

8.2. DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

Subjects Code Study units		Credits									
		Higher Sec. Educ.					Voc. Sec. Educ.				
		Study year				Total	Study year				Total
		1	2	3	4		1	2	3	4	
TOTAL EXTENT		40	40	40	40	160	40	40	40	40	160
IIT10000 COMMON CORE BASIC STUDIES		34	36	10	0	80	35	35	10	0	80
IIT11000 General Basic Studies											
IIT11100 Introductory Studies		1	0	1	0	2	1	0	1	0	2
CCC11101	Studies and Information Acquisition	1					1				
CCC11102	Ethics			1					1		
IIT11200 Entrepreneurship and Society		0	4	5	0	9	0	4	5	0	9
CCC11201	Public Economy			1					1		
CCC11202	Entrepreneurship		2					2			
ICC11201	Basics of Business Administration		2					2			
CCC11203	Basics of Quality Management			2					2		
CCC11204	Man in the Working Community			2					2		
IIT11300 Languages and Communication		6	2	2	0	10	9	4	2	0	15
CCC11301	Finnish for Foreigners 1		2					2			
CCC11302	Finnish for Foreigners 2							2			
CCC11311	Kommunikation inom arbetslivet (Finns)							2			
ICC11311	Tillämpningar av fackspråket (Finns)		2					2			
CCC11321	Working English						3				
CCC11322	Communication Skills	3					3				
ICC11321	Professional English	3					3				
CCC11330	Optional Foreign Language			2					2		
IIT11400 Data Processing		3	2	0	0	5	3	2	0	0	5
CCC11401	Basics of Data Processing	1					1				
ICC11401	Basics of Programming	2					2				
CCC11402	Basics of Internet		2					2			
IIT11500 Mathematics		5	5	0	0	10	7	5	0	0	12
ICC11510	Algebra and Geometry						2				
ICC11503	Analytic Geometry and Linear Algebra	2					2				
ICC11504	Differential Calculus	2					2				
ICC11505	Basics of Mathematical Software	1					1				
ICC11506	Integral Calculus		2					2			
ICC11511	Series and Multivariable Analysis		2					2			
ICC11509	Statistics and Probability Theory		1					1			
IIT11600 Natural Sciences		6	5	0	0	11	6	5	0	0	11
ICC11612	Mechanics	2					2				
ICC11613	Thermodynamics	1					1				
ICC11614	Electricity and Magnetism	2					2				
ICC11604	Wave Motion and Atomic Physics		2					2			
ICC11610	Laboratory Exercises of Basic Physics	1					1				
ICC11611	Laboratory Exercises of Modern Physics		1					1			
ICC11609	Chemistry and Environment		2					2			
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Subjects Code Study units		Credits									
		Higher Sec. Educ.					Voc. Sec. Educ				
		Study year				Total	Study year				Total
		1	2	3	4		1	2	3	4	
IIT12000 Professional Basic Studies											
IIT12100	Design Methods	5	4	2	0	11	3	4	2	0	9
IEI12101	Electronics and Software Documentation	2									
IEC12102	Electrical Safety	1					1				
IEI12102	Computer Aided Design of Electronics		2					2			
IEC12103	Product Development and Production Eng		2					2			
IIT12104	Application Development		2					2			
IEI12106	C-Programming	2					2				
IIT12200	Theory of Electrical Circuits	2	5	0	0	7	0	4	0	0	4
IEI12201	Direct and Alternating Current Circuits	2									
IEI12202	Circuit Analysis		2					2			
IEC12204	Transient and Frequency Analysis			2					2		
IEC12205	Electrical Circuits Laboratory Exercises		1								
IIT12300	Automation Engineering	0	2	0	0	2	0	2	0	0	2
IEC12301	Basics of Automation Engineering		2					2			
IIT12400	Electronics and Information Technology	6	7	0	0	13	6	5	0	0	11
IIT12406	Electronic Components	1									
IIT12402	Electronic Components Lab. Exercises	1					1				
IIT12407	Basics of Electronic Circuits	1					1				
