legislative acts and international co-operation Natural resources and nature conservation	Lecture, Practice
6	Environmental sectors and pollution , industrial pollution, hazardous chemicals and operations with them	Lecture, Practice
7	Climate change and sustainable development, continuity and evaluation	Lecture, Practice
8	Environmental management systems	Lecture, Practice
	Civil protection	
9	Legislative acts regulation of civil defence, objectives and rights in civil defence	Lecture, Practice
10	Civil defence plan.	Lecture, Practice
11	Objects of increased danger.	Lecture, Practice
12	First aid.	Lecture, Practice
13	Evacuation activities.	Lecture, Practice
14	Analysis of easy detaching constructions in A and B category premises. Fire-fighting activities and equipment, calculation of number.	Lecture, Practice
15		
16	Internal, regional and national disasters. Emergency management, restriction of personal rights and freedoms, property involvement in response.	Lecture, Practice

Literature

Labour protection

Basic literature

1. Darba apstākļi un veselība darbā. – Rīga: LR Labklājības ministrija, 2004. – p. 148
2. Darba drošība. – Rīga: LR Labklājības ministrija, 2003. – p. 288
3. Darba higiēna. – Rīga: LR Labklājības ministrija, 2003. – p.160
4. Darba vides risku novērtēšana / V.Kaļķis, I.Kristiņš, Ž.Roja. – Rīga: Latvijas universitāte, 2003. – p. 62
5. Ergonomikadarbā. – Rīga: LR Labklājībasministrija, 2004. – p. 176
6. Psihosociālādarba vide. – Rīga: LR Labklājībasministrija, 2003. – p.140
7. Darbavidesriskafaktoriunstrādājošoveselībasaizsardzība / V.KaķļaunŽ.Rojasredakcijā. Rīga: Elpa, 2001.- p. 500
8. Darba vides risku novērtēšanas metodes / V.Kaļķis. Rīga: Latvijas Izglītības fonds, 2008.- p. 242

Supplementary literature

1. Ar displeju izmantošanu saistīto risku novērtēšanas un novēršanas vadlīnijas. Rīga: Labklājības ministrija 2003, p. 48.
2. Darba aizsardzības likuma vadlīnijas. Rīga: Labklājības ministrija 2003, p. 52.
3. Darba vides iekšējās uzraudzības vadlīnijas. Rīga: Labklājības ministrija 2003, p. 42.
4. Vadlīnijas darba vides riska novērtēšanai mazajos un vidējos uzņēmumos. Rīga: Labklājības ministrija 2003, p. 36.
5. Ar displeju izmantošanu saistīto risku novērtēšanas un novēršanas vadlīnijas. Rīga: Labklājības ministrija 2003, p. 48.

Other sources of information

1. http://www.vdi.gov.lv

Environment

Basic literature

1. Vide un ilgtspējīga attīstība. M. Kļaviņa un J. Zaļokšņa redakcijā. LU Akadēmiskais apgāds. Rīga, 2010.
2. Vides zinātne. M. Kļaviņa redakcijā. LU Akadēmiskais apgāds. Rīga, 2008.
3. Environmental Science (L.Ryden, P.Migula, M.Anderssoneds.). Baltic University Press: Uppsala, 2003.
4. Botkin D. B., Keller E. A. Environmental Science: Earth as living planet. 5th ed. J.Wiley: NY, 2004.

Supplementary literature

1. Kļaviņš M., Zaļoksnis J. Ekotoksikoloģija, Elpa: Rīga, 2005.
2. Kļaviņš M.Vides piesārņojums un tā iedarbība. LU Akadēmiskais apgāds, Rīga, 2009. Blumberga A., Blumberga D., Kļaviņš M., Rošā M., Valtere S. Vides tehnoloģijas. LU Akadēmiskais apgāds, Rīga, 2010.
3. Melecis V. Ekoloģija. LU Akadēmiskais apgāds, Rīga, 2011.
4. Atstāja D., Dimante D., Brīvers I., Malzubris J., Tambovceva T., Keneta M Vide un ekonomika. LU Akadēmiskais apgāds, Rīga, 2011.
5. Zaļoksnis J., Kļaviņš M., Brikše I., Meijere S. Vides vadība. LU Akadēmiskais apgāds, Rīga, 2011.
6. Dabas aizsardzība. Red. O. Nikodemus, G. Brumelis. LU Akadēmiskais apgāds, Rīga, 2015.
7. Kļaviņš M, Cimdiņš P. Ūdeņu kvalitāte un tās aizsardzība, LU: Rīga, 2003.
8. Meadows D.H., Meadows D.L., Randers J. Beyondthe limits. Chelsea Green Publishing Co., Post Mills, USA, 1992. Tulkojums latviešu valodā –Zaļoksnis J. Pārsniedzot robežas. LU, Rīga, 1995.
9. Elmar Römpczyk. Gribam ilgtspējīgu attīstību. Friedrich-Ebert-Stiftung, Rīga, 2007.

Other sources of information

1. Environmental Science and technology: http://pubs.acs.org/journals/esthag
2. Journal of Environmental Protection http://www.scirp.org/journal/jep/
3. American Journal of Environmental Protection http://www.sciencepublishinggroup.com/j/ajep
4. Environment Protection Engineering http://www.journals4free.com/link.jsp?l=1725683

5. Journal of Environmental Sciences www.sciencedirect.com/science/journal/10010742
6. www.varam.gov.lv

Civil protection

Basic literature

1. V. Jemeļjanovs, J. Sulojeva*Civilā aizsardzība*. Part 1. - Rīga: RTU Izdevniecība, 2012. – p. 68
2. Petere G., Voronova I., *Riski uzņēmējdarbībā un to vadība*,- Rīga, Apgāds Rasa ABC, 2003. – p. 175
3. MethodologyRegulations*Civilās aizsardzības pasākumu plāna izstrādei*,- Rīga, VUGD, 2001.
4. Ilvess G., *Katastrofas, kas satricināja pasauli*, Part 3, - SIA Lauku avīze, 2001. – p. 240
5. Ilvess G., *Katastrofas, kas satricināja pasauli*, Part 4, - SIA Lauku avīze, 2002. – p. 256

Supplementary literature

1. Civil Defence and Emergency Management Law, 05.05.2016.,
2. Labor Protection Law, 20.06.2001 with amendments to 16.12.2004.,
3. Fire Safety and Fire-Fighting Law, 24.10.2002 with amendments to 01.10.2006.,
4. Law on Radiation and Nuclear Safety, 26.10.2000 with amendments to 23.02.2005.,
5. Epidemiological Safety Law, 11.12.1997 with amendments to 05.10.2007.,
6. LR Cabinet Regulation No. 532 of 19.07.2005 „Regulations regarding the Procedures for Industrial Accident Risk Assessment and Risk Reduction Measures",
7. LR Cabinet Regulation No. 626 of 18.09.2007 „Regulations Regarding Criteria for the Specification of Objects of Increased Danger and the Duties of the Owners (Possessors, Managers) of Such Objects for Ensuring Measures for Reduction of Risk",
8. LR Cabinet Regulation No. 423 of 26.06.2007 „Order How Development and Approval of Civil Protection Plan and Its Structure Is Made for Self-governments, Merchants and Institutions",
9. LR Cabinet Regulation No. 238 of 19.04.2016 „Fire Safety Regulations",
10. 1LR Cabinet Regulation No. 530 of 07.08.2007 „Order How Civil Defence Alarming Systems Are Developed, Used and Financed",
11. 1LR Cabinet Regulation No. 668 of 11.09.2007 „Regulations Regarding First Aid Training Course Programme, and the Minimal Amount of Medical Materials and Medicinal Products Intended for the Provision of First Aid",
12. 1LR Cabinet Regulation No. 318 of 31.10.1995 „Regulations Regarding Construction Standard LCS 201-96 "Fire Safety Standards"", 31.10.1995 with amendments to 25.02.2004,
13. LR Cabinet Regulation No. 400 of 03.09.2002 „Labour Protection Requirements for Use of Safety Signs",
14. LR Cabinet Regulation No. 674 of 03.08.2004 „Regulations regarding Explosive, Fire-Hazardous and Particularly Important Objects wherein Fire Safety, Fire-fighting and Rescue Services shall be Established",
15. LR Cabinet Regulation No. 300 of 10.06.2003 „Labour Protection Requirements for Work in Explosive Environment".

Other source of information

1. http://www.vugd.gov.lv

Computer Graphics

Author Dr.sc.ing. Aleksandrs Sisojevs
Course Code
Form of evaluation Exam
Credit point (ECTS credit points) 2 KP (ECTS 3 points)
Prerequisites Programming

Objective
The course goal to provide theoretical and practical knowledge of the current and modern computer graphics technology. To learn the practical skills of computer graphics methods and algorithms use.

Learning outcomes
To acquire the main theoretical methods and basic algorithms of computer graphics. Acquire skills for practical implementation of computer graphics methods based on graphic library OpenGL. Obtain the ability to use theoretical knowledge in a specific task for it solving.

Organization mode of students individual assignment
Study project: self – dependent development of interactive 3D computer graphics application (geometric modeling editor, emulator, game, etc.).

Evaluation of learning outcomes
Exnam: 40%
Project: 60%
Total: 100%

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1	**Colors.** Colours physics and psychophysics. The light, the light spectrum. The eye structure. Colours reception. Colour models RGB, CMY / CMYK, HSV / HSL, PANTONE and their application.	1 lecture
2-3	**Basic concepts of 2D graphics**. Raster graphics and vector graphics. Raster image. Graphical primitives. Line drawing algorithms: direct coordinate computation, Bresenham's line algorithm. Circle and elliptical lines drawing.	1 lecture, 1 practical work
4	**The drawing of figures and flood fill algorithms.** Figures concept. Flood fill algorithm from the internal point. Flood fill algorithm with lines. Flood fill algorithms based on mathematical description of contour. Rectangular spray painting. Circle painting. Polygon painting. Landfill spray painting. Line style and brush. Thick line drawing algorithm. Dotted line drawing algorithm	1 lecture

5-6	**Coordinate systems.** Cartesian coordinate system. Left and right coordinate system. Transformation of coordinates. Affine transformation on plane. Parallel movement of coordinates. Coordinate compression / stretching. Rotation. 3D affine transformation. 3D coordinate movement, compression, rotation. Objects affine transformations on plane and 3D space.	1 lecture, 1 practical work
7-8	**Graphical projection.** Projection methods: parallel projection, the central projection. World coordinates. The image coordinate system. Plane of projection. Viewing angle. Display on screen. Scene position.	1 lecture, 1 practical work
9-10	**3D graphics basic definition.** Analytical models. Vector polygons (polygonal) model. Voxel model. Vertex. Line. Landfill. The level of detail (LOD). Surface description methods. Uniform mesh. Non-uniform mesh.	1 lecture, 1 practical work
11-12	**OpenGL.** OpenGL transporters. Libraries. Files. Command structure. Structure of the program. Graphical primitives. Animations principles OpenGL environment. Color installation. RGBA and index colors. Primitive drawing. Coordinate System Management. OpenGL transporter position management. Vertex arrays. Faces breaking to triangles. Scenes forming and management. Model - view transformation. Projection management. Views window description. Matrix stack. Chipping planes.	1 lecture, 1 practical work
13-14	**Lighting modeling.** 3D scene lighting model. Phong reflection model. Blinn – Phong model. Diffuse, specular and ambient lighting components. Plane shading. Gouraud and Phong shading.	1 lecture, 1 practical work
15	**Visibility problem in 3D computer graphics**. Painter's algorithm. Z - buffer algorithm. Weiler–Atherton clipping algorithm. Warnock algorithm.	1 lecture
16	**OpenGL.** Working with buffers. Z-buffer. GLUT library use. Figures fulfilling painting and work with lighting. Normal vectors. Mixing (Blending). Antialiasing. Fog. Display lists. Pixels, fonts and image output. Texturing.	1 practical work

Basic literature

1. D.Hearn, M.Pauline-Baker. Computer Graphics. 4th Edition, Prentice-Hall, Inc., 2010.
2. D.F. Rogers, J.A. Adams Mathematical Elements for Computer Graphics: 2nd Edition, McGraw-Hill Science, 1989.
3. D.F. Rogers, Procedural elements for computer graphics: 2nd Edition, McGraw-Hill Science, 1998.
4. R. Wright, B. Lipchak, N. Haemel OpenGL SuperBible: Comprehensive Tutorial and Reference: 4th, Addison-Wesley, 2007.

Supplementary literature

1. Т. Девис, Дж. Нейдер, Д. Шрайнер OpenGL. Руководство по программированию. Библиотека программиста. 4 издание. – СПб.: Питер, 2006.

2. М. Краснов: OpenGL. Графика в проектах Delphi, . Серия "Мастер". - СПб.: BHV-Санкт-Петербург, 2002.

Other source of information

1. Official Website of OpenGL: https://www.opengl.org/

Computer Systems Hardware and Architecture

Author	mg. sc. comp. Jānis Dzalbs
Course code	
Form of evaluation	Exam
Credit point (ECTS credit points)	2 CP (3 ECTS)
Prerequisites	Not have
Objective	Provide knowledge of modern computer system hardware architecture and design, as well as to prepare students for practical work.
Learning outcomes	Students acquire theoretical knowledge and practical skills about computer equipment, installation, replacement, configuration and testing.

Organization mode of students individual assignment

1. Students' independent work with literature in addition to the acquisition of theoretical material.
2. Individual work with laboratory work result processing and evaluation.

Evaluation of learning outcomes

1. During semester student must have successfully work and defend laboratory works.
2. During semester student need to write and present report
3. During semester student need to pass theoretical knowledge test
4. In exam of course need to get positive mark

Course outline

Week	Topic and subtopic	**Type** (lecture, seminar, laboratory work)
1.	Information on the training process. Information processing systems architecture and classification.	Lecture, laboratory work
2.	Architecture of portable computer	Laboratory work
3.	Motherboard structure and principles of operation, operative memory structure and principles of operation, the hard disk structure and operating principles	Lecture, laboratory work
4.	Architecture of stationary computer	Laboratory work
5.	Intel processor family, AMD processor family, ARM processor family	Lecture, laboratory work
6.	Cloning of hard disk data	Laboratory work
7.	NVIDIA video cards, AMD video cards, extension cards	Lecture, laboratory work

8.	Installing of operating system	Laboratory work
9.	External storage media, input devices, input and output ports	Lecture, laboratory work
10.	Testing of computer	Laboratory work
11.	Monitors, printers and scanners	Lecture, laboratory work
12.	Recover of deleted data on hard disk	Laboratory work
13.	Smartphones, tablets and smart devices, game consoles, drones	Lecture, laboratory work
14.	Creating computer network between two computers	Laboratory work
15.	Knowledge test	Lecture
16.	Computer hardware design according to objective	Laboratory work

Basic literature

1. E.Ginters *Logistics Information Systems (2 Parts).* Jumi Ltd., Riga, 2002, ISBN 9984-30-021-8, 380/302 p.
2. Scott William Mueller, *Mueller Technical Research* Upgrading and Repairing PCs, 20/E
   ISBN-10: 0789747103, ISBN-13: 9780789747105
3. Скотт Мюллер (Scot Mueller). Модернизация и ремонт ПК, 16-е издание. Издательский дом "Вильямс" 2006.g. 1318 lpp.; ISBN 5-8459-0819-1,
4. Гук М. *Аппаратные средства IBM PC. Энциклопедия.* Издательский дом «Питер», ISBN 5-88782-290-2, 816 с. с ил.
5. Douglas E. Comer, Ralph E. Droms. *Computer Networks and Internets, with Internet Applications.* Prentice Hall, ISBN: 0130914495, 3rd edition (February 15, 2001), 720 pages.
6. Rosenthal M. *Build Your Own PC.* McGraw-Hill Professional Publishing; ISBN: 0072124679, 2nd edition Vol 2 (August 25, 2000), 223 pages.

Supplementary literature

Will be useful any textbook about computer and personal computer architectures

Other source of information

On this topic the available sources of information on the Internet

BASICS OF COMPUTER SCIENCE

Author	Prof., Dr. phys. Sergey Hilkevich
Course code	
Form of evaluation	examination
Credit points (ECTS)	4 credits (ECTS 6 credit points)
Prerequisites	No any prerequisites

Objective

The main purpose of the course is to provide students in fundamental knowledge in algorithm theory and relation of theory with computer hardware and software, the foundations of programming.

Learning oucomes

Knowledge

The understanding of fundamental principles of algorithm theory and abstract machines;
The understanding of algorithm realization using real computers;
The understanding of formal languages theory;
The understanding of foundations of compilation theory;

Abilities

Ability to use different descriptions of algorithms;
Ability to use programming tools for programmes creation;
Ability to formulate and solve problems in algorithm theory implementations;

Evaluation of learning outcomes: All practical works performing. Examination positive result.

Course outline

Week	Topic and subtopic	Type (lecture, seminar, laboratory work)
1	**The introduction in algorithm theory**. The history of algorithm. The first definition of algorithm. The Leibnitz problem. The second definition of algorithm. The third definition of algorithm. The Turing machine (TM). The simple TM example.	Lecture, seminar

2	The complicated TM example. The combination of Turing machine algorithms. The fourth definition of algorithm. The Post machine. The emulation of PM with TM and TM with PM. TM and PM equivalence.	Lecture, seminar
3	**Abstract calculating machines and computers.** Von Neumann machine. The von Neumann machine's working cycle. Von Neumann and PM machines equivalence. The realisation of von Neumann machines with physical devices.	Lecture, seminar
4	**Computer architecture.** The field MDS transistor. The dynamic memory element. The complement transistor pair. Trigger. Static memory element	Lecture, seminar
5	Switch. Decoder. Memory module K537RU1. Random access memory element. Read only memory.	Lecture, seminar
6	Programmed logical matrix. Arithmetical logical unit. Processor. The minimal assembler for von Neumann machine. Micro commands and micro codes. Assembler.	Lecture, seminar
7	Markov's algorithms. Markov normal algorithm. The application of Markov algorithm to the word. MA examples. MA self-applicability.	Lecture, seminar
8	The theorem about the Markov algorithm self-applicability identification problem algorithmic insolvability. The sequences from the theorem.	Lecture, seminar
9	**Formal grammars.** Languages and grammars. The languages classification according to Homsky. Example from natural languages. The language syntax and semantics.	Lecture, seminar

10	Example of formal grammars – arithmetic. Backus normal forms. Backus normal forms for programming language Pascal.	Lecture, seminar
11	**Foundations of compilation theory.** Lexical analysis. Syntax analysis. Syntax graph creation. Object code generation. The fifth definition of algorithm. The relations between algorithm theory and programming languages. The sixth definition of algorithm.	Lecture, seminar
12	Algorithms and data structures. Data structures. Classification of algorithms structures. Searching algorithms. Searching of element.	Lecture, seminar
13-15	Binary searching. Substring searching. Array sorting algorithms. Arrays and files sorting. Lists. Trees.	Seminar, laboratory work
16	The review of the course results. Sequences.	

Basic literature.

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest. Introduction to algorithms, MIT Press, 2001.
2. N. Wirth. Algorithms and Data structures. 2010.

Supplementary literature

1. D.Reed. Balanced Introduction to Computer Science, Prentice Hall, 2007.
2. K Sinha. Computer Fundamentals: Information Technology, Fourth Edition, Pradeep Preeti, 2010
3. J. Glenn Brookshear. Computer Science. Addison Wesley, 2000.

Database Technologies

Author	**Mg. soc. G. Neimanis**
Course Code	
Form of evaluation	**Exam**
Credit point (ECTS credit points)	4 (6 ECTS)
Prerequisites	Basic computer skills
Objective	The aim of this course ir to provide knowledge about database management systems, their history, architecture, usability, exploitation as well as to acquire practical skills in creation of databases through practical project.
Learning outcomes	Understanding of databse types, objects. Skills to normalize data, use SQL for data manipulation and data definition. Understanding and skills to use views, transactions, stored procedures and triggers.

Organization mode of students individual assignment
Regular studies of course material, literature and online resources; homework assignments and development of course project; consultations with lecturer.