IIT12403	Electronic Circuits Laboratory Exercises		1					1			
IIT12408	Basics of Digital Electronics	1									
IIT12409	Digital Systems		1					1			
IIT12410	Digital Electronics Lab. Exercises		1					1			
IEI12401	Basics of Operating Systems	2						2			
IEI12402	Microcomputers		2					2			
IEC12405	Basics of Telecommunications		2					2			
IIT20000 SPECIAL. PROFESSIONAL STUDIES		0	0	24	16	40	0	0	24	16	40
IIT21000 Specialisation Alternative of Electronics and Computer Engineering											
IIT21100	Microcomputer Engineering	0	0	10	0	10	0	0	10	0	10
IEI21101	Industrial Electronics			2					2		
IEI21102	Microprocessors			2					2		
IEI21103	Electronic Design			2					2		
IIT21104	Computer Interfacing and Buses			2					2		
IEI21104	Microelectronics Laboratory Exercises			2					2		
IIT21200	Embedded Systems	0	0	0	10	10	0	0	0	10	10
IEI21201	Embedded Systems Design				3					3	
IEI21202	Real Time Operating Systems				2					2	
IEI21205	Embedded Internet				2					2	
IEI21204	Embedded Systems Project				3					3	
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Code	Subjects Study units	Credits																		
		Higher Sec. Educ.					Voc. Sec. Educ.													
		Study year				Total	Study year				Total									
		1	2	3	4		1	2	3	4										
IIT22000	Specialisation Alternative of Software Engineering																			
IIT22100	Software Engineering	0	0	10	0	10	0	0	10	0	10									
IEI22101	Databases			3					3											
IEI22102	Object Oriented Programming			3					3											
IIT22103	Software Specification			2					2											
IEI22104	Java Programming			2					2											
IIT22200	Information Systems	0	0	0	10	10	0	0	0	10	10									
IEI22201	Information System Design				3					3										
IIT22205	C++Programming				2					2										
IEI22203	Windows Programming				2					2										
IEI22204	Information System Development Project				3					3										
IIT23000	Specialisation Alternative of Telecommunication Engineering																			
IIT23100	Data Transmission Engineering	0	0	10	0	10	0	0	10	0	10									
IEI23101	Communication Systems			2					2											
IEI23102	Math. Methods in Telecommunication			1					1											
IEI23103	Digital Signal Processing			2					2											
IEI23104	Computer Networks			3					3											
IEI23105	Data Transmission Laboratory Exercises			2					2											
IIT23200	Telecommunication Systems	0	0	0	10	10	0	0	0	10	10									
IIT23201	Broadband Networks				2					2										
IIT23202	Mobile Telecommunication				3					3										
IEI23203	DSP Advanced Course				2					2										
IEI23204	Telecommunications Lab. Exercises				3					3										
IIT24000	Specialisation Alternative of Production Economics																			
IIT24100	Industrial Economics	0	0	10	0	10	0	0	10	0	10									
ICM22101	Management Accounting			3					3											
ICM22103	Production Control			2					2											
ICM22104	Financial Accounting			2					2											
ICM22105	Basics of Marketing			2					2											
ICM22107	Marketing Research			1					1											
IIT24400	Business Process Development	0	0	0	10	10	0	0	0	10	10									
ICM22307	Supply Chain Management				3					3										
ICM22209	Corporate Planning				2					2										
ICM22208	Company Development				2					2										
ICM22210	Industrial Marketing				2					2										
ICM22211	Management Simulation Game				1					1										