Evaluation of learning outcomes
Course project – 50%.
Final exam - 50%;

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1 - 2	DBMS history, types.	Lecture and seminars
3 - 4	Database design and database objects (tables, relations, keys, indexes).	Lecture and seminars
5 - 6	Data normalization	Lecture and seminars
7 - 8	SQL. DML usage	Lecture and seminars
9 - 10	SQL. DDL and account management commands	Lecture and seminars
11 - 12	Views and transactions. ACID	Lecture and seminars

13 - 14	Stored procedures, triggers	Lecture and seminars
15 - 16	Course project presentations	Seminars

Basic literature

1. Oracle Academy – Data base design, Database Programming with SQL.
2. MySQL Documentation: MySQL Reference Manuals http://dev.mysql.com/doc/

Supplementary literature

Documentation PostgreSQL - www.postgresql.org/docs/

Other source of information -

Data Structures and Algorithms

Author	Mg.sc.comp. Karina Šķirmante Mg.sc.comp. Dace Briede
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 KP (ECTS 3 KP)
Prerequisites	Proficiency in C++

Objective

The aim of this course is to provide students with information about fundamental data structures, including worst-case space/time efficiency and implementation details. Relevant algorithms related to the data structures will be covered as appropriate.

Learning outcomes

Upon successful completion of the course, students should

- be able to describe data structures from three perspectives–logical, application, and implementation,
- be able to implement fundamental data structures such as queues, stacks, trees, heaps, graphs.

Organization mode of students individual assignment

Systematic work during semester includes:

- regular learning using lecture materials, literature, internet resources,
- completion of home assignments,
- preparation for tests and the exam,

weekly teacher consultations.

Evaluation of learning outcomes

Final exam consists of two parts:

- theory (30% of total grade)
- programming (70% of total grade)

To be allowed to take the final exam student has to submit all home assignments given during the semester and the average grade for the home assignments has to be at least 4. If the average grade of home assignments is 8 or higher, the student can choose not to write the programming part of the final exam. In this case 70% of total grade is replaced by the average grade of home assignments.

During the semester students have to take two theoretical tests. If the average result of these tests is 8 or higher, the student can choose not to write the theory part of the exam. In this case 30% of total grade is replaced by the average grade for tests.

Course outline

1. Concept of data and data type. Data structures and their classification. Commonly used data structures. Arrays. Records. Strings.
2. Lists. Implementation of lists. List operations.
3. Stack and queue: implementation, operations and application.
4. Linked structures and their operations.
5. Priority queues and heaps: operations, implementation.

6. Trees: terminology, binary trees, binary search trees, operations, full binary tree, balanced tree, tree traversal and implementation.
7. Graphs: basics and terminology, implementation, traversals, shortest path, minimum spanning tree.

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Concept of data and data type. Data structures and their classification. Commonly used data structures. Arrays. Records. Strings.	Lecture
2.	Lists: operations and implementation.	Seminar
3.-4.	Stack and queue: implementation, operations and application	Lecture, seminar
5.-6.	Linked structures and their operations	Lecture, seminar
7.-8.	Priority queues and heaps: operations, implementation	Lecture, seminar
9.-10.	First test. Trees: terminology, binary trees, binary search trees, operations, full binary tree, balanced tree, tree traversal and implementation.	Test, lecture, seminar
11.-12.	Implementation of binary search tree, copying trees, trees implemented with arrays, expression trees.	Lecture, seminar
13.-14.	Graphs: basics and terminology, implementation, traversals	Lecture, seminar
15.-16.	Second test. Graphs: minimum spanning tree, shortest path	Test, lecture, seminar

Basic literature

1. Nell Dale, *C++ Plus Data Srtuctures, Third Edition*, Jones and Bartlett Publishers, ISBN: 0-7637-0481-4, 2003
2. Donald E. Knuth, *The Art of Computer Programming, Volume 1: Fundamental Algorithms. Third Edition* (Reading, Massachusetts: Addison-Wesley, 1997), xx+650pp. ISBN 0-201-89683-4
3. Donald E. Knuth, *The Art of Computer Programming, Volume 3: Sorting and Searching. Second Edition* (Reading, Massachusetts: Addison-Wesley, 1998), xiv+780pp.+foldout. ISBN 0-201-89685-0
4. Donald E. Knuth, *The Art of Computer Programming, Volume 4, Fascicle 4: Generating all Trees, History of Combinatorial Generation*, (Addison-Wesley, February 6, 2006) vi+120pp, ISBN 0-321-33570-8*)*

Supplementary literature

1. Mark Allen Weiss, *Data Structures and Problem Solving Using C++*, Second Edition, Pearson Education International, ISBN: 0321205006, 2003
2. Robert L. Kruse, Alexander J. Ryba, *Data Structures and Program Design in C++*, Prentice-Hall Inc., ISBN 0-13-087697-6, 2000
3. D.S. Malik, *Data Structures Using C++, Second Edition*, Course Technology, ISBN-13: 978-0-324-78201-1, 2010
4. Douglas Baldwin, Greg W. Scragg, *Algorithms and Data Structures, The Science of Computing*, Charles River Media, 2004.

DIFFERENTIAL EQUATIONS

Author	Dr.math., assoc.prof. Gaļina Hiļķeviča
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 (3 ECTS)
Prerequisites	Mathematical analysis I, Mathematical analysis II
Objective	The main purpose of the course is to consider various physical and geometrical problems that lead to differential equations, and to explain the most important standard methods for such equations solving.
Learning outcomes	After this course students will be able to: demonstrate understanding of basic concepts and rules; derive differential equations from physical or other problems, solve these equations by standard methods, and interpret results in terms of a given problem.

Organization mode of students individual assignment

Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.

Evaluation of learning outcomes

After each of main themes a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	1. First-Order Differential equations.	Lecture

	Notion about differential equation. First-Order Differential equation. Solution of first-order differential equation. General solution of first-order differential equation. Initial value problems. Existence and uniqueness of solutions. Separable differential equations. Homogeneous equations.	
2.	Separable differential equations. Homogeneous equations.	Seminar
3.	1. First-Order Differential equations. Linear differential equations. Bernoulli equations. Exact differential equations. Picard iteration for Initial value problems. Numerical methods for first-order differential equations.	Lecture
4.	Linear differential equations. Bernoulli equations. Exact differential equations. Picard iteration for Initial value problems. Numerical methods for first-order differential equations.	Seminar
5.	2. Higher Order Differential equations. Second order equations which right-hand side does not contain function. Second order equations which right-hand side does not contain argument.	Lecture
6.	Second order equations which right-hand side does not contain function. Second order equations which right-hand side does not contain argument.	Seminar
7.	Numerical methods for first-order differential equations.	Lecture
8.	Test.	Seminar
9.	Homogeneous linear equations of second order. Fundamental theorems for the Homogeneous equation. General solution. Basis. Wronskian. Second order homogeneous linear equations with constant coefficients.	Lecture
10.	Second order homogeneous linear equations with constant coefficients.	Seminar
11.	Second order nonhomogeneous linear equations with constant coefficients. Method of variation of parameters. Lagrange's method.	Lecture
12.	Second order nonhomogeneous linear equations with constant coefficients. Method of variation of parameters. Lagrange's method.	Seminar
13.	3. Systems of Differential equations.	Lecture
14.	Systems of Differential equations.	Seminar
15.	4. Modelling. Radioactivity. A population model. Oscillations. Heating problem. Modelling of electric circuits.	Lecture
16.	Test.	Seminar

Course outline

1. **First-Order Differential equations**. Notion about differential equation. First-Order Differential equation. Solution of first-order differential equation. General solution of first-order differential equation. Initial value problems. Existence and uniqueness of solutions. Separable differential equations. Homogeneous equations. Linear differential equations. Bernoulli equations. Exact differential equations. Numerical methods for first-order differential equations.
2 **Higher Order Differential equations**. Second order equations which right-hand side does not contain function. Second order equations which right-hand side does not contain argument. Homogeneous linear equations of second order. Fundamental theorems for the Homogeneous equation. General solution. Basis. Wronskian. Second order homogeneous linear equations with constant coefficients. Second order nonhomogeneous linear equations with constant coefficients. Method of variation of parameters. Lagrange's method.
3. **Systems of Differential equations**.
4. **Modeling.** Radioactivity. A population model. Oscillations. Heating problem. Modeling of electric circuits.

Basic literature

1. Kārlis Šteiners. Augstākā matemātika IV. - Zvaigzne ABC, 1999.
2. Inta Volodko. Augstākā matemātika. Īss teorijas izklāsts, uzdevumu risinājumu paraugi. Divas daļas - Zvaigzne ABC, 2007.
3. Gaļina Hiļķeviča, Jeļena Mihailova. Parastie diferenciālvienādojumi. – Rīga: SIA „Drukatāva", 2011.

Supplementary literature

4. Andrew Browder. Mathematical Analysis. – Springer, 2001.
5. Erwin Kreyszig. Advanced Engineering Mathematics.- John Wiley & SONS, INC, 1999.
5. C.Henry Edwards, David E. Penney. Elementary differential equations with Boundary value Problems. – Prentice HALL, 2000.
7. Чарльз Генри Эдвардс. Дифференциальные уравнения и краевые задачи: моделирование и вычисление с помощью Mathematica, Maple и MATLAB. – М.: ООО „И.Д. Вильямс", 2008.

Other source of information

Fundamentals of GIS and Digital Cartography

Author	Lecturer, Mg.sc.comp. Inese Jaunzeme, Lecturer, Mg.sc.ing. Vladislavs Bezrukovs
Code of the course	
Examination form	Exam
Credit points (ECTS points)	4 credits (6 ECTS points)
Prerequisites for taking the course	None
Course group	Course on the topical issues

Goal of the course

The goal is to learn about geographic information systems, their differences and connections to other information systems, to get acquainted with the system components, their purpose and practical application in cartography and when addressing other environmental tasks.

Expected results

After finishing the course students should be able to: demonstrate understanding of the most important definitions and regularities as well as their link to the issues of natural sciences, create a thematic map and perform simple manipulations with raster and vector data; apply theoretical knowledge when addressing practical tasks.

Organization of student individual work

Preparation of a thematic map according to set requirements, completion of practical tasks.

Evaluation of study results

A positive evaluation of theoretical knowledge and abilities to solve practical GIS tasks must be achieved on the course exam; also a thematic map must be prepared and designed according to the set requirements. Exam (40%), practical tasks (40%), thematic map (20%).

Course contents

Geodetic basics of cartography and geoinformatics. Geodetic coordinates. Reference ellipsoids. Geodetic systems and transitions between them. The World Geodetic System WGS-84. Cartographic projections and transitions between them. Universal Mercator projection.

Core definitions of cartography. Map types: topographic, thematic, etc. Map scale and precision of coordinates, scale line in classical and digital cartography. Completeness of information and currency of maps. Map legend and other aspects of behind-the-frame design.

Definition of a geoinformation system. Core differences between geoinformation and basic, non-geographic information systems. Tasks of geoinformation and digital cartography systems. Components of geoinformation systems: computer equipment, software, geographical data, methodology, specialists.

Digital geographic data models. Definition of digital geographic data models and model selection criteria. Difference between digital geographic data and digital cartographic data. Connection between content and representation of digital geographic data: representation table.

Digital geographic raster data. Concept and nature of geographic raster data. Geographic raster data transformation problems and methods. Geographic raster data sources and acquisition methods (including cosmic). Most popular types of geographic raster data.

Digital geographic vector data. Concept and nature of geographic vector data. Geospatial and attribute information in geographical vector data. Basic geometric forms of geographic vector data: dots, lines, figures. Types of composite geographic vector data. Structure of digital geographic data. Geographic vector data sources and acquisition methods. Most popular types of geographic vector data.

Geographical grid data. Types of digital geographical grid data and its nature, similarities and differences from other types of digital geographical data. Triangulated irregular network (TIN). Sources and ways to obtain geographical grid data. Its most popular forms.

Computer hardware for geoinformatics and digital cartography. Requirements of geoinformatics and digital cartography towards computer hardware components. Big graphical input tools for geoinformatics and cartography (digitizer, flatbed scanner, drum scanner), their most important technical parameters, comparative advantages and disadvantages. Big graphical output tools for cartography and geoinformatics (pen plotters, raster plotters, etc.), their most important technical parameters, comparative advantages and disadvantages, suitability for different applications.

Software for geoinformatics and digital cartography. Variety and its substantiation of geoinformatic and digital cartography systems. Role of the special software for geoinformatics and the most important functions of geoinformatic and digital cartography systems. Role of the non-geographical data base software in systems of geoinformatics. Application of computer-aided design and drafting software in systems of geoinformatics. Role of the computer graphics software in digital cartography systems.

Application of geoinformatic systems. Their typical application in variety of applied and research sectors in military and civilian life.

Basic literature

1. Ervins Sturmanis.Ģeogrāfiskās informācijas sistēmas. Jelgava. Mācību līdzeklis LIF zemes ierīcības specialitātes studentiem - 2005.

2. Wilpen L. Gorr, Kristen S. Kurland GIS Tutorial: Workbook for ArcView 9 1st ed., ESRI Press – 2005., 353 p.
3. ESRI Press Getting to Know ArcView GIS 3rd edition, 1999., 450p.

Additional literature

4. Duane Wilkins. “GIS Lectures”. http://sites.google.com/site/duanewilkins/gis-lectures

Other sources

Information on Quantum GIS - http://www.qgis.org/
Information on ESRI ARC GIS - http://training.esri.com/gateway/index.cfm?fa=mytraining.gateway

DISCRETE MATHEMATICS

Author	Dr.math., assoc.prof. Gaļina Hiļķeviča
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 (3 ECTS)
Prerequisites	Mathematical logic
Objective	The purpose of the course is to teach the main concepts and methods of discrete mathematics and prepare students for courses “Data structures and algorithms” and “Theory of algorithms”.
Learning outcomes	After this course students will be able to demonstrate understanding of basic concepts and rules, to proof fundamental theorems of discrete mathematics, operate with sets and relations, solve standard problems of combinatory and graph theory, to apply theoretical knowledge in real problems solving.

Organization mode of students individual assignment

Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.

Evaluation of learning outcomes

After each of main themes a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	1. Sets and relations. Concept of set. Description of the set. Operations with sets. Binary relations. Operations with binary relations. Properties of binary relations.	Lecture
2.	Binary relations. Operations with binary relations. Properties of binary relations.	Seminar
3.	Equivalence Relation. Sets and factorsets. Ordered sets. Relations in ordered sets.	Lecture
4.	Equivalence Relation. Sets and factorsets. Ordered sets. Relations in ordered sets.	Seminar

5.	Functions. Injective functions, surjective functions and bijective functions. Cardinality of Sets. Continuum sets. Continuum hypothesis.	Lecture
6.	Functions. Injective functions, surjective functions and bijective functions. Cardinality of Sets. Continuum sets. Continuum hypothesis.	Seminar
7.	2. Combinatory. The law of multiplication. Permutations. Combinations. Samples and selections. Substitution group. Binomial coefficients and their properties. Binomial theorem. Creation functions.	Lecture
8.	Test.	Seminar
9.	Principle of Inclusion and Exclusion. Recurrence relation. Fibonacci and Lukas numbers.	Lecture
10.	Binomial coefficients and their properties. Binomial theorem. Principle of Inclusion and Exclusion. Recurrence relation.	Seminar
11.	Stirling numbers. Catalan numbers. Bernoulli and Euler numbers.	Lecture
12.	Fibonacci and Lukas numbers. Stirling numbers.	Seminar
13.	3. Graph theory. Concept of graph. Isomorphic graphs. Operations with graphs. The storage of information about graphs on a computer. Graphs and binary relations. Concepts of connectivity components of a graph. Vertices index. Edges index. Bridge. K-component graphs. Menger theorem. Hall theorem. Maximal flow. Shortest path.	Lecture and seminar
14.	Test.	Seminar
15.	The concept of a tree. Trees properties. Oriented trees. Ordered trees. Binary trees. Minimal Spanning tree. The representation of tree in computer. Sorting tree. Eulerian graphs. Euler's theorem. Fluery algorithm. Eulerian Walks. Semi-Eulerian graph. Hamiltonian Graphs. Hamilton's Game.	Lecture and seminar
16.	Independence and covering. Minimal covering of a graph. A colouring of a graph. The chromatic number of a graph. Five colour theorem. Planar graphs and Four Colour Problem.	Lecture and seminar

Course outline

1. **Sets and relations**. Concept of set. Description of the set. Operations with sets. Binary relations. Operations with binary relations. Properties of binary relations. Equivalence Relation. Sets and factorsets. Ordered sets. Relations in ordered sets. Functions. Injective functions, surjective functions and bijective functions. Cardinality of Sets. Continuum sets. Continuum hypothesis.

2. **Combinatory**. The law of multiplication. Permutations. Combinations. Samples and selections. Substitution group. Binomial coefficients and their properties. Binomial theorem. Creation functions. Principle of Inclusion and Exclusion. Recurrence relation. Fibonacci sequence. Fibonacci and Lukas numbers. Stirling numbers. Catalan numbers. Bernoulli and Euler numbers.
3. **Graph theory**. Concept of graph. Isomorphic graphs. Operations with graphs. The storage of information about graphs on a computer. Graphs and binary relations. Concepts of connectivity components of a graph. Vertices index. Edges index. Bridge. K-component graphs. Menger theorem. Hall theorem. Maximal flow. Shortest path. The concept of a tree. Trees properties. Oriented trees. Ordered trees. Binary trees. Minimal Spanning tree. The representation of tree in computer. Sorting tree. Eulerian graphs. Euler's theorem. Fluery algorithm. Eulerian Walks. Semi-Eulerian graph. Hamiltonian Graphs. Hamilton's Game. Independence and covering. Minimal covering of a graph. A colouring of a graph. The chromatic number of a graph. Five colour theorem. Planar graphs and Four Colour Problem.

Basic literature

1. J. Dambītis. Modernā grafu teorija. – R.: Datorzinību centrs, 2002.
2. I.Strazdiņš. Diskrētā matemātika. - R.: Zvaigzne ABC, 2001.
3. В.Ф. Горбатов, Ф.В.Горбатов, М.В.Горбатов. Дискретная математика. – М.:Астрель, 2003.
4. Джеймс А. Андерсон. Дискретная математика и комбинаторика. – М., С.-П., К.: Вильямс, 2003.
5. Ф.А.Новиков. Дискретная математика для программистов.- С.-П.: Питер, 2002.
6. С.В. Яблонский. Введение в дискретную математику. – М.: Высшая школа, 2002.
7. Б.Н.Иванов. Дискретная математика. Алгоритмы и программы.-М: Лаборатория Базовых Знаний, 2002.

Supplementary literature

8. I.Strazdiņš. Diskrētās matemātikas elementi. - R.: Zvaigzne, 1980.

Other source of information

9. A. Gricāns. Diskrētā matemātika
http://www.de.dau.lv/matematika/dm/dm-1.html

FUNDAMENTALS OF ECONOMICS

Author	Dmitrijs Smirnovs
Course Code	
Form of evaluation	test
Credit points (ECTS credit points)	2 (3 ECTS)
Prerequisites	Dont need

Objective

The goal of the course is to give students background knowledge about the market economy and the nature of the main problems, to promote the acquisition of basic knowledge about business forms, work organization and planning in enterprise, risk management.

Learning outcomes

After the course students will be able to explain the main economic objectives and problems , will get knowledge about country's financial system, will get the knowledge about company's core operating principles, about enterprise foundation and business plan preparation.

Organization mode of students individual assignment

Regular studies of course material, literature and online resources; consultations with lecturer.