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Subjects Code Study units		Credits																			
		Higher Sec. Educ.					Voc. Sec. Educ														
		Study year				Total	Study year				Total										
		1	2	3	4		1	2	3	4											
IIT26000 Specialisation Alternative of IT-project																					
IIT26100	Basic IT-Project	0	0	0	10	10	0	0	0	10	10										
IIT26101	Basics of Projectwork				2					2											
IIT26202	Project				8					8											
IIT29000 Separate Professional Modules																					
IIT29100	Technical Mathematics	0	0	10	0	10	0	0	0	10	10										
ICC29101	Integral transforms and discrete math.				2					2											
ICC29102	Matrix Calculations				2					2											
ICC29103	Numerical Methods				2					2											
ICC29104	Statistics				2					2											
ICC29105	Vector Analysis				2					2											
IIT30000 OPTIONAL STUDIES		2	2	3	3	10	2	2	3	3	10										
IIT40000 PRACTICAL TRAINING		4	2	3	11	20	3	3	3	11	20										
IIT50000 THESIS		0	0	0	10	10	0	0	0	10	10										

8.2.1 OBJECTIVES OF THE DEGREE PROGRAMME

The goal of the programme is to provide knowledge and skills in versatile planning, research, production, marketing and administration activities required especially in export and international projecting in mechanical and production engineering. Active use of computers at different stages of the production process is emphasised.

8.2.2 COMMON CORE BASIC STUDIES

GENERAL BASIC STUDIES

Introductory Studies

Learning Objectives

The student learns the polytechnic studying environment, degree requirements, basics of the methods and information acquisition needed in the studies and the possibilities and ethical obligations of the future profession.

CCC11101 Studies and Information Acquisition, 1 cu

Learning Objectives

The student will get familiar with the functions of the Vaasa Polytechnic and the learning environment and learning community as well the degree programmes and learning methods. The student will learn to draw out his/her own study plan and to use various information services.

Contents

The learning environment in the Polytechnic, students' health care, financial aid to students and other measures of support; engineer's job description and typical tasks, one's own degree programme and various learning methods; library and information services and the basics of

information management.

Learning Material

Study guides, material produced by the library, any other material given by the teacher.

Assessment of Learning

Passing the given assignments, drawing out a personal studying program. Assessment on the pass or fail principle.

CCC11102 Ethics, 1 cu

Learning Objectives

The student will get a good understanding of ethical issues with a view to engineering. In all his activities he will be able to consider the demands made by the environment and the society.

Contents

Different basis of values, individual responsibility, duties and morals.

Learning Material

Handouts provided by the lecturer.

Assessment of Learning

Lectures, exercises and examination; assessment on the pass or fail principle.

Entrepreneurship and Society

Learning Objectives

The objective of the study module is that the student, having completed it, has a conception of the public economy as a whole and of the significance of business activity within it. The learner knows how to establish a company and understands the basics of the operations and economic control of the company.

CCC11201 Public Economy, 1 cu

Learning Objectives

The student will know the concepts related to national economy and will acquire an integral view of the structure, nature and development of national economy.

Contents

Concepts related to national economy; the national economy of Finland, the structure, functions and development of its various sectors.

Learning Material

Case and Fair. Principles of Macroeconomics. 2nd Edition.

Assessment of Learning

Lectures, exercises, examinations.

CCC11202 Entrepreneurship, 2 cu

Learning Objectives

The student will acquire a view of entrepreneurship in general as well as the skills required for self-employment. The student familiarises him/herself with the corporate planning and the criteria for choosing the form of enterprise.

Contents

Entrepreneur and enterprise environment, the qualities of an entrepreneur, impediments and incentives of entrepreneurship, entrepreneurship as a career and occupation, 'inner' entrepreneurship, company networking and international comparison of entrepreneurship, establishing a business, corporate planning, the aims of entrepreneurship and choosing the form of enterprise.

Learning Material

Thomas W. Zimmerer and Norman M. Scarborough. Essentials of Entrepreneurship and Small Business Management. 2nd Edition.

Assessment of Learning

Lectures, teamwork, exercises, examinations.

ICC11201 Basics of Business Administration, 2 cu

Learning Objectives

The student will have an understanding of the interaction between the various economical functions of a company, will be able to use parameters for assessing different business activities and will be able to monitor the operational process successfully.

Contents

Operational processes of a company. Interrelation between the profitability, quality and productivity. Parameters for measuring the financial state of a company. Classification and directing of costs. Basics of pricing, budgeting and investment accounting.

Learning Material

Thomas W. Zimmerer and Norman M. Scarborough. Essentials of Entrepreneurship and Small Business Management. 2nd Edition.

Assessment of Learning

Lectures, teamwork, assignments, examinations.