Evaluation of learning outcomes

Successful test

Course outline

Week	Topic and subtopic	Type (lecture, seminar, laboratory work)
1.	Introduction into economy. The main objectives and problems. Production resources	Lecture, seminar
2.	Market mechanism. Supply and demand. Flexibility.	Lecture, seminar
3.	The government economic policy and the nature of instruments of its implementation.	Lecture, seminar
4.	Fiscal policy. Latvian national budget system.	Lecture, seminar
5.	Taxation. Latvian taxation system.	Lecture, seminar
6.	The basis for monetary policy. Central bank activity.	Lecture, seminar
7.	Inflation and unemployment.	Lecture, seminar
8.	Exchange rates and interest rates.	Lecture, seminar
9.	The world economy. International relations	Lecture, seminar
10.	Business essential. Business forms	Lecture, seminar
11.	Business risks. Internal and external environment. Competition.	Lecture, seminar
12.	Introduction to financial accounting. Balance sheet, profit and loss statement, cash flow	Lecture, seminar
13.	Introduction to Management Accounting. Cost, non-profit point.	Lecture, seminar
14	Business plan. Fundraising. Company foundation	Lecture, seminar

Basic literature:

1. N. Gregory Mankiw. Principles of economic. Cengage Learning, 2014. ISBN-10: 128516587X
2. Mcconnel, Brue, Flynn. Economics. McGraw Hill Irwing. 2014

Supplementary literature:

1. Barovs P. Biznesa plāni: kā tos uzrakstīt un īstenot. R., Lietišķās informācijas dienests, 2008
2. Hofs K.G., Alsiņa R. Biznesa ekonomika. Jāņa Rozes apgāds. 2011.
3. Kārlis Ketners. Nodokļi un nodevas Latvijā un Eiropā. Sia Info tilts, 2013

Other source of information:

Will be provided during course

Electronics
(Elektronika)

Author	Doc., dr.sc.ing. Aigars Krauze
Course Code	
Form of evaluation:	Exam
Credit points (ECTS)	4 (6)
Prerequisites:	Mathematics, physics secondary school program
Course group:	Compulsory
Objective:	Extend knowledge of the electrical current in conductors and semiconductor materials; operation and using of semiconductor devices (diodes, transistors, etc.). Give concept of analogue and digital electronics.
Learning outcomes:	Understanding and can describe electric current behavior in solid state materials, electric current in semiconductors. Understanding structure, operation and usage of semiconductor electronic devices (semiconductor diodes, transistors, …). Calculating of electric circuits. Practical skills of using of basic analogue and digital electronic chips - calculate the circuits, assembly electrical scheme, perform measurements, interpret results, write a technical report.
Organization mode of students individual assignment	Lecture notes, lecture course notes (available in the university *Moodle* site) independent development, additional information acquisition in the library and on the Internet. Lab report preparation and presentation. Self-dependent preparing for tests on a specific topic. Advice to the course instructor outside of class time.
Evaluation of learning outcomes	Three test works will be done during the course: 1) electrotechnical basics of electronics; 2) circuits of semiconductor devices; 3) analogue and digital devices. All laboratory works must be done and presented; All 3 tests done – 40%; Exam - 60%

Course outline:

Week	Topic and subtopic	**Type** (lecture, seminar, laboratory work)
1.	Electro technical basics of electronics	Lecture 2 hrs Seminar 2 hrs
2. – 3.	Basics of calculation of linear circuits, Ohm, Kirchoff law	Lecture 4 hrs Seminar 4 hrs
4.	Semiconductors, electric current in semiconductors Test work – calculation of electrical circuits	Lecture 2 hrs Seminar 2 hrs
5.	Semiconductor diode	Lecture 2 hrs Seminar 2 hrs
6. – 7.	Bipolar junction transistors, BJT connections, operation modes Semiconductor diode	Lecture 4 hrs Seminar 2 hrs Lab work 2 hrs
8.	Field Effect Transistors Bipolar junction transistor	Lecture 2 hrs Lab work 2 hrs
9.	Optoelectronic devices, transistor as amplifier Test work on diodes and transistor circuits	Lecture 2 hrs Seminar 2 hrs
10. – 11.	Operational amplifier, basic usage Circuits with OpAmps, calculations	Lecture 4 hrs Seminar 4 hrs
12.	Basics of digital electronics, gates Operational amplifier	Lecture 2 hrs Lab work 2 hrs
13.	Basics of digital electronics, triggers, registers, memory elements	Lecture 2 hrs Seminar 2 hrs
14.	AD and DA convertors Test work on OpAmps and digital electronics	Lecture 2 hrs Seminar 2 hrs
15.	Basics of micro processor Lab work assessment	Lecture 2 hrs Seminar 2 hrs
16.	Summary of the course Repetition of main topics for exam	Lecture 2 hrs Seminar 2 hrs

Basic literature:

1. Werner Dzieia, Wolfgang Oberthur, Hans-Jobst Siedler, Josef Kammerer, Peter Zastrow. Elektronika I : Elektronikas elektrotehniskie pamati : mācību grāmata. - Valmiera : VPIC izdevniecība, 2003.
2. Manfred Frohn, Wolfgang Oberthur, Hans-Jobst Siedler, Manfred Wiemer, Peter Zastrow. Elektronika II: mikroelektronikas komponentes un pamatshēmas: mācību grāmata. - Valmiera : VPIC izdevniecība, 2003.

Supplementary literature:

1. Zītars, U. Elektronikas pamati. Mācību līdzeklis. – Rīga: Rīgas tehniskā universitāte, 2007.
2. Leščevics, P. Galiņš, A. Elektronika un sakaru tehnika: mācību metodiskaislīdzeklis. Jelgava: LLU, 2008.

Other source of information:

1. http://www.electronics-tutorials.ws/
2. https://www.clear.rice.edu/elec201/Book/basic_elec.html
3. http://www.scribd.com/doc/20421639/Electricity-Exercises-1

PHYSICS I

Authors	Artūrs Vrubļevskis
Course code	
Form of evaluation	exam
Credit points (ECTS credit points)	2 (3 ECTS)
Prerequisites	High school level math and physics
Objective	Form understanding of relationships in the macroscopic world. Develop understanding of the close connection between math and physics by modelling different processes and verifying those models in practice.
Learning outcomes	Understanding of mechanical motion of bodies, oscillations and waves. Proficiency in using calculus for describing physical processes and solving mechanics problems. Proficiency in using measuring instruments and sensors in physical experiments. Proficiency in executing mechanics experiments, data processing, estimating errors in measurements and results, formulating conclusions.

Organization mode of students individual assignment
Regular studies of course material, using study literature and lecture materials. Problems to be solved individually are assigned regularly during the semester. Consultations with the lecturer.

Evaluation of learning outcomes
Completed and defended 3 laboratory assignments (20%)
2 tests taken during the semester (30%)
Homework assignments (20%)
Exam (30%)

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Measurement errors. Introduction to laboratory assignment write-up.	Laboratory work.
2.	Quantities and units. Kinematics of a point object.	Lecture.
3.	Problem solving on topics from week 1. and 2.	Seminar.
4.	Free fall. Motion in two dimensions.	Lecture.
5.		Laboratory work.
6.	Point object dynamics.	Lecture.
7.	Problem solving on topics from week 4. and 6.	Seminar.
8.	Rotational motion kinematics. Motion in gravitational field. Weight.	Lecture.
9.		Laboratory work.
10.	Work, power, energy.	Lecture.
11.	Problem solving on topics from week 8. and 10.	Seminar.
12.	Momentum, collisions. Rotational motion dynamics.	Lecture.
13.		Laboratory work.
14.	Undamped free oscillations. Damped and forced oscillations, resonance.	Lecture.
15.	Problem solving on topics from week 12. and 14.	Seminar.
16.	Waves, wave types and interactions.	Lecture.

Laboratory assignments

1. Verifying Newton's laws.
2. Free fall.
3. Vibrations of a string.
4. Helmholtz resonator.
5. Doppler effect.
6. Determining moment of inertia.
7. Ultrasound wave.

Basic literature

Giancoli D.C. Physics for Scientists and Engineers with Modern Physics. 4-th edition, Prentice Hall, 2008

Supplementary literature

1. Halliday, Resnick, Walker, "Fundamentals of Physics", 6th edition, John Wiley & Sons Inc., 2001.
2. Petrovskis. "Mehānika". Zvaigzne, 1976.

Other source of information
Feynman lectures on physics, http://www.feynmanlectures.caltech.edu/

PHYSICS II

Autors	Artūrs Vrubļevskis
Kursa kods	
Pārbaudes forma	exam
Kredītpunkti (ECTS kredītpunkti)	2 (3 ECTS)
Priekšnosacījumi kursa uzsākšanai	Physics I, Linear Algebra and Analytic Geometry, Calculus
Objective	Provide introduction to the electric and magnetic phenomena in vacuum and in media using the concepts of electric and magnetic fields. Develop understanding of direct and alternating current in different media and of the close connection between electric and magnetic phenomena.
Learning outcomes	Understanding of electric and magnetic phenomena at macroscopic and microscopic scales. Proficiency in using calculus for describing electric and magnetic processes. Proficiency in solving problems concerning electromagnetism. Proficiency in using measuring instruments and sensors in physical experiments. Proficiency in planning and executing experiments in electromagnetism, data processing, estimating errors in measurements and results.

Organization mode of students individual assignment
Regular studies of course material, using study literature and lecture materials. Problems to be solved individually are assigned regularly during the semester. Consultations with the lecturer.

Evaluation of learning outcomes
Completed and defended 3 laboratory assignments (20%)
2 tests taken during the semester (30%)
Homework assignments (20%)
Exam (30%)

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Introduction to laboratory assignment write-up.	Laboratory work.
2.	Electric charges. Coulomb's law.	Lecture.
3.	Problem solving on topics from week 2.	Seminar.
4.	Electric field. Gauss's law and its application.	Lecture.
5.		Laboratory work.
6.	Work, potential energy, and electric potential. Relationship between electric field and potential. Conductors and dielectrics in electric field. Capacity, capacitors. Electric field energy.	Lecture.
7.	Problem solving on topics from week 4. and 6.	Seminar.
8.	Direct current. Ohm's law for a circuit element. Electromotive force. Ohm's law for a closed circuit. Kirchhoff's rules.	Lecture.
9.		Laboratory work.
10.	Magnets and magnetism. Lorentz force. Motion of a charged particle in magnetic field. Magnetic properties of currents. Ampere's law	Lecture.
11.	Problem solving on topics from week 8. and 10.	Seminar.
12.	Electromagnetic induction. Self-inductance, inductance, mutual inductance, magnetic field energy, transformer.	Lecture.
13.		Laboratory work.
14.	Alternating current, phasor diagrams, RLC circuits. Electric oscillations in LC circuits.	Lecture.
15.	Problem solving on topics from week 12. and 14.	Seminar.
16.	Maxwell's equations, displacement current, electromagnetic waves. Light as an electromagnetic wave.	Lecture.

Laboratory assignments

1. Parallel plate capacitor and the dielectric constant of a medium.
2. Ohm's law.
3. Capacitor and inductor in a DC circuit.
4. Electromagnetic induction – Faraday's law.
5. Determining Earth's magnetic field.
6. Alternating current – generating, rectifying, filtering.
7. Resonance in an RLC circuit.
8. Coulomb's law.
9. Hall effect.

Basic literature	Giancoli D.C. Physics for Scientists and Engineers with Modern Physics. 4-th edition, Prentice Hall, 2008
Supplementary literature	1. Halliday, Resnick, Walker, "Fundamentals of Physics", 6th edition, John Wiley & Sons Inc., 2001. 2. Platacis. “Elektrība”. Zvaigzne, 1974.

Other source of information
Feynman lectures on physics, http://www.feynmanlectures.caltech.edu/

MODELING OF CHAOTIC PROCESSES

Author	Asoc. prof., dr.habil.phys. Juris Žagars
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 credit points (ECTS 3 points)
Prerequisites	Differential equations course

Objective

The objective of the course is to introduce with the basics of the theory of chaos as well as with its applications for modelling of non-linear dynamic systems. Course is started with introduction of the theory of chaos in connection with the problems of modelling non-linear dynamic systems. The basic ideas are explained mainly by use of the one dimensional iterative maps under conditions when their behaviour becomes chaotic. The explanation is given for attractors, fractals, bifurcations and other key characteristics of chaos, as well as extrapolation of time series having high importance for modelling of chaotic processes.

Learning outcomes

Understanding the different forms of expression of chaotic behavior and their modelling paradigm. Ability to estimate the paradigms influence on methods of mathematical modelling. Capability to expline different scenarious of chaotic transition, so-called "butterfly effect" and related effects of chaotic behavior. Ability to develop and compare the technologies of modelling for regular and chaotic processes.

Organization mode of students individual assignment

Students has to accomplish individual (or in group) programming exercise (in MATLAB, Scilab or OCTAVE media) with modelling chaotic behavior of non-linear dynamic process.

Evaluation of learning outcomes

1. The assessment of the end-of-course examination is not below 4.
2. The assesment of individual assignment is positive.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	**Continuous modeling.**	Lecture
2.	**Discreet modeling.**	Lecture
3.	**Butterfly effect.**	Lecture
4.	**Periodic trajectories.**	Lecture
5.	**Logistic map and tents map.**	Lecture
6.	**Bifurcations of the logistic map.**	Lecture
7.	**Fractal dimension.**	Lecture
8.	**Atractors population and dimensions.**	Lecture
9.	**Chaotic transitions.**	Lecture
10.	**Fractal compression of digital images.**	Lecture
11.	**Chaos in continuous systems.**	Lecture
12.	**Chaos in oscillating systems.**	Lecture
13.	**Chaos in conservatives systems.**	Lecture
14.	**Controlling of chaotic systems.**	Lecture

15.-16.	**Analyse of individual assignment**	Seminar

Basic literature

1. Edward Ott *Chaos in dynamic systems,* Cambridge university press, 2002.
2. M.Lakshmanan, S.Rajasekar *Nonlinear Dynamics,* Springer v. 2003.

Supplementary literature

1. Donald L. Turcotte *Fractals and Chaos in Geology and Geophysics,* 2nd. Edition, Cambridge university press, 1997.
2. R.Manke, J.Šmelcers, G.Repke *Nelineārās parādības un pašorganizēšanās* (sērija *Teubnera grāmatas studēšanai)*, Rīga "Mācību grāmata" 1995.
3. Huyen Dang-Vu, Claudine Delcarte *Bifurcations et chaos*, Paris 2000.
4. B.Mandelbrot *Fractals and scaling in finance*, Springer v. 1997.
5. K.T.Alligood, T.D.Sauer, J.A.Yorke *Chaos, An Introduction to Dynamical Systems,* Springer, 1996.
6. H.G.Schuster, W.Just *Deterministic Chaos, An Introduction,* Willey-VCH Verlag GmbH&Co. KgaA, 2005.
7. S.H.Strogatz *Nonlinear Dynamics and Chaos (With Applications to Physics, Biology, Chemistry and Engineering),* Perseus books, 1994.
8. S.Wiggins *Introduction to Applied Nonlinear Dynamical Systems and Chaos,* Springer, 1990.

Other source of information

1. ***https://en.wikipedia.org/wiki/Chaos_theory***
2. ***http://www.physicsplanet.com/articles/chaos-theory-simplified***
3. ***http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3202497/***
4. ***http://whatis.techtarget.com/definition/chaos-theory***

Introduction to Computer Processing of Satellite Images

Author	Mg. sc. comp. Linda Gulbe
Course Code	
Form of evaluation	Exam and/or coursework
Credit point (ECTS credit points)	4 (6 ECTS)
Prerequisites	Basic knowledge in linear algebra and mathematical analysis

Objective
To acquaint Bachelor's students with multispectral satellite image processing and to provide practical skills in image processing methods and their implementation ensuring theoretical and practical knowledge for remote sensing tasks.

Learning outcomes
Knowledge about image processing basics and most common image processing methods.
Understanding about opportunities and limitations of remote sensing data processing.
Understanding about choosing methodology for solving different environmental problems using multispectral satellite data.
Skills to perform multispectral satellite image pre-processing.
Skills to perform multispectral satellite image enhancement and transformations.
Skills to perform multispectral satellite image classification.

Organization mode of students individual assignment
Course planning contains contact hours and student's independent work with literature and internet resources. Contact lectures include theoretical material and practical training when students improve their theoretical knowledge by accomplishing data processing tasks in popular image processing environments. During the course, students will also develop skills in research work by preparing coursework about some environment-monitoring problem using multispectral satellite data.

Evaluation of learning outcomes
Student must achieve a mark not less than 4 (10 point system) in both coursework and exam to pass. Final grade: 50 % exam grade, 50 % coursework grade. If grade for coursework is higher than 8 and student have accomplished at least 75% of practical tasks during the lessons, then student can choose not to write an exam and to get coursework grade as final grade.

Course outline

Academic hours (90 min)	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
2	Introduction in remote sensing, multispectral satellite images	Lecture/ practical training
2	Satellite images and GIS	Lecture/ practical training
2	Pre-processing: image geometrical corrections	Lecture/ practical training
2	Pre-processing: pixel value corrections	Lecture/ practical training

2	Image enhancement: contrast improvement	Lecture/ practical training
2	Image enhancement: image filtering, pseudo colours	Lecture/ practical training
2	Image arithmetic	Lecture/ practical training
2	Unsupervised classification: k-means, FCM	Lecture/ practical training
2	Supervised classification: training data	Lecture/ practical training
2	Supervised classification: kNN, GML, SVM, Spectral Angle Mapper	Lecture/ practical training
2	Supervised classification: accuracy assessment	Lecture/ practical training
2	Principal components	Lecture/ practical training
2	Mixed pixel analysis	Lecture/ practical training
4	Object identification: specialised algorithms, template matching, segmentation methods	Lecture/ practical training
2	Presentations of coursework	Practical training

Basic literature

1. Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2004). Remote sensing and image interpretation (Ed. 5). John Wiley & Sons Ltd.

2. Mather, P. M. (2005). Computer Processing of Remotely – Sensed Images: An Introduction (Ed. 3), John Wiley & Sons Ltd.

Supplementary literature

Gonzales, R.C., Woods, R. E. (2008). Digital Image Processing (Ed. 3), Pearson Prentice Hall

Other source of information

Scientific articles in Remote Sensing of Environment, available in http://www.sciencedirect.com/

INFORMATION SYSTEMS SECURITY

Author	Dr. sc. ing. Aleksandrs Berežnojs
Course Code	
Form of evaluation	Test
Credit points (ECTS credit points)	2 (3 ECTS)
Prerequisites	Basic knowledge of computer networking and system administration, Fundamentals of logical operations, Basic computer skills.

Objective

To provide fundamentals in the field of information security, explain general concepts of data protection, share initial knowledge on security network services, devices and network traffic. To help in acquiring the specific skills needed for basic security services implementation.

Learning outcomes

Understanding of infrastructure, application, and operational security. Gained skills to apply information security concepts in protecting corporate information resources.

- Understanding the fundamental concepts of information security
- Understanding threats and vulnerabilities
- Understanding of access control and account management
- Understanding of certificate management
- Knowledge on managing data and application security
- Knowledge on managing network security
- Knowledge on managing security incidents
- Ability to implement compliance and operational security controls
- Skills of security risk management
- Skills of business continuity and disaster recovery planning

Organization mode of students individual assignment

Periodic studies of course material using literature and online resources; attending course related webinars; homework assignments; advisory on demand.

Evaluation of learning outcomes

Homework assignments - 50%;
Final test - 50%.

Course outline

Week	Topic and subtopic	**Type** (lecture, seminar, laboratory work)
1	Information security fundamentals.	Lecture, seminar
1	Security threats and vulnerabilities.	Lecture, seminar
2-3	Managing data and application security.	Lecture, seminar
4-5	Managing networking security.	Lecture, seminar
6-7	Access control, authentication, authorization and account management.	Lecture, seminar
8-9	Managing certificates.	Lecture, seminar
10-11	Compliance and operational security.	Lecture, seminar
12-13	Managing security risks.	Lecture, seminar
14	Managing security incidents.	Lecture, seminar
15	Managing business continuity and disaster recovery.	Lecture, seminar
16	Interactive work on home assignments.	Lecture, seminar

Basic literature:

1. Dawn Dunkerley, T.J.Samuelle, (2014). CompTIA Security+ (Fourth Edition), ISBN: Book p/n 978-0-07-183214-4.

Supplementary literature:

1. Bowman, R.H., (2008). Business Continuity Planning for Data Centers and Systems: A Strategic Implementation Guide.
2. Hayden, L., (2010). IT Security Metrics: A Practical Framework for Measuring Security & Protecting Data.
3. Whitman, M.E., Mattord, H.J., (2013). Management of Information Security (4th Edition).
4. W.Stallings, (2013). Cryptography and Network Security: Principles and Practice (6th Edition).
5. Prowell S., R.Kraus, M.Borkin, (2010). Seven Deadiest Network Attacks.
6. Bertino, E., Takahashi K., (2011). Identity Management: Concepts, Technologies and Systems.
7. Foreman, P., (2009). Vulnerability Management.
8. Aiello, R., (2010). Configuration Management Best Practices: Practical Methods that Work in the Real World.
9. Snedaker, S., (2013). Business Continuity and Disaster Recovery Planning for IT Professionals, (2nd Edition).
10. Engebretson, P., (2013). The Basics of Hacking and Penetration Testing, Second Edition.

Other source of information:

1. http://csrc.nist.gov/
2. https://www.sans.org/
3. https://www.owasp.org
4. http://cve.mitre.org
5. https://www.cert.org/
6. http://www.securityfocus.com/
7. https://www.pcisecuritystandards.org/
8. https://www.open-scap.org
9. http://www.securityinfowatch.com/
10. https://www.symantec.com/security_response/
11. http://www.tenable.com/
12. https://www.hacking-lab.com/

INFORMATION SYSTEMS ANALYSIS AND DESIGN

Author	Dr.sc.ing., assistant professor Raita Rollande
LAIS code	
Form of evaluation	Exam, group work
Credit point (ECTS credit points)	4 KP (6 ECTS)
Prerequisites	No prerequisites
Course group	Fundamental Principles
Objective	The objective of the course is to introduce students to design theoretical aspects of information systems analysis and design, and to develop practical skills in information systems development.

Learning outcomes

- Understand the role of design in the development of information systems.
- Understand the software development stages, models and works to be executed in each phase, phase deliverables and documentation.
- Be able to choose the information systems development model based on the characteristics of the developed system.
- Be able to apply the information system design standards, create the concept description, software requirements specifications description, and software design description documentation.
- Be able to develop a system's prototype or a simple system described by the concept description, software requirements specifications description, and software design description documentation.
- Be able to create test cases for software systems testing.
- Be able to present the project for large audience.

Organization mode of students` individual assignment

- Teamwork. Based on the proposed problem, students in groups develop: a description of the concept, software requirements specification, software design description of the system, design prototypes, carry out testing.
- Preparation for the exam.

Evaluation of learning outcomes

Teamwork (50%); Exam (50%)

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	General conception of information system analysis and design. Types of information systems. Work characteristics of information system analysts, consultants, and experts.	Lecture
1.	Information system architecture. Information system development. Information system life cycle models	Lecture

	(waterfall life cycle model, shell model; rapid prototyping model, etc.). Agile modeling.	
2.	Agile modeling in information system development. Types of agile modeling. Organization analysis. Organization management. Organization culture. System contractors' rights and obligations.	Lecture
2.	With the development of information systems related to professional standards.	Practical lesson
3.	System requirements collection methods. Interviews. Interviews organization. Questions formation. Interview process. Summing up and analysis of acquired data.	Lecture
3.	Agreements. Types of agreements. Information system documentation standards. Software development standards. Software engineering standards. Necessary documentation for software usage and maintenance.	Lecture
4.	The use of diagrams in information system analysis and design. Organization diagrams, entity relationship diagrams, data flow diagrams, business process diagrams. CASE tools for software development.	Lecture
4.	The use of diagrams in information system analysis and design.	Practical lesson
5.	Information systems documentation - concept description. Content of the concept description.	Lecture
5.	Meeting with system contractors. Clarification of issues related with concept description development.	Practical lesson
6.	System requirements analysis. Prototypes. The role of prototype in information system design.	Lecture
6.	Concept description presentation and delivery.	Practical lesson
7.	Information systems documentation - software requirements specification description. Content of the software requirements specification description.	Lecture
7.	Analysis of concept description, discussions.	Practical lesson
8.	Meeting with system contractors. Clarification of system requirements.	Practical lesson
8.	System development. Using a prototype in system design.	Practical lesson
9.	Development of software requirement specification.	Lecture
9.	Development of requirement specification. Tools for prototype development.	Practical lesson
10.	Information systems documentation - software design description. Content of the software design description.	Lecture
10.	Presentation of software requirement specification and delivery.	Practical lesson
11.	Information system testing. Verification and validation. Planning of testing. Method of testing. Testing process.	Lecture

11.	Analysis of software requirements specification, discussions.	Practical lesson
12.	Meeting with system contractors to get information for development of software design description.	Practical lesson
12.	Development of software design description.	Practical lesson
13.	Information system user guide. User guide for programmer and for end user.	Lecture
13.	Presentation of software design description and delivery.	Practical lesson
14.	Quality guarantee. Effective exploitation of time resources. Costing management. Customer satisfaction.	Lecture
14.	Analysis of software design description, discussions.	Practical lesson
15.	Information system implementation and maintenance. Information system maintenance and service contract.	Lecture
15.	Preparation of the final presentation.	Practical lesson
16.	Course summary.	Lecture
16.	System presentation to system contractors.	Practical lesson

Basic literature

1. Bell D. Software Engineering for Students. – Pearson Education (US), 2005.
2. J. L. Whitten, L.D. Bentley,K. C. Dittman, Systems analysis and design methods, McGraw-Hill, 2000
3. Jeffrey A. Hoffer, Joey F. George, Joseph S. Valacich, Modern Systems Analysis and Design, 4/E, Prentice Hall, 2001
4. Joseph S. Valacich, Joey F. George, Jeffrey A. Hoffer, Essentials of Systems Analysis and Design, 2/E, Prentice Hall, 2003
5. Kenneth E. Kendall Julie E. Kendall, Systems Analysis and Design, 6/E, Prentice Hall, 2004
6. Kenneth E. Kendall Julie E. Kendall, Systems Analysis and Design, 5/E, Prentice Hall, 2001
7. Shouhong Wang, Hai Wang, Information Systems Analysis and Design, Universal-Publishers, 2012. http://www.bookpump.com/upb/pdf-b/2330754b.pdf
8. Sommerville I. Software Engineering. – 8th Edition. – Addison-Wesley Pub. Comp, 2006.
9. Van Vliet H. Software Engineering. Principles and Practice. – John Wiley & Sons, 2008. http://sunset.usc.edu/available_tools/index.html

Supplementary literature

Other sources of information

Designing and Administration of Local Area Networks

Author	**Mg. sc. comp. Mārcis Koloda**
Course Code	
Form of evaluation	**Exam**
Credit point (ECTS credit points)	**4 (6 ECTS)**
Prerequisites	**None**

Objective
The course aims to provide theoretical knowledge and practical skills for local area networks designing and administration, network architecture, network elements, technologies and protocols operating principles, design, administration, network security and management of general principles.

Learning outcomes
During training course the students will gain theoretical knowledge and practical skills in a local area network installation and configuration. Gain insight into network technologies, security principles and its structure.

Organization mode of students individual assignment
The course consists of a theoretical part (lectures), practical part (laboratory work) and independent part (tests on the local network transmission technology solutions).
Practical work, students acquire the skills and abilities to install and configure the local network equipment and perform related network equipment element measurements and simulations.

Evaluation of learning outcomes
Completed laboratory work, presented individual work, tests and examination.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1. - 2.	Introduction of local area networks and its history.	Lecture, laboratory work
3.	ISO/OSI reference model.	Lecture, laboratory work
4. - 5.	OSI Model Physical Layer. Included technology and standards.	Lecture, laboratory work
6. - 7.	OSI Model Data Link layer. The principle of operation, technology and standards.	Lecture, laboratory work
8. - 9.	OSI model Network layer. Standards, protocols and IP addresses operations.	Lecture, laboratory work
10. - 11.	OSI model Transport layer. Standards, flow assurance.	Lecture, laboratory work
12.	OSI model Session Layer.	Lecture, laboratory work
13.	OSI model Presentation Layer. Data presentation technologies.	Lecture, laboratory work

14.	OSI model Aplication Layer.	Lecture, laboratory work
15. - 16.	The final presentation of individual work	Seminar

Basic literature

1. Todd Lammle “CompTIA Network+ Study Guide: Exam N10-006”. Sybex. May 2015. ISBN-13: 9781119021247
2. Laboratory equipment manuals – D-LINK, CISCO, Fluke Networks
3. Laboratory software instructions/manuals – putty, WireShark, airmon-ng u.c.

Supplementary literature

1. Andrew S. Tanenbaum „Computer Networks, Fourth Edition”. Prentice Hall. August 2002, ISBN-13: 9780130661029

Other source of information

1. https://standards.ieee.org

Fundamentals of the Latvian Language I

Author	Mg.philol., lecturer Sintija Ozoliņa
LAIS course code	
Form of evaluation	Test
Academic credit points (ECTS credit points)	3 ECTS
The total number of contact lessons	16
The number of lectures	-
The number of practical classes	16
Prerequisites	-
Part of the study programme	General education study courses

Study course objective

The study course objective is to develop written and spoken communication skills in the Latvian language.

Study results

Having acquired the study course, a student:

- Is capable of communicating in the Latvian language with or without a dictionary;
- Is able to introduce others to himself/herself, to use Latvian when shopping and in other daily activities, as well as is able to write simple messages in Latvian and to fill out questionnaires, and is able to form a dialogue.

Organization mode of students' individual work

The independent work of students include:

- a regular learning of the course by using lecture materials, study literature, internet resources,
- homework assignment completion,
- situation interpretations and group work during classes,
- preparations for the tests and exams.

Evaluation of study results

The end result is made of:

- Homework 10%
- Performance in classes 30%
- Exam 60%

Study course outline

No.	Title of the topic
1.	Pronunciation of the sounds in the Latvian language.
2.	Creation and building of vocabulary.
3.	Nouns and their categories.
4.	Numerals and their categories.
5.	Pronouns and their categories.
6.	Verbs and their categories.

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Study course schedule

No. of the class	Title of the topic	Type of class (lectures, seminars, practical classes, laboratory work), amount of academic hours
1.	Introduction. The Latvian alphabet.	Lecture, 2 academic hours
2.	Pronunciation.	Practical class, 2 academic hours
3.	Greetings, forms of the verb “to be”.	Practical class, 2 academic hours
4.	Languages, nationalities.	Practical class, 2 academic hours
5.	Noun cases, singular and plural forms, genders.	Practical class, 2 academic hours
6.	Personal pronouns. Family.	Practical class, 2 academic hours
7.	Numerals.	Practical class, 2 academic hours
8.	Clock times.	Practical class, 2 academic hours
9.	The adverb. Locations, directions.	Practical class, 2 academic hours
10.	At the shop/cafe/restaurant.	Practical class, 2 academic hours
11.	The verb. Leisure time. Dative forms of nouns.	Practical class, 2 academic hours
12.	Education and work. Culture.	Practical class, 2 academic hours
13.	Lifestyle.	Practical class, 2 academic hours
14.	Years. Months. Days of the week. Daily schedule.	Practical class, 2 academic hours
15.	At the doctor’s office.	Practical class, 2 academic hours
16.	Revision.	Practical class, 2 academic hours

.Basic literature

1.C.Moseley. Colloquial Latvian. Routledge: 1996.
2. I. Auziņa u.c. Māci un mācies. Latviešu valodas aģentūra: 2015.
3. Kursa vadītāja izstrādātie materiāli tēmu un gramatikas apguvei.

Supplementary literature

Budviķe, B.Šiliņa, R.Vizule. *Palīgā! Mācībgrāmata pieaugušajiem*. Zvaigzne ABC, Rīga: 1998

Other sources of information

Internet resources:
1.www.sazinastilts.lv Valodas apguve
2.http://maciunmacies.valoda.lv/valodas-apguve/e-nodarbibas#tab2 E-nodarbības
3. http://www.valoda.lv/Papildus_Materiali/eapmaciba2/default.htm Papildmateriāli I
4. http://www.valoda.lv/Papildus_Materiali/LVA-2-dala/default.htm Papildmateriāli II

Law on Institutions of Higher Education Section 56.[1] Study Course

(1) Institutions of higher education and colleges shall determine the procedures by which study courses shall be developed and included in study programmes, in order to ensure the achievement of the common study results. The description of a study course shall be prepared and approved in accordance with the procedures specified by the institution of higher education and college.

(2) The study course description shall:

1) define the requirements for the commencement of the acquisition of the study course;

2) determine the aims for the implementation of the study course and the planned study results;

3) outline the content of the study course necessary for the achievement of study results, contain the study course calendar, mandatory and supplementary literature, indicate other sources of information;

4) describe the organisation and tasks for the independent work of students; and

5) determine the evaluation criteria of study results.

Fundamentals of the Latvian Language I

Author	Mg.philol., lecturer Sintija Ozoliņa
LAIS course code	
Form of evaluation	Test
Academic credit points (ECTS credit points)	3 ECTS
The total number of contact lessons	16
The number of lectures	-
The number of practical classes	16
Prerequisites	-
Part of the study programme	General education study courses

Study course objective

The study course objective is to develop written and spoken communication skills in the Latvian language.

Study results

Having acquired the study course, a student:

- Is capable of communicating in the Latvian language with or without a dictionary;
- Is able to introduce others to himself/herself, to use Latvian when shopping and in other daily activities, as well as is able to write simple messages in Latvian and to fill out questionnaires, and is able to form a dialogue.

Organization mode of students' individual work

The independent work of students include:

- a regular learning of the course by using lecture materials, study literature, internet resources,
- homework assignment completion,
- situation interpretations and group work during classes,
- preparations for the tests and exams.

Evaluation of study results

The end result is made of:

- Homework 10%
- Performance in classes 30%
- Exam 60%

Study course outline

No.	Title of the topic
1.	Personal information.
2.	Education and work.
3.	Culture and leisure.
4.	Health and lifestyle.
5.	Plans for the future.

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Study course schedule

No. of the class	Title of the topic	Type of class (lectures, seminars, practical classes, laboratory work), amount of academic hours
1.	Personal information. Family. Verbs of the simple present.	Practical class, 2 academic hours
2.	Education system in Latvia. Accusative nouns.	Practical class, 2 academic hours
3.	Curriculum vitae. Job description. Verbs of the simple past.	Practical class, 2 academic hours
4.	Job advertisements. Job interviews. A day at work.	Practical class, 2 academic hours
5.	Nationalities, languages. Genitive nouns.	Practical class, 2 academic hours
6.	National stereotypes. Adjectives.	Practical class, 2 academic hours
7.	Leisure time activities. Verbs. Reflexive verbs.	Practical class, 2 academic hours
8.	Travelling. Booking a hotel room. Phone calls. Numerals.	Practical class, 2 academic hours
9.	Culture events. Ordinal numbers.	Practical class, 2 academic hours
10.	. At an exhibition/concert/theatre. Expressing views.	Practical class, 2 academic hours
11.	Writing a letter/e-mail. Locative nouns	Practical class, 2 academic hours
12.	. Healthy lifestyle. Healthy eating.	Practical class, 2 academic hours
13.	Medicine. At a doctor's office. Dative nouns. Debitive mood.	Practical class, 2 academic hours
14.	Verbs of the simple future – reflexive and non-reflexive verbs with prepositions *uz, līdz, no,* etc.	Practical class, 2 academic hours
15.	Plans for the next week/month/year. Personal development.	Practical class, 2 academic hours
16.	Revision.	Practical class, 2 academic hours

.Basic literature

1.I. Klēvere-Velhli, N. Naua. Latviešu valoda studentiem. . Latviešu valodas aģentūra: 2012..
2. Kursa vadītāja izstrādātie materiāli tēmu un gramatikas apguvei.

Supplementary literature

1. I. Auziņa u.c. Māci un mācies. Latviešu valodas aģentūra: 2015

Other sources of information

Internet resources:
1.www.sazinastilts.lv Valodas apguve
2.http://maciunmacies.valoda.lv/valodas-apguve/e-nodarbibas#tab2 E-nodarbības

Law on Institutions of Higher Education Section 56.[1] Study Course

(1) Institutions of higher education and colleges shall determine the procedures by which study courses shall be developed and included in study programmes, in order to ensure the achievement of the common study results. The description of a study course shall be prepared and approved in accordance with the procedures specified by the institution of higher education and college.

(2) The study course description shall:

1) define the requirements for the commencement of the acquisition of the study course;

2) determine the aims for the implementation of the study course and the planned study results;

3) outline the content of the study course necessary for the achievement of study results, contain the study course calendar, mandatory and supplementary literature, indicate other sources of information;

4) describe the organisation and tasks for the independent work of students; and

5) determine the evaluation criteria of study results.

Linear algebra and analytic geometry II

Author	Lector, Master of Science in Mathematics Jeļena Mihailova
Course Code	
Form of evaluation	Examination
Credit point(ECTS credit points)	2 (3 ECTS)
Prerequisites	School course of mathematic and Linear Algebra and Analytical Geometry I
Objective	The course objective is to acquire the main concepts, methods and results of linear algebra and analytical geometry, and to learn to use them in solving practical tasks.
Learning outcomes	Student will be able to recognize the coordinate system in plane and space and understanding of the relationship between the different coordinates. Able to write the line equation in the plane. Able to write the straight-line equation in plane. Able to transform the general equation of a conic section into standard form. Able to understand the concept of lines and surfaces in space, the so-called simpler than the other round surfaces. Able to write an equation for the straight line in space, the plane equation. Able to understand the concepts of the linear spaces and linear transformation. Able to find the matrix eigenvalues and eigenvectors.
Organization mode of students individual assignment	Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.
Evaluation of learning outcomes	After each of the main themes, a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

1. **Coordinate Systems (4h)**
   Cartesian coordinate system. Right angle and polar coordinates. Cylindrical, polar and spherical coordinates.

2. **Line in plane (14 h)**
   Line in the plane and its equation; polar equations. Parametric equations of line. Straight-line in plane, its equation and direction coefficient. Angle between straight lines. General straight-line equation and its line segment equation. Intersection of straight lines, conditions of parallelism and congruence. Normal equation of straight line. Distance from the point to the straight line.
   The conic sections: the ellipse the hyperbola, the parabola (form, properties, asymptotes and directrix); general form and standard form. The conic sections polar equations. Transforming the general equation of a conic section into standard form.

   Lines and surfaces in space (7 h)
   Plane equation in space, its special cases. Plane equation of line segments. Normal equation of plane, distance from the point to the plane. Equation of a straight line in the space, its canonical and parametric forms. Line intersection. Algebraic and transcendental lines. Equations of surface and line in the space. Cylindrical and conical surfaces. Parametric form (in space) of line and surface equations. Surface and line intersection. Second-order surfaces and their canonical reduction. Ellipsoid. One-sheet and two-sheet hyperboloid. Second-order cones and cylinders. Elliptic and hyperbolic parabolic.

3. **Linear operators (7 h)**
   Concept of the linear space and Euclidean space, their properties. Isomorphism. Linear combinations and linear independence. Bases of n-dimensional vector space, its transformation. Orthogonal transformation. Concept of linear transformations. Matrix transformations. Properties of linear transformations. Coordinates and change of basic. Eigenvectors and eigenvalues of linear operators.

Week	Lecture	Seminar
1.	Cartesian coordinate system. Right angle and polar coordinates. Cylindrical, polar and spherical coordinates. Line in the plane and its equation; polar equations of line. Parametric equations of line.	
2.		Cartesian coordinate system. Right angle and polar coordinates. Cylindrical, polar and spherical coordinates. Line in the plane and its equation; polar equations of line. Parametric equations of line.
3.	Straight-line in plane, its equation and direction coefficient. Angle between straight lines. General straight-line equation and its line segment equation. Intersection of straight lines, conditions of parallelism and congruence. Normal	

	equation of straight line. Distance from the point to the straight line.	
4.		Straight-line in plane.
5.	The conic sections: the ellipse the hyperbola, the parabola (form, properties, asymptotes and directrix); general form and standard form. The conic sections polar equations.	
6.		Test "Line in the plane and its equation" (45 min). Standard forms of the conic sections and its characteristics.
7.	Geometric transformations of the plane R^2 (rotated coordinate axes and coordinate axes parallel transfer). Transforming the general equation of a conic section into standard form.	
8.		Transforming the general equation of a conic section and second-degree equations into standard form.
9.	The analytic geometric in space. Lines and surfaces in space. Plane equation, its special cases. Plane equation of line segments. Normal equation of plane. Distance from the point to the plane. Equation of a straight line in the space, its canonical and parametric forms. Line intersection. Algebraic and transcendental lines.	
10.		Test "The conic sections. Transforming the second-degree equations into standard form."
11.	The equations of surface and line in the space. Cylindrical and conical surfaces. Parametric form (in space) of line and surface equations. Surface and line intersection. Second-order surfaces and their canonical reduction. Ellipsoid. One-sheet and two-sheet hyperboloid. Second-order cones and cylinders. Elliptic and hyperbolic parabolic.	