CCC11203 Basics of Quality Management, 2 cu

Learning Objectives

The student will have an integral understanding of the quality control related to products and operations and the role played by quality in the profit making and continuous operation of the company.

Contents

The concept and components of quality. The role played by quality on the profit of the company. History, different improvement principles. Quality control by means of quality systems and their use as basis for continuous development work. Integral quality during the product's life span.

Learning Material

Gary K Griffith. The Quality Technician's Handbook. 3rd Edition. Amitava Mitra. Fundamentals of Quality Control and Improvement. 2nd Edition.

Assessment of Learning

Lectures, exercises and examinations.

CCC11204 Man in the Working Community, 2 cu

Learning Objectives

The student will learn the principles of the modern flexible working environment and will appreciate the way it functions. The student will be able to apply this knowledge to developing her/his own working environment.

Contents

Principles of work and organisation behaviour, leadership and management, issues related to personnel policy, wages and occupational safety.

Learning Material

Stephen P. Robins and Mary Coulter. Management. 6th Edition.

Assessment of Learning

Lectures, assignments, examinations.

Languages and Communication

Learning Objectives

The student is able to communicate orally and in writing in foreign languages in working life in an appropriate way. The Finnish students master the central terminology of working life also in Swedish and the foreign students in Finnish.

CCC11301

Finnish for Foreigners 1, 2 cu

Learning Objectives

Producing basic structures both orally and in writing; managing in elementary functional situations.

Contents

Pronunciation, basic verbal conjugation and main endings in nouns, elementary vocabulary and situational phrases.

Learning Material

Lepämaa & Silferberg. Suomen kielen oppikirja, units 1 - 6.

Assessment of Learning

Lectures, oral and written exercises, examinations.

CCC11302

Finnish for Foreigners 2, 2 cu

Learning Objectives

The student will be able to produce the main structures of Finnish, develop reading skills in Finnish, manage in standard functional situations and become aware of the Finnish culture.

Contents

Structural and syntactic features of Finnish, communication tasks, text analyses, introduction to Finnish culture.

Previous Knowledge

Finnish for Foreigners1.

Learning Material

Lepämaa & Silfverberg. Suomen kielen alkeisoppikirja, units 7 - 14.

Assessment of Learning

Lectures, oral and written exercises, examinations.

CCC11311

Kommunikation inom arbetslivet (Finns), 2 cu

Learning Objectives

The student will acquire the basic skills required in working life.

Knowledge: The student knows the basic structures and central vocabulary of the language as well as general language and is introduced to the vocabulary of his/her own field of study to be able to understand more difficult text and to communicate orally and in writing in various situations.

Attitudes: The student has a positive attitude towards learning a language and understands the significance of language skills in communication situations in working life. The student understands the significance of life-long learning when developing the language skills. S/he sees bilingualism as a strength and understands the status of a minority language in Finland.

Skills: The student develops the mastery of the general language and thus the ability to communicate in writing or orally in various situations and understands even more difficult Swedish text.

Contents

Central structures and vocabulary of the language, oral and written exercises, use of tools, such as dictionary and grammar as aids in language learning.

Previous Knowledge

Comprehensive and vocational school Swedish or corresponding knowledge and skills.

Study Methods

Communicative language learning, pair work, group work, active participation in contact teaching and independent studying.

Learning Material

Material compiled by the teacher.

Assessment

Exams, continuous assessment, completed assignments.

ICC11311

Tillämpningar av fackspråket (Finns), 2 cu

Learning Objectives

The objective is to develop professional language skills. The student deepens his/her language skills and develops it actively. The student becomes familiar with the oral and written communication in his/her own field of study and develops the ability to communicate in various professional situations.

Knowledge: The student has sufficient knowledge to understand texts and speech of the trade and is able to communicate orally and in writing in various communication situations in working life.

Attitudes: The student has a positive attitude towards learning a language and understands the significance of language skills in communication situations in working life. The student understands the significance of life-long learning when developing the language skills. S/he sees bilingualism as a strength and understands the status of a minority language in Finland.