12.		The equations of the straight line and surface in the space. Solutions to selected problems.
13.	Concept of the linear space and Euclidean space, their properties. Isomorphism. Linear combinations and linear independence. Bases of n-dimensional vector space, its transformation. Orthogonal transformation.	
14.		Test "Analytic geometric in space".
15.	Concept of the linear transformations. Matrix transformations. Properties of linear transformations. Coordinates and change of basic. Eigenvectors and eigenvalues of linear operators.	
16.		The linear space and linear transformations. Eigenvectors and eigenvalues of linear operators.

Basic literature

1) K. Šteiners, B. Siliņa. Augstākā matemātika II - Zvaigzne ABC, 1997
2) I. Volodko. Augstākā matemātika, 1.daļa. – Rīga, Zvaigzne ABC, 2007
3) E. Kronbergs, P. Rivža, Dz. Bože. Augstākā matemātika 1.daļa. - Rīga, Zvaigzne, 1988
4) C.H. Edwards, Jr. David E. Penney. Elementary Linear Algebra. – prentice Hall International, Inc., 1988

Supplementary literature

1) C.D. Meyer. Matrix Analysis and Applied Linear Algebra. - Society of Applied Mathematics, 2001.
2) U. Stammbach. Lineare Algebra. – Teubner verlag, Stuttgart, 1994.
3) G.H. Golub, C.F. Van Loan. Matrix Computation.- The Johns Hopkins University Press, Baltimor and London, 1996.

Other source of information

www.algebra.com
www.algebrahelp.com
www.bymath.com

Linear algebra and analytic geometry I

Author	Lector, Master of Science in Mathematics Jelena Mihailova
Course Code	
Form of evaluation	Examination
Credit point(ECTS credit points)	2 (3 ECTS)
Prerequisites	School course of mathematic
Objective	The course objective is to acquire the main concepts, methods and results of linear algebra, vector algebra and complex numbers and to learn to use them in solving practical tasks.
Learning outcomes	Student will be able to take basic operations of matrix and evaluate the determinants. Able to determine the matrix rank. Able to find the inverse of a matrix. Able to solve the matrix equations. Able to solve linear systems by Cramer's rule, by finding the inverse of the coefficient matrix, by Gaussian elimination. Able to take operations with vector in the space R^2 and R^3. Able to take operations on vectors in component form. Able to understand in details the dot product, the cross product, the scalar triple product and able to apply it in practical tasks. Able to understand the vector of linear combinations and linear independence. Able to perform the operations with complex numbers algebraic, polar and exponential forms.
Organization mode of students individual assignment	Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.
Evaluation of learning outcomes	After each of the main themes, a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

1. **Matrices. Determinants. Linear systems (16 h)**
   Introduction to Matrices and Linear Systems. Matrix types. Determinants of a matrix. Determinants of order 2 and of order 3. Properties of the determinant. Minors and cofactors. Determinants of matrices of higher order. General formula for the determinant.
   Cramer`s Rule to solve the linear systems. Basic operation of matrix (adding, subtracting, multiply of a matrix by a constant). Multiplication of matrices. Algebraic properties of matrix operations. Invertible matrix. Finding the inverse A^{-1} of the invertible $n \times n$ matrix A. Matrix equations. Solving the linear system by finding the inverse of the coefficient matrix. Elementary operations on the matrix. Gaussian elimination. Solving the linear systems by Gaussian elimination. The rank of a matrix. Kronecker-Capelli's theorem. Homogeneous systems.

2. **Vector algebra (11 h)**
   Definition of a vector. Types of vectors. Operations on vectors (adding, subtracting, multiply by a scalar). Properties of these operations. Projection of a vector. Vectors in two- and three-dimensional Cartesian coordinates. The component of a vector. Operations on vectors in component form. The dot product. The cross product. The scalar triple product.

3. **Complex Number (5 h)**
   Complex number basic definitions and arithmetic. The complex plane. The polar form of a complex number. Euler`s formula. Operations with complex numbers algebraic, polar and exponential forms.

Week	Lecture	Seminar
1.	Introduction to Matrices and Linear Systems. Matrix types. Determinants of a matrix. Determinants of order 2 and of order 3. Properties of the determinant. Minors and cofactors. Determinants of matrices of higher order. General formula for the determinant.	
2.		Determinants of order 2 and of order 3. Properties of the determinant. Minors and cofactors. Determinants of matrices of higher order. General formula for the determinant.
3.	Cramer's Rule to solve the linear systems. Basic operation of matrix (adding, subtracting, multiply of a matrix by a constant). Multiplication of matrices. Algebraic properties of matrix operations. Identity matrix. Invertible	

	matrix. Finding the inverse A^{-1} of the invertible $n \times n$ matrix A. Matrix equations.	
4.		Basic operation of matrix. Multiplication of matrices. Finding the inverse A^{-1} of the invertible $n \times n$ matrix A. The Matrix equations.
5.	Solving the linear system by finding the inverse of the coefficient matrix. Elementary operations on the matrix. Gaussian elimination. Solving the linear systems by Gaussian elimination.	
6.		Cramer`s Rule to solve the linear systems. Solving the linear system by finding the inverse of the coefficient matrix. Solving the linear systems by Gaussian elimination.
7.	The rank of a matrix. Kronecker - Capelli's theorem. Homogeneous systems.	
8.		**Test** "Matrices. Determinants. Linear systems".
9.	Vector algebra. Definition of a vector. Types of vectors. Operations on vectors (adding, subtracting, multiply by a scalar). Properties of these operations. Projection of a vector. Vectors in two- and three- dimensional Cartesian coordinates. The component of a vector. Operations on vectors in component form.	
10.		Operations on vectors in geometric form. Operations on vectors in component form.
11.	The dot product. Geometric definition. The formula for the dot product in terms of vector components. Properties of the dot product. The cross product.	

	Geometric definition. The formula for the cross product in component form.	
12.		The dot product. The cross product.
13.	The scalar triple product. Geometric definition. The formula for the scalar triple product in component form. Complex Number. Basic definitions and arithmetic.	
14.		**Test** "Vector algebra".
15.	The complex plane. The polar form of a complex number. Euler's formula. Operations with complex numbers algebraic, polar and exponential forms.	
16.		**Test** "Complex number".

Basic literature

1) K. Šteiners, B. Siliņa. Augstākā matemātika I. - Zvaigzne ABC, 1997
2) I. Volodko. Augstākā matemātika, 1.daļa. - Rīga, Zvaigzne ABC, 2007
3) E. Kronbergs, P. Rivža, Dz. Bože. Augstākā matemātika 1.daļa. - Rīga, Zvaigzne, 1988
4) C.H. Edwards, Jr. David E. Penney. Elementary Linear Algebra. – prentice Hall International, Inc., 1988

Supplementary literature

1) C.D. Meyer. Matrix Analysis and Applied Linear Algebra. - Society of Applied Mathematics, 2001.
2) U. Stammbach. Lineare Algebra. – Teubner verlag, Stuttgart, 1994.
3) G.H. Golub, C.F. Van Loan. Matrix Computation.- The Johns Hopkins University Press, Baltimor and London, 1996.

Other source of information

www.algebra.com
www.algebrahelp.com
www.bymath.com

MATHEMATICAL ANALYSIS I

Author	Dr.math., assoc.prof. Gaļina Hiļķeviča
Course Code	1209
Form of evaluation	Examination
Credit point (ECTS credit points)	4 (6 ECTS)
Prerequisites	School course of mathematic
Objective	The main purpose of the course is to teach students to main methods of mathematical analysis and it's applications for different processes investigation.
Learning outcomes	After this course students will be able to, demonstrate understanding of basic concepts and rules, to solve standard problems of mathematical analysis (finding function limit, derivate functions, integrate functions, construct function graphics, etc.), to apply theoretical knowledge in real problems solving.

Organization mode of students individual assignment
Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam
Evaluation of learning outcomes
After each of main themes a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	**1. INTRODUCTION** 1.1. **Real Numbers.** The real number system. The real line. The absolute value of a number. Bounded and unbounded sets. Intervals in R. 1.2. **Functions.** The concept of a function. Composite function (a function of a function). Inverse functions. Bounded and unbounded functions. Even and odd	1 lecture and 1 seminar

	functions. Periodic functions. Graphs of function. Infinite sequences.	
2.	**1.3. The Limit of Function.** The concept of a limit of function. Unique theorem. The limit of a sum. The limit of a product. The limit of a quotient. The limit of a composite function. The Squeeze Theorem. One-sides limits. Convergence of Infinite sequences.	1 lecture and 1 seminar
3.	**1.4. Continuity.** Continuous function at a point. Continuity of a sum, of a product and of a quotient. Continuity of composite function. Points of discontinuity. Properties of continuous functions.	1 lecture and 1 seminar
4.	**2. THE DIFFERENTIAL CALCULUS.** 2.1. **The Derivative of a Function and differentials.** Differentiability of a function. The derivative of a function, it's geometric and mechanics interpretations. Continuity of a differentiable function. Differentiability of a sum, of a product and of a quotient.	1 lecture and 1 seminar
5.	Differentiability of composite function (The Chain Rule). Differentiability of inverse function. Derivatives of some Elementary Functions. Higher order derivatives. Mechanics interpretation of second order derivatives.	1 lecture and 1 seminar
6.	**2.2. Fundamental Theorems of Calculus. Applications of Derivatives.** Rolle's Theorems, Lagrange's Theorem (The Mean Value Theorem) and Cauchy's Theorem. L'Hospital's Rule. Taylor's theorem.	1 lecture and 1 seminar
7.	Increasing and decreasing functions. Local maximum and local minimum. Fermat's Theorem. Absolute (global) maximum and absolute (global) minimum.	1 lecture and 1 seminar
8.	The Closed Interval Method. Concave upward and concave downward functions. Points of inflection. Derivatives and the Shapes of Curves.	1 lecture and 1 seminar
9.	**3. INTEGRALS.** **3.1. Indefinite Integrals.** A primitive (antiderivative) of function. Indefinite integral. Properties of indefinite integrals.	1 lecture and 1 seminar
10.	Integration by substitution. Integration by parts.	1 lecture and 1 seminar
11.	Techniques of integration.	1 lecture and 1 seminar
12.	3.2. **Definite Integrals.** The problem of areas. The definite integral. Properties of the definite integrals. Connection between definite integrals and antiderivatives.	1 lecture and 1 seminar
13.	Variable limits of integration. Evaluation Theorem. Integration by substitution. Integration by parts.	1 lecture and 1 seminar

14.	3.3. **Applications of Integration.** The area between two curves. Volumes. Arc length. The area of a surface of revolution. Applications to Physics (Moments and Centers of Mass. Work and energy).	1 lecture and 1 seminar
15.	**3.4. Improper integrals.** The concept of improper integral. A Comparison Test for Improper Integrals. Absolutely convergent integrals.	1 lecture and 1 seminar
16.	**4. INFINITE SERIES OF CONSTANTS.** 4.1. **Infinite series of constants.** Partial sum of the infinite series. Convergence and sum for infinite series. Remainder. The nth term test (convergence's necessary condition). Harmonic series. Series of nonnegative terms. Testing with an integral. Testing by comparing. The limit comparison test. The ratio test and root test. The alternating series test. Absolute convergence. Rearrangements of series. Conditional convergence.	1 lecture and 1 seminar

Course outline

1. INTRODUCTION

1.1. **Real Numbers.** The real number system. The real line. The absolute value of a number. Bounded and unbounded sets. Intervals in R.

1.2. **Functions.** The concept of a function. Composite function (a function of a function). Inverse functions. Bounded and unbounded functions. Even and odd functions. Periodic functions. Graphs of function. Infinite sequences.

1.3. **The Limit of Function.** The concept of a limit of function. Unique theorem. The limit of a sum. The limit of a product. The limit of a quotient. The limit of a composite function. The Squeeze Theorem. One-sides limits. Convergence of Infinite sequences.

1.4. **Continuity.** Continuous function at a point. Continuity of a sum, of a product and of a quotient. Continuity of composite function. Points of discontinuity. Properties of continuous functions.

2. THE DIFFERENTIAL CALCULUS.

2.1. **The Derivative of a Function and differentials.** Differentiability of a function. The derivative of a function, it's geometric and mechanics interpretations. Continuity of a differentiable function. Differentiability of a sum, of a product and of a quotient. Differentiability of composite function (The Chain Rule). Differentiability of inverse function. Derivatives of some Elementary Functions. Higher order derivatives. Mechanics interpretation of second order derivatives.

2.2. **Fundamental Theorems of Calculus**. Applications of Derivatives. Rolle's Theorems, Lagrange's Theorem (The Mean Value Theorem) and Cauchy's Theorem. L'Hospital's Rule. Taylor's theorem. Increasing and decreasing functions. Local maximum and local minimum. Fermat's Theorem. Absolute (global) maximum and absolute (global) minimum. The Closed Interval Method. Concave upward and concave downward functions. Points of inflection. Derivatives and the Shapes of Curves.

3. INTEGRALS.

3.1. **Indefinite Integrals**. A primitive (antiderivative) of function. Indefinite integral. Properties of indefinite integrals. Integration by substitution. Integration by parts.

3.2. **Definite Integrals.** The problem of areas. The definite integral. Properties of the definite integrals. Connection between definite integrals and antiderivatives. Variable limits of integration. Evaluation Theorem. Integration by substitution. Integration by parts.

3.3. **Applications of Integration.** The area between two curves. Volumes. Arc length. The area of a surface of revolution. Applications to Physics (Moments and Centers of Mass. Work and energy).

3.4. **Improper integrals.** The concept of improper integral. A Comparison Test for Improper Integrals. Absolutely convergent integrals.

4. INFINITE SERIES OF CONSTANTS.

4.1. **Infinite series of constants.** Partial sum of the infinite series. Convergence and sum for infinite series. Remainder. The nth term test (convergence's necessary condition). Harmonic series. Series of nonnegative terms. Testing with an integral. Testing by comparing. The limit comparison test. The ratio test and root test. The alternating series test. Absolute convergence. Rearrangements of series. Conditional convergence.

Basic literature

1. Kārlis Šteiners. Augstākā matemātika III. - Zvaigzne ABC, 1998.
2. Kārlis Šteiners. Augstākā matemātika IV. - Zvaigzne ABC, 1999.
3. Kārlis Šteiners. Augstākā matemātika VI. - Zvaigzne ABC, 2001.
4. Inta Volodko. Augstākā matemātika. Īss teorijas izklāsts, uzdevumu risinājumu paraugi. Divas daļas - Zvaigzne ABC, 2007.
5. E.Kronbergs, P.Rivža, Dz.Bože. Augstākā matemātika. 1.,2.daļa. - R.:Zvaigzne, 1988. - Zvaigzne ABC, 1996.

Supplementary literature

6. Andrew Browder. Mathematical Analysis. – Springer, 2001.
7. Erwin Kreyszig. Advanced Engineering Mathematics.- John Wiley & SONS, INC, 1999.

Other source of information

8. Vitolds Gedroics. Viena argumenta funkciju diferenciālrēķini. Daugavpils universitāte, 2002.
http://www.de.dau.lv/matematika/ievmatanavit2ht/index.html
9. Vitolds Gedroics. Viena argumenta funkciju integrālrēķini. Daugavpils universitāte, 2002.
http://www.de.dau.lv/matematika/int1ht/index.html

Vitolds Gedroics. Viena argumenta funkciju integrālrēķini. Daugavpils universitāte, 2002.
http://www.de.dau.lv/matematika/int1ht/index.html

MATHEMATICAL ANALYSIS II

Author	Dr.math., assoc.prof. Gaļina Hiļķeviča
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 (3 ECTS)
Prerequisites	Mathematical analysis I
Objective	The main purpose of the course is to generalize the main methods of one variable functions mathematical analysis for many variables and to teach students to use appropriate methods for practical problems solving.
Learning outcomes	After this course students will be able to demonstrate understanding of basic concepts and rules, to solve standard problems of mathematical analysis (represent functions in Fourier and Taylor series, find limit of many variables functions, find partial derivates, integrate many variables functions, etc.), to apply theoretical knowledge in real problems solving.

Organization mode of students individual assignment
Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.
Evaluation of learning outcomes
After each of main themes a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	1. SEVERAL VARIABLES FUNCTIONS DIFFERENTIAL CALCULUS 1.1. Function of Several Variables. N-argument function. The graph of two-argument function. Level curves. Three-argument function. Level surfaces. Many variables function limit and continuity.	Lecture

2.	Function of Several Variables. The graph of two-argument function. Level curves. Three-argument function. Level surfaces. Many variables function limit and continuity.	Seminar
3.	1.2. Several Variables functions differentiability. Partial derivative. Tangent plane. The geometric interpretation of two argument function differential. Direction derivative. Gradient. Theorem on indirect defined function existence and differentiation. Partial derivatives of indirect function.	Lecture
4.	Partial derivative. Tangent plane. Partial derivatives of indirect function.	Seminar
5.	1.3. High orders derivatives and differentials. Mixed derivatives equality. Two argument function Taylor formula. 1.4. Several Variables functions extremums. Maximum and minimum definitions. Extremum necessary condition. Two variables function maximum and minimum enough conditions.	Lecture
6.	High orders derivatives and differentials. Several Variables functions extremums.	Seminar
7.	Maximal and minimal value determination. Conditional extremums.	Lecture
8.	Test.	Seminar
9.	2. MANY VARIABLES FUNCTIONS INTEGRAL CALCULUS. 2.1. Double and Triple Integrals. Double integral definition. The continuous function inerrability. Double integral calculation using repeated integration. Variables change in double integral. Double integral in polar system. Triple integral definition. Variables change in triple integral. Triple integral in cylinder and spherical coordinates.	Lecture
10.	Double integral calculation. Triple integral calculation.	Seminar
11.	2.2. Multiple Integrals applications. The calculation of body volume. The calculation of smooth surface area. Rotational surface area. Implementations in physics. 2.3. Line Integrals. The problem of variable force work on flat plane. Linear integral definition. Linear integral calculation. Green's formulas. Path independent linear integrals.	Lecture
12.	The calculation of body volume. The calculation of smooth surface area. Rotational surface area. Linear integral calculation.	Seminar

13.	3. INFINIVE SERIES. 3.1. Sequences and series of functions. Convergence set. Uniform convergence. Uniform and absolute convergences conditions. Continuous functions uniformly convergent series sum. Series integration and differentiation. 3.2. Power Series. The concept of a power series. The interval of convergence. Radius of convergence. Differentiation and integration of power series. 3.3. Representations of Functions as Power Series. Taylor series. Approximate functions and integrals computations using Taylor series.	Lecture and seminar
14.	Test.	Seminar
15.	3.4 Trigonometric series. The representation of functions as trigonometric sets. Orthogonal and orthonornals systems of functions. Fourier coefficients and Fourier series. Averaged convergence.	Lecture
16.	Trigonometric series.	Seminar

1. SEVERAL VARIABLES FUNCTIONS DIFFERENTIAL CALCULUS

1.1. **Function of Several Variables.** N-argument function. The graph of two-argument function. Level curves. Three-argument function. Level surfaces. Many variables function limit and continuity.

1.2. **Several Variables functions differentiability.** Partial derivative. Tangent plane. The geometric interpretation of two argument function differential. Direction derivative. Gradient. Theorem on indirect defined function existence and differentiation. Partial derivatives of indirect function.

1.3. **High orders derivatives and differentials.** Mixed derivatives equality. High order differentials. Two argument function Taylor formula.

1.4. **Several Variables functions extremums.** Maximum and minimum definitions. Extremum necessary condition. Two variables function maximum and minimum enough conditions. Maximal and minimal value determination. Conditional extremums.

2. MANY VARIABLES FUNCTIONS INTEGRAL CALCULUS.

2.1. Double and Triple Integrals. Double integral definition. The continuous function inerrability. Double integral calculation using repeated integration. Variables change in double integral. Double integral in polar system. Triple integral definition. Variables change in triple integral. Triple integral in cylinder and spherical coordinates.

2.2. Multiple Integrals applications. The calculation of body volume. The calculation of smooth surface area. Rotational surface area. Implementations in physics.

2.3. Line Integrals. The problem of variable force work on flat plane. Linear integral definition. Linear integral calculation. Green's formulas. Path independent linear integrals.

3. INFINIVE SERIES.

3.1. **Sequences and series of functions**. Convergence set. Uniform convergence. Uniform and absolute convergences conditions. Continuous functions uniformly convergent series sum. Series integration and differentiation.

3.2. **Power Series**. The concept of a power series. The interval of convergence. Radius of convergence. Differentiation and integration of power series.

3.3. **Representations of Functions as Power Series.** Taylor series. Approximate functions and integrals computations using Taylor series.

3.4. **Trigonometric series.** The representation of functions as trigonometric sets. Orthogonal and orthonornals systems of functions. Fourier coefficients and Fourier series. Averaged convergence.

Basic literature

1. Kārlis Šteiners. Augstākā matemātika III. - Zvaigzne ABC, 1998.
2. Kārlis Šteiners. Augstākā matemātika IV. - Zvaigzne ABC, 1999.
3. Kārlis Šteiners. Augstākā matemātika VI. - Zvaigzne ABC, 2001.
4. Inta Volodko. Augstākā matemātika. Īss teorijas izklāsts, uzdevumu risinājumu paraugi. Divas daļas - Zvaigzne ABC, 2007.
5. 5. E.Kronbergs, P.Rivža, Dz.Bože. Augstākā matemātika. 1.,2.daļa. - R.:Zvaigzne, 1988. - Zvaigzne ABC, 1996.

Supplementary literature

6. Andrew Browder. Mathematical Analysis. – Springer, 2001.
7. Erwin Kreyszig. Advanced Engineering Mathematics.- John Wiley & SONS, INC, 1999.

Other source of information

9. Vitolds Gedroics. Vairāku argumentu funkciju diferenciālrēķini. Daugavpils universitāte, 2002.
http://www.de.dau.lv/matematika/fun2/index.html
10. Vitolds Gedroics. Vairāku argumentu funkciju integrālrēķini. Daugavpils universitāte, 2002.
http://www.de.dau.lv/matematika/int2.pdf
11. Vitolds Gedroics. Rindas. Daugavpils universitāte, 2005.
http://www.de.dau.lv/matematika/rindas.pdf

MATHEMATICAL LOGIC

Author	Dr.math., assoc.prof. Gaļina Hiļķeviča
Course Code	
Form of evaluation	Examination
Credit point (ECTS credit points)	2 (3 ECTS)
Prerequisites	School course of mathematic
Objective	The main purpose of the course is to consider Propositional calculus and Predicate calculus as foundations of logic. The course contains the consideration of languages formalisation, mathematical theories formalisation and axiomatic approach to formal theories.
Learning outcomes	After this course students will be able to demonstrate understanding of basic concepts and rules, to use operations of mathematical logic for statements logical structure description, to use mathematical logic methods for verification of statements correctness. Students will be able to use axiomatic methods for mathematical theories formalization.

Organization mode of students individual assignment

Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.

Evaluation of learning outcomes

After each of the two main themes a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

Week	Topic and subtopic	**Type** (lecture, seminar, laboratory work)
1.	Basic concepts of set theory.	Lecture
2.	Basic concepts of set theory.	Seminar
3.	1. Propositional logic. Proposition. Logical operations. Propositional formulas. Truth tables. Tautologies. Logical Equivalence.	Lecture
4.	1. Propositional logic. Proposition. Logical operations. Propositional formulas. Truth tables. Tautologies. Logical Equivalence.	Seminar
5.	1. Propositional logic. Normal forms. Principle of duality. Boole functions. Boole functions implementation for discrete automata analysis and synthesis. Logical consequences.	Lecture
6.	1. Propositional logic. Normal forms. Principle of duality. Boole functions. Boole functions implementation for discrete automata analysis and synthesis. Logical consequences.	Seminar
7.	2. Predicate logic. The predicate. Logical operations with predicates. The universal quantifier and the existential quantifier. The predicate logic formulas. Free and bounded variables.	Lecture
8.	Test.	
9.	2. Predicate logic. The principle of concretisation. Identically true formulas. Normal forms.	Lecture
10.	2. Predicate logic. The predicate. Logical operations with predicates. The universal quantifier and the existential quantifier. The predicate logic formulas. Free and bounded variables.	Seminar
11.	3. Propositional Calculus. The axiomatic approach to propositional logic. Logical axioms and inference rules. Proofs and Theorems. Inference from hypotheses. Deduction theorem. The Completeness Theorem. Solvability theory. Axiom independence.	Lecture
12.	2. Predicate logic. The principle of concretisation. Identically true formulas. Normal forms.	Seminar
13.	4. First-Order Language.	Lecture

	Terms and Formulas in First-Order Languages. Language interpretations (models). Formulas interpretations. Examples of languages and interpretations. Laws of logic. Prenex normal form. Conjunctive and disjunctive normal forms.	
14.	Test.	Seminar
15.	5. Formal axiomatic theories. Predicate calculus. Logical and special axioms. Inferences from axioms. Formal axiomatic theories. Theories and Models. Examples of formal axiomatic theories. Completeness theory. Interpretability. Categoricality of theories. Languages. Special axioms. Goedel's incompleteness Theorem.	Lecture
16.	5. Formal axiomatic theories. Predicate calculus. Axioms. Inferences from axioms.	Seminar

Course outline

1. **Propositional logic.** Proposition. Logical operations. Propositional formulas. Truth tables. Tautologies. Logical Equivalence. Normal forms. Principle of duality. Boole functions. Boole functions implementation for discrete automata analysis and synthesis. Logical consequences.
2. **Propositional Calculus.** The axiomatic approach to propositional logic. Logical axioms and inference rules. Proofs and Theorems. Inference from hypotheses. Deduction theorem. The Completeness Theorem. Solvability theory. Axiom independence.
3. **Predicate logic.** The predicate. Logical operations with predicates. The universal quantifier and the existential quantifier. The predicate logic formulas. Free and bounded variables. The principle of concretisation. Identically true formulas. Normal forms.
4. **First-Order Language**. Terms and Formulas in First-Order Languages. Language interpretations (models). Formulas interpretations. Examples of languages and interpretations. Laws of logic. Prenex normal form. Conjunctive and disjunctive normal forms.
5. **Formal axiomatic theories**. Predicate calculus. Logical and special axioms. Axioms of logic. Inferences from axioms. Formal axiomatic theories. Theories and Models. Examples of formal axiomatic theories. Completeness theory. Interpretability. Categoricality of theories. Languages. Special axioms. Goedel's incompleteness Theorem.

Basic literature

1. V. Detlovs. Matemātiskā loģika. - R.: Zvaigzne, 1974.
2. Jānis Cīrulis. Matemātiskā loģika un kopu teorija.- Zvaigzne ABC apgāds, 2007.
3. Колмогоров А.Н., Драгалин А.Г. Введение в математическую логику. – М.: МГУ, 1982.

Supplementary literature

4. Ben-Arī, Mōtī, Mathematical logic for computer science / Mordechai Ben-Ari. - 2., rev. ed. - London ; Berlin ; Heidelberg : Springer, 2001.
5. H.-D.Ebbinghaus, J.Flum, W.Thomas. Mathematical Logic. – Springer-Verlag, 1994.
6. Мощенский В.А. Лекции по математической логике. - Минск: Изд-во Белорус. Ун-та,1973.
7. Новиков П.С. Элементы математической логики. - М.: Наука, 1973.
8. Черч А. Введение в математическую логику. - М.: Наука,1960.
9. Мендельсон Э. Введение в математическую логику. - М.; „Наука”,1984.

Other source of information

10. Vilnis Detlovs, Karlis Podnieks. Introduction to Mathematical Logic http://www.ltn.lv/~podnieks/mlog/ml.htm

MATHEMATICAL MODELING

Author prof. Dr.habil.phys Juris Roberts Kalnins
Course Code
Form of evaluation test
Credit point (ECTS credit points) 4 (6 ECTS)
Prerequisites MathAnalysis, linear algebra courses

Objective
To introduce students to basic principles of mathematical modeling, to learn how to make mathematical models using VensimPLE, MatLab and AnyLogic tools.

Learning outcomes
Understanding the mathematical modeling. Ability to model dynamics of processes based on differential equations. Ability to model continuous, discrete and random processes.

Organization mode of students individual assignment
Regular attendance of lectures. Completion of homework assignments in time. Studies of course material consultations with lecturer

Evaluation of learning outcomes
Home assignments -30%;
Practical modeling -30%
Test - 40%.
Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	*Basic principles of mathematical modeling.* Model. Mathematical model. Matemātisko modeļu universalitāte. Classifications of models. Modelation steps	lecture, seminar
2.	*Models based on linear algebraic equations.* Solution of linear algebraic equations. Examples, electric circuits.	lecture, seminar
3.	Lineārās optimizācijas uzdevumi.	lecture, seminar
4.	*Models based on ordinary differential equations.* Mathematical formulation	lecture, seminar
5.	Examples: harmonic oscillator, damped oscillations, auto - oscillations. Chemical reactions.	lecture, seminar
6.	Glider problem, modeling of chaotic processes.	lecture, seminar nodarbības

7.	*Models based on partial differentiual equation (PDE)*. Numerical solution of PDE methods. Example: 1d heat conductivity model.	lecture, seminar
8.	Wave propagation 1d model.	lecture, seminar
9.	Two-dimensional problems.	lecture, seminar
10.	*Discrete mahtematical models.* General charasteristics. Examples.	lecture, seminar
11.	Forest fire model. Cellular automata. Conway's Game of Life.	lecture, seminar
12.	*Random processes.* Examples: random walking. Monte – Carlo method.	lecture, seminar
13.	Radiation defect accumulation (1d) model.	lecture, seminar
14.	*Mathematical modelling in optimization problems.* Maximization of utility functon. Basics of variation calculus and modeling.	lecture, seminar
15.	Examples: minimual time trajectory. Fermat principle and light propagation. Minimal area problem.	lecture, seminar
16.	*Agent based modeling in* AnyLogic.	lecture, seminar

Basic literature

1. **Matemātiskā modelēšana. J.R.Kalniņš, G. Hiļķeviča, E.** Vītola.Ventspils, 2008,ISBN 9984-648-86-9, 169 p.
2. Sandip Banerjee. Mathematical Modeling: Models, Analysis and Applications.Publisher: Chapman and Hall/CRC; 1 edition, 2014, ISBN-10: 1439854513 , ISBN-13: 978-1439854518, 276 p.
3. Clive Dym. Principles of mathematical modeling. Academic Press; 2 edition, 2004, ISBN-10: 0122265513, ISBN-13, 303 p.

Supplementary literature

1. Frank R. Giordano , William P. Fox, Steven B. Horton. A First Course in Mathematical Modeling. Cengage Learning 5 edition. ISBN-10: 1285050908, ISBN-13: 978-128505090, 2013, 704 p.

Other source of information

1. http://ccl.northwestern.edu/netlogo/

Basics of Information Technologies Law

Author	Sanita Meijere
Form of evaluation	Group work, tests, exam
Credit point (ECTS credit points)	2 (3 ECTS)
Prequalification	N/A
Part of the study programme	Compulsory elective courses

Course description
Explained basics of IPR, Copyright law, Patent Law, Law on physical persons` data protection, classification of cybercrime, Information security law.
Explained quality management and Quality management standard ISO 9001.
Explained Information security management standard ISO 27 001.

Learning outcome
By completing the course students will be aware of key aspects of IPR, its necessity and mechanisms and the most essential international and national rules and regulations in the field. Besides that, students will be aware of key quality and information security management tendencies and requirements based on the best practices.

Students independent work – study of the materials

Grading scheme 70% class participation, 30% final exam

Course schedule

Lectures	Topic	Type
1	IPR	Lecture & seminar
2	Copyright	Lecture & seminar
3	Patents	Lecture & seminar
4	Physical person data protection	Lecture & seminar
5	Cybercrime	Lecture & seminar
6	Information security	Lecture & seminar
7	Quality management	Lecture & seminar
8	Exam	

Literature:

- **Rules and regulations:** Copyright law, Patent law, Law on **Physical person data protection**, Criminal Law, Information security law.
- **Standards:** ISO 9001, ISO 27 001
- **Web:** CERT, ISACA

Object Oriented Programming

Author	Mag. paed., lekt. Estere Vītola
Course Code	
Form of evaluation	Exam
Credit point (ECTS credit points)	4 (6 ECTS)
Prerequisites	Basics of programming language C or C++

Objective	To develop an understanding of object-oriented approach to programming. Understand and be able to apply object-oriented programming approach to software development process by using the programming language C++. To be able to use this approach in other object-oriented programming languages.
Learning outcomes	Able to explain the basic concepts of object-oriented programming approach and realize them in programming language C ++. Able to explain the object-oriented programming and procedural programming features and compare these approaches. Able to define the class as a real object description, choose the descriptive variables (data members) and define the member functions. Able to develop programs using the language C++ and object-oriented approach. Able to analyze and explain the C++ source code. Able to use a C ++ library classes, including the STL (Standard Template Library). Able to work with literature and internet resources.
Organization mode of students individual assignment	Regular studies of course material, literature and online resources; homework assignments; consultations with lecturer.
Evaluation of learning outcomes	A systematic work during the semester – 50%: • Systematic work in lectures and seminars – 5% • Homework assignments – 25% • Tests - 20% Exam - 50%

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Introduction. Software life cycle. Object-oriented programming approach, comparison with procedural programming approach. Review of the most popular programming language.	Lecture, seminar
2.	Basic concepts of Object-oriented programming (OOP). Class as an abstract data type. Object as a class instance. Class implementation in the programming language C++. Access levels. Encapsulation and hiding.	Lecture, seminar
3.	Constructors. The default constructor, overloaded constructors.	Lecture, seminar
4.	Static class members. Pointer *this*. Constant class functions and constant function arguments. Passing arguments (objects) by value and by reference.	Lecture, seminar
5.	Member and "non-member" functions, comparison. Class friends.	Lecture, seminar
6.	Operator overloading. Overloaded operators as member functions and as "non-member" functions.	Lecture, seminar
7.	Test. A simple class development using previously learned OOP concepts and techniques. Development of class client program.	Lecture, seminar
8.	Dynamic memory usage in the class. The copy constructor definition and assignment operator definition. Shallow and deep copying.	Lecture, seminar
9.	Templates. Function template definition. Class template definition. STL (Standard Template Library) functions and classes.	Lecture, seminar
10., 11.	Various associations between classes, such as a-kind-of, part-of, has-a. Using UML use to represent association between classes. The composition and aggregation. Inheritance. The base class and inherited class. Private, public and protected class members and public, protected and private inheritance.	Lecture, seminar
12.	Virtual functions. Pure virtual functions and abstract classes.	Lecture, seminar
13.	Exceptions and exception handling. Exception handling implementation in language C++. C ++ exception class.	Lecture, seminar
14.	Test. Development of classes using previously learned OOP concepts and techniques. Development of client program.	Lecture, seminar
15.	Data structures: stacks, queues, linked lists. Data structure development using object-oriented programming approach.	Lecture, seminar

16.	Summary and repetition. Miscellaneous.	Lecture, seminar

Basic literature:

Prata S. C++ Primer Plus (6th Edition) (Developer's Library).- Addison-Wesley Professional, 2011, ISBN-13 978-0321776402, 1200 p

Savitch W. Problem Solving with C++ (9th Edition).- Pearson, 2014, ISBN-13: 978-0133591743, 1088 p

Supplementary literature:

Stroustrup B. The C++ Programming Language, 4th Edition.- Addison-Wesley Professional, 2013, ISBN-13 978-0321563842, 1368 p

Other source of information:

Lecture materials available to learning management system Moodle.

http://www.cplusplus.com/

http://www.learncpp.com/

http://en.cppreference.com/w/cpp/language

Thinking in C++ 2nd Edition by Bruce Eckel

http://mindview.net/Books/TICPP/ThinkingInCPP2e.html

https://www.tutorialspoint.com/cplusplus/index.htm

https://www.tutorialspoint.com/cpp_standard_library/index.htm

Operating Systems

Author	Prof. Dr.Sc.Ing. I. Lemberskis/ Lect. Mg. Oec. G. Neimanis
Course Code	1228
Form of evaluation	exam
Credit point (ECTS credit points)	**4 (6 ECTS)**
Prerequisites	Basic knowledge in computers, knowledge in programming in C language

Objective

Provide knowledge in operating systems theory, structure, design and working principles. Knowledge in operating systems installation, configuration and maintenance as well as programming in LINUX environment

Learning outcomes

Knowledge in theory of operating systems, installation, configuration and maintenance as well as programming in LINUX environment

Organization mode of students individual assignment

Regular studies of course material, literature and online resources; practical exercises assignments; consultations with lecturer

Evaluation of learning outcomes

Exam – 70%

Practical exercises - 30%;

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1	Evolution and classification of operating systems LINUX structure and basic commands. File system	Lecture Practice
2	Computer structure, Instruction execution diagram System calls fork(),wait(),exit()	Lecture Practice
3	Proceses queue and treatment System call dup()	Lecture Practice
4	Memory partition System call execl()	Lecture Practice
5	Cashe memory System call ppid(),getpid()	Lecture Practice
6	Proceses deadlock and stavration Input-output system calls	Lecture Practice
7	Banker's algoritm System call pipe()	Lecture Practice
8	Disk structure System call signal().	Lecture Practice
9	Mutual exclusion (ME)(software approach). Unix and Linux history.	Lecture Practice

10	4 variants how to implement ME. Installing Linux OS.	Lecture Practice
11	Dekker and Peterson's algoritms. Linux OS help system, system utilities.	Lecture Practice
12	Mutual exclusion (hardware approach). Linux package management systems. Installing software from source code.	Lecture Practice
13	Proceses shceduling. Linux command line interface. Shell scripting.	Lecture Practice
14	Semaphores. Linux desktop management systems, configuring printing and SSH.	Lecture Practice
15	Produsers and consumers problem with infinite and circular buffers Installing FreeBSD.	Lecture Practice
16	Produsers and consumers problem description using semaphores. FreeBSD package management systems.	Lecture Practice

Core literature:

1.Stallings William. Operating Systems : Internals and Design Principles / William Stallings. - 8th ed. - [New Jersey] : Pearson Education International, [2015]. - 818 p: il. ISBN 0133805913

Supplementary literature:

1. A.S.Tanenbaum. Modern Operating Systems. Prentice Hall, 2001.

2. Glenn Walter. MCSA/MCSE Self-Paced Training Kit (Exam 70-270) : installing, configuring, and administering Microsoft Windows XP Professional / Walter Glenn, Tony Northrup. - 2nd ed. - Washington : Microsoft Press, 2005. - [1110] p. ISBN 9780735621527 (var mainīties pēc aktuālās Windows versijas un oficiālā mācību kursa).

3. Linux Professional Institute (LPI) exam prep - http://www.ibm.com/developerworks/linux/lpi/

4. Smith Roderick W. Linux+ : Study Guide / Roderick W.Smith. - San Francisco : Sybex, 2004. - 597 p. ISBN 0-7821-4312-1

5. Brian. FreeBSD 6 Unleashed / Brian Tiemann, Michael Urban. - Indianapolis, Ind. Sams, 2006. - xxv, 877 p. ISBN 0-672-32875-5

6. Cisco NetAcademy – NDG Linux Essentials//NDG Linux I & II

OPTIMIZATION METHODS

Author	Dr. math. Jānis Vucāns
Course Code	
Form of evaluation	exam
Credit points (ECTS credit points)	2 (3 ECTS)
Prerequisites	The basic knowledge from algebra and calculus of functions of one and several variables, at least one programming language skill

Objective

To provide students with knowledge on the theoretical background of optimization methods and to build their skills to apply the optimization methods and their most used numerical algorithms in solving various types of problems.

Learning outcomes

Understanding about the set of optimization methods, about main results of mathematics forming the basis for building optimization methods, about main fields of application of optimization methods and about their more frequently used numerical algorithms. Gained skills to apply optimization methods and their more frequently used numerical algorithms in solving of concrete types of problems.

Organization mode of students individual assignment

Regular studies of course material, literature and online resources; training the ability to apply the special type computer software; elaboration of laboratory works with individually assigned problems (with the possibility in case of necessity to have consultations with the lecturer) and defending the solutions of problems.

Evaluation of learning outcomes

Individual laboratory work's assignments - 100%.

Course outline

Week	Topic and subtopic	Type (lecture, seminar, laboratory work)

1.	Topic 1 – Classification of optimization methods. Active and passive search. Stochastic and deterministic minimization algorithms. Application of basic results from the calculus of functions of one and several variables for determination of extremal values of the functions; the concepts of *inf, sup, arg min* and *arg max*; local and absolute extrema; determination of absolute extrema in the situations with or without additional conditions in the form of equalities or inequalities.	Lecture
2.	Laboratory work on the Topic 1 and its defense.	Laboratory work.
3.	Topic 2 – Mathematically theoretical basis for minimization of one variable unimodal functions; more often used numerical algorithms – Dichotomy method, Golden section method and Fibonacci method.	Lecture.
4.	Laboratory work on the Topic 2; defense of the Laboratory work on the Topic 1.	Laboratory work.
5.	Topic 3– Concept of *Lipschitz* continuous function; numerical algorithms for minimization of such one variable functions, including the Broken lines method. Tangent method.	Lecture.
6.	Laboratory work on the Topic 3; defense of the Laboratory work on the Topic 2.	Laboratory work.
7.	Topic 4 – The types of Linear Programming problems, more often used in applications – Problem of diet, Production problem, Transportation problem. Transportation type problems and possibilities of their reduction to the Transportation problem. More often used numerical algorithms for solving the Linear Programming problems.	Lecture.
8.	Laboratory work on the Topic 4; defense of the Laboratory work on the Topic 3.	Laboratory work.
9.	Topic 5 – Mathematic basis of Game Theory. Reducing of the Two-person game with the zero sum to the solving of Linear Programming problem.	Lecture.
10.	Laboratory work on the Topic 5; defense of the Laboratory work on the Topic 4.	Laboratory work.
11.	Topic 6 – Determination of absolute extrema for several variables function, including Exclusion method, Lagrange multipliers method, Method of graphical solution.	Lecture.
12.	Laboratory work on the Topic 6; defense of the Laboratory work on the Topic 5.	Laboratory work.
13.	Topic 7 – Basic algorithms for minimization of several variable functions – Gradient methods, Newton methods et al.	Lecture.
14.	Laboratory work on the Topic 7; defense of the Laboratory work on the Topic 6.	Laboratory work.
15.	Topic 8 – Use of the Bellman Dynamic Programming principle for solution of Optimal Control Problems.	Lecture.

16.	Laboratory work on the Topic 8; defense of the Laboratory works on the Topics 7 and 8.	Laboratory work.

Basic literature:

1. D. Kļaviņš. Optimizācijas metodes ekonomikā I, II. Rīga: "Datorzinību centrs", 2003.
2. U. Raitums. Optimizācijas metodes. – Rīga: "Mācību grāmata", 2002. *(http://nms.lu.lv/wp-content/uploads/2015/11/OptimMet.pdf)*
3. F. Sadirbajevs. Ievads optimizācijā. - Daugavpils: DU izdevniecība "Saule", 2003. *(http://de.du.lv/matematika/optfs/index.html)*
4. A. Cibulis. Ekstrēmu uzdevumi 1. daļa. – Rīga: LU, 2003
5. A. Andronovs, Transporta sistēmu optimizācijas metodes. 1. dala. Lineārā programmēšana. 1 daļa. Rīga: Rīgas Tehniskā universitāte, 2007. 72 lpp.
6. D.P. Bertsekas. Dynamic Programming and Optimal Control: Vol. 1 and 2; 2nd edition, 2002.
7. G. M. Siouris. An Engineering Approach to Optimal Control and Estimation Theory. John Wiley & Sons, Inc., 2003.
8. R. Fletcher, Practical Methods of Optimization, John Wiley & Sons, 2000.
9. Jorge Nocedal, Stephen J. Wright. Numerical Optimization, 1999.

Supplementary literature:

1.Druvvaldis Kļaviņš, Lineārā programmēšana piemēros, Rīga: Zvaigzne, 1987.
2.Э.М. Галеев, В.М. Тихомиров, Краткий курс теории экстремальных задач, изд. МГУ, 1989.
3. Ф.П.Васильев, Численные методы решенния экстремальных задач, М.: Наука, 1980.
4. Р. Габасов, Ф.М. Кириллова. Методы оптимизации. Издательство БГУ, Минск, 1975.
5. Н.Н. Моисеев, Ю.П. Иванилов, Е.М. Столярова. Методы оптимизации. М.: Наука, 1978.
6. В.М. Алексеев и др. Сборник задач по оптимизации. М.: Наука, 1984.
7. И.М. Гельфанд, С.В. Фомин. Вариационное исчисление. ГИФМЛ, 1961.
8. Л.С. Понтрягин и др. Математическая теория оптимальных процессов., М.: Наука, 1978.

Basics of Programmable Logic Controllers

Authors	Jānis Šperbergs, Gatis Gaigals
Code of the course	
Examination form	Test
Credit points (ECTS points)	2
Prerequisites for taking the course	Basics of programming, physics
Course group	Compulsory selection courses
Goal of the course	To provide an insight into physical and algorithmic operational basics and application of programmable controllers and their peripheral units. To teach working with programmable logic controllers and peripheral units for developing their software.
Expected results	Ability to plan work and work in groups. Ability to apply theoretical knowledge of programming to develop software for programmable logic controllers. Ability to determine type of sensor using different materials. Ability to determine sensor limits. Ability to install sensors at an optimal distance. Ability to choose and apply the correct programming tools for controllers. Ability to use documentation from the manufacturer. Ability to create a program for a programmable controller based on a process model simulation.

Organization of student individual work

Laboratory work

Evaluation of study results

10 completed and presented laboratory works - 100%

Course contents

Lectures

1. Mechatronics, mechatronic systems.
2. Application of automated design elements in development of a mechatronic system.
3. Sensor technologies.
4. General basics of programmable controllers.
5. Programming of PLC.
6. Basics of robotics. Structure and programming of microcontrollers.

Laboratory works

1. FESTO controller FEC Standard programming: familiarization with FST.
2. FESTO controller FEC Standard programming: control of garage doors.

3. Usage of timers in FESTO programmable controllers.
4. Usage of counters in FESTO programmable controllers.
5. FEC34: implementation of a traffic light with additional sensors.
6. Familiarization with the FESTO MPS process workstation.
7. Study of capacitive and inductive proximity sensors.
8. Simulation of EasyVeep processes: control of 7 section indicators.
9. Simulation of EasyVeep processes: automation of water reservoirs.
10. Basics of robotics.

Optional:

11. Full drilling cycle realization of the FESTO MPS process workstation.
12. BECK SC13 RTOS basics.

Basic literature	P. Croser, Frank Ebel, Pneimatika. Mācību grāmata. Festo Didactic Rīga, 2003, 100 lpp
Additional literature	1. R. Bliesner, F. Ebel, C. Loffler, B.Plageman, H. Regber, Ev. Terzi, A Winter, Programable logic controllers Basic Level. TP301 – textbook D-73770. Denkendorf, 2002, 214p. 2. A.Peļiņins, G.Spalis, „AutoCad Datorizētā projektēšana". Jumava, 2002, 199 lpp. 3. Mekka, "Mehatronika". Pneimatika, Jelgava, MEKKA, 2005, 117 lpp. 4. Greivulis J., Raņķis I. Iekārtu vadības elektroniskie elementi un mezgli. Rīga, Avots, 288 lpp. 5. R.Müller, Fa. Beck; P.Janssen YC-EPM FEC Hardware Description V1.7. Esslingen: Festo AG & Co, 1998, 69 lpp. 6. A. Čipa, Mikroprocesori i80x86, Mācību līdzeklis. Rīgas Tehniskā universitāte, 1994.

Other sources

1. Arrick Robotics: http://www.robotics.com
2. Blackboard Learning System: http://www.vu.lv
3. PIC programmēšana: http://www.mplab.com
4. FESTO kontrollieri: http://www.beck-ipc.com

Programming

Author	Mag. paed., lekt. Estere Vītola
Course Code	
Form of evaluation	Exam
Credit point (ECTS credit points)	4 (6 ECTS)
Prerequisites	No need

Objective	To acquire basic knowledge of algorithms and program development process. Learn algorithmic thinking. Understand and be able to apply procedural programming approach to program development process by using the programming language C++.
Learning outcomes	Able to develop applications (programs) using the programming language C ++ in accordance with good programming practice. Able to detect and correct errors in the source code. According to requirements of the problem are able to find an appropriate solution and to justify it. Able to use C ++ library functions. Able to analyze and explain the C ++ source code. Able to work independently with literature and internet resources.
Organization mode of students individual assignment	Regular studies of course material, literature and online resources; homework assignments; consultations with lecturer.
Evaluation of learning outcomes	A systematic work during the semester – 50%: • Systematic work in lectures and seminars – 5% • Homework assignments – 25% • Tests - 20% Exam - 50%

Course outline

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.	Introduction. Algorithm. Program. History of programming languages. Programming paradigms. Review the most popular programming language.	Lecture, seminar
2.	The program life cycle. Compilation and execution. C ++ program structure. Error detecting and correcting. Comments. Programming style. Internet resources.	Lecture, seminar

3.	Variables and data types. Constants. Operators. Operator priorities. Input / output using the predefined *cin* and *cout* objects.	Lecture, seminar
4.	Conditional and logical operators. Controlling program flow by using the *if ... else* and *switch* statements.	Lecture, seminar
5.	Loops (*for, while, do ... while*).	Lecture, seminar
6.	Functions. C ++ library functions. Function declaration and definition (implementation). Function arguments and parameters. Function returning value type. Variable scope. Reference (reference) type variables. Constant function parameters and constant functions. Function overloading. Recursive functions.	Lecture, seminar
7.	Test. Development of simple programs using the acquired topics.	Lecture, seminar
8.	Arrays. Two-dimensional arrays. Arrays as function parameters.	Lecture, seminar
9.	Characters and strings (C-style strings). String size, initializing. C ++ style strings - string class. Input/output. C++ library functions that manipulates character strings.	Lecture, seminar
10., 11.	References. Addresses and pointers. Operators * and &. Pointers and arrays. Pointers arithmetic. Pointers to pointers. Pointers to functions.	Lecture, seminar
12.	Memory management in C ++. Variable duration and scope. Dynamic or free memory. Operators *new* and *delete*.	Lecture, seminar
13.	C++ input/output file streams.	Lecture, seminar
14.	Compound C++ types: enumerations and structures.	Lecture, seminar
15.	Test. Development of programs using the acquired topics.	Lecture, seminar
16.	Summary and repetition. Miscellaneous.	Lecture, seminar

Basic literature:

Prata S. C++ Primer Plus (6th Edition) (Developer's Library).- Addison-Wesley Professional, 2011, ISBN-13 978-0321776402, 1200 p

Savitch W. Problem Solving with C++ (9th Edition).- Pearson, 2014, ISBN-13: 978-0133591743, 1088 p

Supplementary literature:

Stroustrup B. The C++ Programming Language, 4th Edition.- Addison-Wesley Professional, 2013, ISBN-13 978-0321563842, 1368 p

Other source of information:
Lecture materials available to learning management system Moodle.
http://www.cplusplus.com/
http://www.learncpp.com/
http://en.cppreference.com/w/cpp/language
Thinking in C++ 2nd Edition by Bruce Eckel
http://mindview.net/Books/TICPP/ThinkingInCPP2e.html
https://www.tutorialspoint.com/cplusplus/index.htm
https://www.tutorialspoint.com/cpp_standard_library/index.htm

JAVA Programming

Author	Mg. sc. comp. Karina Šķirmante
Course Code	1371
Form of evaluation	Exam
Credit point (ECTS credit points)	4 CP (6 ETCS)
Prerequisites	OOP basic knowledge

Objective

Objective of this course is to introduce students to JAVA programming language and different modern technologies connected to them as well as to give students basic understanding about the advantages and shortcomings of these technologies and their main cases of usage.

Learning outcomes

After finishing this course students must have basic knowledge about JAVA programming language. Students must understand the possibilities and advantages of using these technologies and they must be able to develop some basic applications using JAVA about the topics covered throughout the course.

Organization mode of students individual assignment

Students must attend lectures or read the according information from the provided presentations or other sources (including internet). Laboratory work. Weekly consulting session with the lecturer is available.

Evaluation of learning outcomes

Final evaluation includes:

- exam/semester project (50%),
- theoretical tests (10%)
- practical assignments (20%)
- practical tests (20%)

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1	OOP : variables and their types, concepts of program, commands, operators, inheritance, polymorphism, interfaces, exceptions.	Lecture and seminar
2	Graphical interfaces. IO streams	Lecture and seminar
3	Threading	Lecture and seminar

4	Networking	Lecture and seminar
5	Networking	Lecture and seminar
6	Connections with database, queries and implementation of results	Lecture and seminar
7	Connections with database, queries and implementation of results	Lecture and seminar
8	Practical work	Laboratory work
9	JSP, HTML un JavaScript;	Lecture and seminar
10	Services - RESTful, SOAP, JAX-WS, JAX-RS	Lecture and seminar
11	Services - RESTful, SOAP, JAX-WS, JAX-RS	Lecture and seminar
12	Version control and Testing	Lecture and seminar
13	Design Patterns	Lecture and seminar
14	Android - Mobile Development	Lecture and seminar
15	Android - Mobile Development	Lecture and seminar
16	Practical work	Laboratory work

Course outline

Basic literature

1. 'Learning Java, 4th Edition', Patrick Niemeyer, Daniel Leuck, O'Reilly Media, ISBN: 144-9-319-246
2. 'Effective Java Second Edition', Joshua Bloch, Prentice Hall, ISBN:978-0-321-35668-0
3. 'Java How to Program, 7th Edition', H.M.Deitel, Prentice Hall, ISBN:0132222205

Supplementary literature

4. 'Core Web Programming, Second Edition', Marty Hall, Larry Brown, Prentice Hall, ISBN: 978-0-13-089793-0
5. 'Pro Java Programming, Second Edition ', Brett Spell, ISBN:1-59059-474-6
6. 'The Complete Reference JAVA, Seventh Edition', Herbert Schildt, Mc Graw Hill Companies, ISBN: 978-0-07-163177-8

Other source of information

1. The JAVA Tutorial website: http://download.oracle.com/javase/tutorial/index.html

2. Web developer information website: http://www.w3schools.com/

Numerical Methods

Author	Mg.sc.comp. D. Briede
Course Code	
Form of evaluation	Exam
Credit point (ECTS credit points)	2 KP (3 ECTS)
Prerequisites	Higher mathematics

Objective
To acquaint students with methods for solving scientific problems on a modern computer and limitations of these methods.

Learning outcomes
Upon successful completion of the course, the student will be able to use a computer to solve problems that have been cast into certain standard mathematical forms and understand the underlying algorithmic techniques. The student will have an understanding of the limitations of numerical methods.

Organization mode of students individual assignment
Systematic work during semester includes:

- regular learning using lecture materials, literature, internet resources,
- completion of home assignments,
- preparation for the exam,

weekly teacher consultations.

Evaluation of learning outcomes
Course assessment consists of two parts:

- average grade for the home assignments (30% of total grade)
- exam grade (70% of total grade)

If the average grade for home assignments is 8 or higher, the student can choose not to write the exam. In this case the average grade for home assignments is also the total grade for the course.

Course outline

1. *Numerical methods and error analysis*. A simple mathematical model. Significant digits of precision. Errors: absolute and relative. Accuracy and precision. Rounding and chopping. Taylor series. Floating-point representation.
2. *Locating roots of equations*. Bisection method. False position method. Newton's method. Secant method. Simple fixed-point iteration. Convergence analysis.
3. *Systems of linear equations*. Gauss elimination. Determinants and Cramer's rule. Gauss-Seidel method. Jakobi iterative method.
4. *Interpolation.* Vandermonde matrix. Polynomial interpolation. Lagrange interpolating polynomials. Finite difference and divided difference. Newton's interpolating polynomials. Interpolation errors. Spline interpolation. Method of least squares. Nonlinear example.
5. *Numerical differentiation*. Derivative formulas via interpolation polynomials. Derivatives of unequally spaced data. Errors in numerical differentiation.
6. *Numerical integration*. Newton-Cotes integration formulas Riemann sums. Trapezoidal rule. Simpson's rules. Integration with unequal segments.
7. *Ordinary differential equations*. A solution of an ordinary differential equation. Geometric interpretation of differentiation, vector field. First order Taylor series method (Euler's method). Higher-order Taylor series methods. Heun's method.

Midpoint method. Backward Euler's method. Runge-Kutta method. Picards iterations.

8. *Systems of ordinary differential equations*. Predator-prey model. Euler's method. Runge-Kutta methods. Autonomous ODE systems. Higher-order equations and systems.

Week	**Topic and subtopic**	**Type** (lecture, seminar, laboratory work)
1.-2.	*Numerical methods and error analysis*. A simple mathematical model. Significant digits of precision. Errors: absolute and relative. Accuracy and precision. Rounding and chopping. Taylor series. Floating-point representation.	Lecture, seminar.
3.-4.	*Locating roots of equations*. Bisection method. False position method. Newton's method. Secant method. Simple fixed-point iteration. Convergence analysis.	Lecture, seminar.
5.-6.	*Systems of linear equations*. Gauss elimination. Determinants and Cramer's rule. Gauss-Seidel method. Jakobi iterative method.	Lecture, seminar.
7.-8.	*Interpolation.* Vandermonde matrix. Polynomial interpolation. Lagrange interpolating polynomials. Finite difference and divided difference. Newton's interpolating polynomials. Interpolation errors. Spline interpolation. Method of least squares. Nonlinear example. *Numerical differentiation*. Derivative formulas via interpolation polynomials. Derivatives of unequally spaced data. Errors in numerical differentiation.	Lecture, seminar.
9.-11.	*Numerical integration*. Newton-Cotes integration formulas Riemann sums. Trapezoidal rule. Simpson's rules. Integration with unequal segments.	Lecture, seminar.
12.-14.	*Ordinary differential equations*. A solution of an ordinary differential equation. Geometric interpretation of differentiation, vector field. First order Taylor series method (Euler's method). Higher-order Taylor series methods. Heun's method. Midpoint method. Backward Euler's method. Runge-Kutta method.	Lecture, seminar.
15.-16.	*Ordinary differential equations.* Picards iterations. *Systems of ordinary differential equations.* Predator-prey model. Euler's method. Runge-Kutta methods. Autonomous ODE systems. Higher-order equations and systems.	Lecture, seminar.

Basic literature

1. J. R. Kalniņš, G. Hiļķevica, E. Vītola.,"Skaitliskās metodes", māc. mater., ESF proj, VeA, 2008.
2. W. Cheney, D. Kincaid: "Numerical Mathematics and Computing (6th edition)", 2008
3. S.C. Chapra, R.P. Canale: "Numerical Methods for Engineers (6th edition)", 2010

Supplementary literature

1. K. Atkinson, W.Han, "Elementary Numerical Analysis", 3rd edition, Wiley, 2003
2. M. Grasselli and D. Pelinovsky, "Numerical Mathematics" , Jones & Bartlett, 2008.
3. Michael T. Heath, "Scientific Computing: An Introductory Survey", 2nd Edition, McGraw-Hill, 2002

4. H.Kalis,”Skaitliskās metodes IV”, Rīga, 2008

Other source of information

1. K. Atkinson and W. Han, Teaching Numerical Analysis using elementary numerical Analysis, Master File
http://www.cs.uiowa.edu/~atkinson/ena_master.html

Network Operating Systems

Author	**Mg. soc. G. Neimanis**
Course Code	
Form of evaluation	**Exam**
Credit point (ECTS credit points)	2 (3 ECTS)
Prerequisites	Skills to use Linux OS. Understanding LAN.
Objective	Provide background and practical skills in computer networking, network services and network administration.
Learning outcomes	Background knowledge about OSI and TCP/IP. Practical skills to configure computer network settings and troubleshoot them. Practical skills to establish network services (DNS, file sharing, Samba, NFS Active Directory) and managing users. Background knowledge about network administration tasks.

Organization mode of students individual assignment
Regular studies of course material, literature and online resources; consultations with lecturer.

Evaluation of learning outcomes
Completed assignments. Final exam.

Course outline

Week	Topic and subtopic	Type (lecture, seminar, laboratory work)
1	OSI and TCP/IP. Installing and configuring Linux OS for network.	Lecture and laboratory work
2	IPv4 and IPv6. Network monitoring and traffic sniffing.	Lecture and laboratory work
3	DNS, DHCP and other LAN services. Setting up DNS server.	Lecture and laboratory work
4	User and group management.	Lecture and laboratory work
5	Sharing network resources with NFS, SMB/SAMBA.	Lecture and laboratory work
6	Windows Active Directory, Group Policies. Building AD with Windows Server OS.	Lecture and laboratory work
7	Windows Active Directory, Group Policies. Building AD with Linux/SAMBA.	Lecture and laboratory work

8	Network security. Redundancy and redundancy.	Lecture and laboratory work

Basic literature

1. Lammle, Todd. CompTia Network + study guide : exam N10-006 / Todd Lammle. - 3rd ed. - Indianapolis, IN : John Wiley and Sons, 2015. - xxv, 906 p. : il., tables. - Index: p. 865.- 906. ISBN 9781119021247.

Supplementary literature

1. http://www.zytrax.com/books
2. Red Hat Enterprise Linux 4.5.0 “System Administration Guide “
3. http://wiki.samba.org

Other source of information -

WWW TECHNOLOGIES

Author	Mārcis Koloda
Course Code	
Form of evaluation	Exam
Credit point (ECTS credit points)	2KP (ECTS 3KP)
Prerequisites	None

Objective
Aim of the course to provide practical skills in dynamic web site development and provide insight into the development tools, languages and environments.
Learning outcomes
Training course the students will gain practical skills in website development using the following technologies:

- HTML, CSS, Javascript, JQuery
- PHP, MySQL, GIT

Organization mode of students individual assignment
Practical lessons, home assignments and course work development.
Evaluation of learning outcomes
Home assignments, course work and exam. 25% home assignments, 50% course work and 25% exam.

Course outline

Week	Topic and subtopic	Type
1.	Tools for website development. Atom Visual, Studio Code, PHPMyAdmin, git, gitlab etc.	seminar
2.	Preparing environment for work: configuring server, installing dependencies etc.	seminar
3. - 4.	HTML usage and syntax.	seminar
5. - 7.	CSS usage and syntax.	seminar
8. – 10.	Javascript, JQuery	seminar
11. – 12.	Server-side: PHP	seminar
13.	Databases	seminar
14. - 15.	Frameworks: Bootstrap, Semantic-ui etc.	seminar
16.	Course work presentation	seminar

Basic literature

1. HTML, CSS, PHP, Angular, Javascript, JQuery, http://www.w3schools.com/
2. Tools: https://atom.io/docs, https://www.phpmyadmin.net/, https://git-scm.com/doc
3. Frameworks: https://semantic-ui.com/, https://getbootstrap.com/docs/4.0/getting-started/introduction/

Supplementary literature

1. Guide https://www.sitepoint.com/, http://tympanus.net/codrops/
2. Resources: http://colours.neilorangepeel.com/, http://www.iconarchive.com/ https://www.pexels.com/

Other source of information

1. CSS, HTML - http://css-tricks.com/
2. Training - http://www.lynda.com/

Introduction to Business

Author Professor Sergey Hilkevics
Course Code
Form of evaluation examination
Credit points **2** CP (3 ECTS)
Prerequisites No

Objectives

The main objective of the course is to provide ITF students with knowledge in business administration and business processes that is necessary for successful work in business structures.

Learning outcomes

After completion of the course, students will have fundamental knowledge necessary in business administration. Students will be able to understand business administration terminology and principles, know how the business organization is functioning, analyse business processes and functions, and will have skills to identify business opportunities.

Organization mode of students individual assignment

Regular studies of course material, literature and online resources; practical exercises; homework assignments and development of course project in the form of business plan; consultations with lecturer.

Evaluation of learning outcomes

Homework assignments - 50%; Course project - 50%.

Course outline

Week	Topic and subtopic	Type (lecture, seminar, laboratory work)
1	1. Economic activities as humans existence condition 2. Business and business administration 3. The essence and functions of business 4. The goals and tasks of business 5. Capital, labour, resources, goods, services markets	Lecture, seminar
2	6. Business organizational forms 7. Business legal foundations 8. The process of company creation and development 9. The reorganization of company 10. Business globalization	Seminar
3	11. Functional approach to business administration 12. Organization theory 13. Company organizational structure 14. Management as business function 15. Financial management as business function	Lecture, seminar
4	16. Human resources management as business function 17. Material resources management as business function 18. Main business activity of company as business function 19. Marketing as business function 20. Hierarchical business organizational structures	Seminar
5	21. Management of hierarchical structures 22. Different levels of management in organizations 23. Management efficiency 24. Management specific features in different economy sectors 25. Management historical development	Lecture, seminar

6	26. Classical managerial theories 27. Human behaviour theories 28. Quantitative management theories 29. Integrated management theories 30. Modern management theories	Seminar
7	31. Business environment 32. Internal environment 33. External environment 34. Internal and external environment relations 35. Communications in management	Lecture, seminar
8	36. Human behaviour in communication process 37. Communication forms classification 38. Communications management 39. Decision making general description 40. Decision making process	Seminar
9	41. Individual and collective decision making 42. Quantitative methods in decisions making 43. Decision making efficiency evaluation 44. Business planning general description 45. Organization goals formulation	Lecture, seminar
10	46. Strategic, tactic, operative plans 47. Classification of plan types and planning methods 48. Budget as planning tool 49. Strategic planning goals 50. Strategic planning process	Seminar
11	51. Strategic planning levels 52. Functional level strategic planning 53. Business level strategic planning 54. Company level strategic planning 55. Coordination as business function	Lecture, seminar
12	56. Planned works and responsibility distribution 57. Administrative capacity evaluation 58. Powers distribution 59. Centralization and decentralization of companies 60. General principles of organizational structures creation	Seminar
13	61. Organization structure influencing factors 62. Organization structure and company life cycle	Lecture, seminar

	63. Organization structure correspondence to goals of company 64. Organization structure and company products 65. Organization structure and territorial factors	
14	66. Organization structure and customers 67. Organization structure and HRM 68. PERT charts 69. Imitation modelling in business 70. Motivation theories evolution	Seminar
15	71. Control in organizations 72. Main forms and principles of control 73. Operative control 74. Tactic control 75. Strategic control	Lecture, seminar
16	76. Control efficiency evaluation 77. Internal and external control 78. Administrative power 79. Authority influencing factors 80. CEO personality significance in business 81. Business administration problems classification 82. CEO behaviour models 83. CEO behaviour style in different situations	Lecture, seminar

Literature

Main literature:

1. V. Praude, J.Beļčikovs. Menedžments. Rīga, Veidelote, 2001.
2. A. Klauss. Zinības vadītājam. Rīga, Preses nams, 2002.

Additional literature:

1. G.A. Cole. Management Theory and Practice. London, 2008.
2. M. Armstrong. A Handbook of Management Techniques. Glasgow, Bell&Bain, 2006
3. Philip A. Wicham. Strategic entrepreneurship. 3rd edition. Pearson education, 2006

Probability Theory and Mathematical Statistics

Author	Lector, Mg. Math. Jeļena Mihailova
Course Code	
Form of evaluation	Examination
Credit point(ECTS credit points)	2 (3 ECTS)
Prerequisites	School course of mathematic and mathematical analysis
Objective	The course objective is to acquire the main concepts, methods and results of the probability theory and mathematical statistic and to learn to use them in solving practical tasks.
Learning outcomes	Student will be able to calculate a classical, statistical and geometric probability, the conditional probability. Able to calculate the total probability and be able to apply the Bayes' formula. Able to apply the Bernoulli formula to calculate the probability of independent events. Able to understand the difference between discrete and continuous random variables and able to calculate the numerical characteristics (mathematical expectation, variance, moments, etc.). Able to operate with distribution and density functions. Know the most important probability distributions of random variables. Able to understand the law of large numbers, the Chebyshev inequality, the Central Limit Theorem. Able to understand the basic concept of multi-dimensional random variable. Able to understand the basics of sampling and processing of statistical data, the statistical distribution of parameter estimates, the point and interval evaluation of the confidence interval for statistical hypothesis testing and can perform a standard calculation of statistics. Able to understand the basic concepts correlation and regression analysis. Able to write the linear regression equation, calculate the correlation coefficient.
Organization mode of students individual assignment	Regular course of study substances learning through lecture materials, textbooks, internet resources. Regular homework performance. Weekly teacher consultations. Students work in groups. Preparing for the exam.
Evaluation of learning outcomes	After each of the main themes, a written tests to be done, on which tasks to be solved and the questions of theory to be answered. Each task and the question are valued at a certain score, which is calculated at mid-semester grades. Study course final mark consists of two parts: a mid-semester mark - 30% and exam mark - 70%.

Course outline

1. **Random events (10 h)**
   Basic concepts of probability theory. The random events and algebra of events. Definition of probability (classical, statistic, geometric). Addition and multiplication laws of probabilities. Conditional probability. Total probability and Bayes' formula. Trials and Binomial probabilities.

2. **Random variable (14 h)**
Random variable (definition and classification). Functions of a random variable (distribution and density functions). Discrete random variables. Expected value (mathematical expectation), variance and standard deviation of a discrete random variable; properties. The most important probability distributions of discreet random variables: uniform, hypergeometric, binomial, geometric, the Poisson distributions. Continuous random variable. Probability density function and distribution function. Expected value and variance. Characteristics of probability distribution. Chebyshev's inequality. The most important probability distributions of continuous random variables (exponential, uniform, normal, t-distribution). Strong law of large numbers. Central limit theorem and De Moivre-Laplace theorem.
Basic concepts of random variable probability distribution of discrete complete 2D.

3. **Mathematical statistics (6 h)**
Introduction to Statistic. Descriptive statistics (collecting and presentation of statistical data; cumulative sample distribution function). Inductive statistics (random sampling and sampling distributions). Point and interval estimation. Confidence interval.

4. **Introduction to Correlation and Regression Analysis (2 h)**
Basic concepts of correlation theory. Correlation coefficient. Linear regression equation.

Week	Lecture	Seminar
1.	Introduction in Probability theory. Basic concepts of probability theory. The random events and algebra of events. Definition of probability (classical, statistic, geometric). Addition and multiplication laws of probabilities.	
2.		Basic concepts of the probability theory. Combinatorial problems. Definition of probability (classical, statistic, geometric).
3.	Addition and multiplication laws of probabilities. Conditional probability. Total probability and Bayes formula. Trials and Binomial probabilities.	
4.		Addition and multiplication laws of probabilities. Conditional probability. Total probability and Bayes formula. Bernoulli trial.
5.	Random variable (definition and classification). Functions of a random variable (distribution and density functions). Discrete random variables. Expected value (mathematical expectation), variance and standard deviation of a discrete random variable. Properties.	
6.		Test "Events and Probability".

7.	The most important probability distributions of discreet random variables: uniform, hypergeometric, binomial, geometric, the Poisson distributions. Continuous random variable. Probability density function and distribution function. Expected value and variance.	
8.		Discrete random variable. Functions of a discrete random variable (distribution and density functions). Probability, expected value, variance calculation. Graphs of p.d.f f and of c.d.f F.
9.	Characteristics of probability distribution. Chebyshev's inequality. The most important probability distributions of continuous random variables (exponential, uniform, normal, t-distribution).	
10.		Continuous random variable. Probability density function and distribution function. Probability, expected value, variance calculation.
11.	Strong law of large numbers. Central limit theorem and De Moivre-Laplace theorem. Basic concepts of random variable probability distribution of discrete complete 2D.	
12.		Test "Random variable".
13.	Introduction to Statistic. Descriptive statistics (collecting and presentation of statistical data; cumulative sample distribution function). Inductive statistics (random sampling and sampling distributions; point and interval estimation; confidence interval).	
14.		Most important calculations in statistics.
15.	Basic concepts of correlation theory. Correlation coefficient. Linear regression equation.	
16.		Point and interval estimation. Confidence interval. Correlation coefficient. Linear regression equation.

Basic literature

1. J.Smotrovs. Varbūtību teorija un matemātiskā statistika.- Zvaigzne, 2004.
2. E.Vasermanis, D.Šķiltere. Varbūtību teorija un matemātiskā statistika. – Rīga, 2003.
3. A.Koliškins, I.Volodko. Varbūtību teorijas un statistikas elementi.- RTU, Rīga, 2004.
4. E.Kronbergs, P.Rivža, Dz. Bože. Augstākā matemātika 2.daļa.- Rīga, Zvaigzne, 1988.
5. M. Mitzenmacher, E.Upfal. Probability and Computing. – Cambridge University Press, 2006

Supplementary literature

1. Н.Ш. Кремер. Теория вероятностей и математическая статистика. – Юнити, Москва, 2003
2. В.А.Колемаев, В.Н.Калинина. Теория вероятностей и математическая статистика. – Юнити, Москва, 2003
3. Sh.M.Ross. Introduction of Probability Models. - Fifth Edition, Acad.Press, NY, 1995.

Other source of information

www.bymath.com
www.efunda.com/math
www.probabilitytheory.info
www.mathgoodies.com
http://www.math.uiuc.edu
www.de.dau.lv

Visual Programming Languages

Author	mg. sc. comp. Vairis Caune
LAIS course code	
Form of evaluation	Tests, exam, practical assignments
Academic credit points (ECTS credit points)	6 ECTS
The total number of contact lessons	32
The number of lectures	8
The number of practical classes	24
Prerequisites	Knowledge in OOP, Java programming language
Part of the study programme	Actual problems of the field (comp.part)

Study course objective

The aim ot the course is to introduce the students with MS Visual Studio IDE, C# programming language and the graphics in 3D, using both OpenGL language and Unity3D environment.

Study results

Having acquired the study course, a student:

- Is capable of creating Visual Studio project coupled with OpenGL and C# programming language to solve problems.
- Is capable of creating Unity3D project and configuring all the necessary components.
- Is able to choose the most suitable solution among the studied ones in order to solve a problem.

Organization mode of students' individual work

The independent work of students include:

- a regular learning of the course by using lecture materials, study literature, internet resources,
- homework assignment completion,
- preparations for the tests and exams.

Evaluation of study results

The end result is made of:

- Exam 40%

- Practical home assignments 20%
- Practical tests 20%
- Performance in classes (seminar works) 10%
- Theoretical tests 10%

Study course outline

No.	Title of the topic
1.	C# syntax, MS Visual Studio overview
2.	Version control overview
3.	Inheritance in C#
4.	Graphical interfaces using C#
5.	Threading and introduction in parallel programming
6.	2D and 3D space, introduction to OpenGL
7.	Working with Unity3D
8.	C# code usage in Unity3D

Study course schedule

No. of the class	Title of the topic	Type of class (lectures, seminars, practical classes, laboratory work), amount of academic hours
1.	C# syntax, MS Visual Studio overview	Lecture
2.	MS Visual Studio C# project	Seminar
3.	Version control overview	Lecture
4.	Version control setting up for project submission	Seminar
5.	Inheritance in C#	Lecture
6.	Creation of C# program on the basis of UML diagram	Seminar
7.	Creation of OOP structure of the program	Seminar
8.	Creation of dynamic libraries	Seminar
9.	Graphical interfaces using C#	Lecture
10.	C# application	Seminar
11.	C# application	Seminar
12.	C# application	Seminar
13.	Threading and introduction in parallel programming	Lecture
14.	Practical assignment in threading	Seminar
15.	2D and 3D space, introduction to OpenGL	Lecture
16.	OpenGL application	Seminar
17.	OpenGL application, textures	Seminar
18.	OpenGL application, perspectives, viewpoints	Seminar
19.	OpenGL application, interactive object inspection	Seminar
20.	OpenGL application, interactive object inspection	Seminar
21.	Practical test about OpenGL	Seminar
22.	Practical test about OpenGL	Seminar
23.	OpenGL home assignment presentation	Seminar
24.	Working with Unity3D	Lecture

25.	Unity3D, scenes, objects, project planning	Seminar
26.	Unity3D, materials, coordinate systems	Seminar
27.	Unity3D, physics	Seminar
28.	C# code usage in Unity3D	Lecture
29.	Unity3D, programmingg interactivity using c#	Seminar
30.	Practical test about Unity3D	Seminar
31.	Practical test about Unity3D	Seminar
32.	OpenGL home assignment presentation	Seminar

Basic literature

1. C#: J.Sharp, Microsoft Visual C# 2012. Step by Step, Microsoft Press, ISBN:978-0-7356-6801- 0, Dec. 2012
2. OpenGL: https://www.khronos.org/opengl/wiki/Main_Page
3. Unity3D: https://unity3d.com/learn/

Supplementary literature

1. Anders Hejlsberg, Mads Torgersen, Scott Wiltamuth, Peter Golde, C# Programming Language, The 4th Edition, Courier in Westford, Massachusetts, 2010.
2. Jesse Liberty, Programming C#. Building .NEt applications, O'Reilly Media, 2001.
3. A.Harris, Microsoft C# Programming for the absolute beginner, Series Edition, Premier Press, 2002.
4. Eric Brown, Windows Forms programming with C#, Hanning Publications Co., 2002.

Other source of information

1. OpenGL description: https://en.wikipedia.org/wiki/OpenGL
2. For Unity3D seminars: https://www.youtube.com/watch?v=RFlh8pTf4DU
3. Threading description: https://en.wikipedia.org/wiki/Thread_(computing)
4. About Git: https://git-scm.com/book/en/v2/Getting-Started-Git-Basics
5. Microsoft Developer Network (MSDN), C# Tutorials: https://msdn.microsoft.com/en-us/library/aa288436(v=vs.71).aspx
6. Online materials about C#: http://www.tutorialspoint.com/csharp/
7. Online materials about C#: http://csharp.net-tutorials.com/

Web page programming

Author	Agris Traskovs
Course Code	
Form of evaluation	Exam and practical assignments
Credit point (ECTS credit points)	4 **(6 ECTS)**
Prerequisites	OOP, Web development 101

Objective
Give the students insight on modern web application frameworks, REST API usage and practical experience creating responsive web applications.
Learning outcomes
Students have insight in web technologies currently used in industry.
Students have learned asynchronous process handling in Javascript.
Students have attained practical skills in creating web applications.
Can use most common data structures and formats in web communication.
Have an understanding how different Javascript frameworks function.
Organization mode of students individual assignment
The course consists of contact hours with students and their independent work with literature and internet resources. Contact hours include theoretical lectures and practical sessions, where students strengthen their theoretical knowledge implementing the things learned in the theoretical part of the course.
Evaluation of learning outcomes
Final grade is composed of 50% grade in the final exam, 50% grades in practical assignments, both must be higher or equal to 4 on a scale of 10.
Course outline

Week	**Topic**	**Type (lecture, seminar, laboratory work)**
1	Introduction to currently used technologies. Architectural influence in web application development. Single page applications.	Lecture, seminar
2	**Fundamentals of web page creation**. HTML5, CSS3. Images and different media usage.	Lecture, seminar
3	Responsive design, flexible grids. DOM and its usage in element distinction and search	Lecture, seminar
4	**Frontend templates and tools.** LESS/SASS, Gulp, ES6 templates, Handlebars, Git	Lecture, seminar
5	**JQuery.** What is JQuery, when to use it. Basic formatting functions, advanced data processing.	Lecture, seminar
6	**Communications used in web applications**. Ajax calls JSON, XML data structures. REST API, their usage.	Lecture, seminar
7	**Javascript Frameworks**. Controllers and data binding. EmberJS	Lecture, seminar

8	**Javascript Frameworks**. Services. Data manipulation operations. Components and directives. AngularJS	Lecture, seminar
9	**NodeJS.** NPM, Callbacks, usage and different features	Lecture, seminar
10	**Webpage security**: Authorization/ Authentication. OAuth. Testing functionality and security. Communication security issues.	Lecture, seminar
11	Webpage architecture, Project planning, process automation.	Lecture, seminar
12-16	Course Project in groups	Laboratory work

Basic literature

- Responsive Web Design with HTML5 and CSS3 – Ben Frain – ISBN:978-1-78439-893-4
- AngularJS documentation: https://angularjs.org
- NodeJS documentation: https://nodejs.org
- EmberJS documentation https://guides.emberjs.com/

Supplementary literature

Other source of information