Skills: The student is able to manage in the communication situations in his/her own profession and to understand even more difficult professional text and is able to use Swedish when acquiring information during the studies/in working life. The student develops the general language as well as language skills needed in the trade and its characteristic way of communication.

Contents

The contents are integrated into the field of study - texts, oral and written exercises, communication situations of working life.

Previous Knowledge

Higher secondary school level or equivalent

Study Methods

Lectures, exercises, pair work, active participation in contact teaching, independent studying.

Learning Material

Material compiled by the teacher.

Assessment of Learning

Written exams, continuous assessment, listening comprehension test, oral proof, completed assignments.

ICC11312

Avancerad facksvenska, 2 cu

The language can be chosen during the first study year according to the student's own wishes and the institute's possibilities to arrange courses.

Learning Objectives

The objective is to deepen professional language skills by acquiring abilities to manage in more demanding situations in working life.

Skills: The student develops the knowledge of the terminology in his/her own field of study and its characteristic way to communicate. The student deepens his/her knowledge in order to understand more difficult texts of the trade and to communicate efficiently in various situations in working life.

Attitudes: The student has a positive attitude towards learning a language and understands the significance of language skills in communication situations in working life. The student understands the significance of life-long learning when developing the language skills. S/he sees bilingualism as a strength and understands the status of a minority language in Finland.

Skills: The student is able to manage as well as possible in communications situations in his/her profession and is able to understand and produce more demanding professional texts.

Contents

The contents are integrated into the field of study – texts, oral and written exercises, communication situations of working life.

Previous Knowledge

Tillämpningar av fackspråket

Study Methods

Lectures, exercises, pair work, active participation in contact teaching, independent studying.

Learning Material

Material compiled by the teacher.

Assessment of Learning

Written exams, continuous assessment, listening comprehension test, oral proof, completed assignments.

CCC11321

Working English, 3 cu

Learning Objective

The student will become familiar with the basic communication proficiency required for understanding and production of spoken and written text in working life context for engineers.

Contents

Texts, structures and terminology of engineering English, communication exercises in the form of product and company presentations

Previous Knowledge

Diagnostic test.

Learning Material

Handouts, dictionary and basic grammar.

Assessment of Learning

Lectures, oral and written exercises, exams.

CCC11322

Communication Skills, 3 cu

Learning Objectives

The student will acquire sufficient language skills needed in academic instruction given in English.

Contents

Writing skills for study purposes: essays, reports and test answers; proofreading, editing

and use of dictionaries; accurate and appropriate language usage. Speaking skills: class room situations, reporting and pronunciation. Reading skills: reading effectively from textbooks, journals and media sources. Note-taking skills from lectures and texts. Information gathering skills from library resources, Internet, CD-ROMs etc.

Previous Knowledge

English of higher secondary school or Working English

Learning Material

To be announced at the beginning of the unit.

Assessment of Learning

Examinations, oral and written assignments, continuous assessment.

ICC11321

Professional English, 3 cu

Learning Objectives

The student will acquire sufficient language skills in professional context.

Contents

Professional writing skills (business letters, job application procedure, production of subject-specific texts); professional speaking skills (business calls, negotiations, meetings, company presentations, job interview)

Previous Knowledge

Communication Skills, Working English.

Learning Material

To be announced at the beginning of the unit.

Assessment of Learning

Examinations, oral and written assignments, continuous assessment.

ICC11322

Advanced Professional English, 2 cu

Learning Objectives

To improve the students language skills for the needs of working life and further studies.

Contents

Working life related advanced speech and writing practice.

Previous Knowledge
Communication Skills, Working English, Professional English.

Learning Material

To be announced at the beginning of the unit.

Assessment of Learning

Lectures, oral and written exercises, examinations.

CCC11330
Optional Foreign Language, 2 cu

Learning Objective

The student improves according to his/her own choice his/her professional language skills either in English or in Swedish or takes up a new foreign language.

Contents

The language can be chosen during the first study year according to the student's own wishes, and the institute's possibilities to arrange courses.

The options are as follows:

- 2nd Foreign Language, Basics, see CCC11331
- 2nd Foreign Language, Working Language, see CCC11332
- 2nd Foreign Language, Professional Language, line-specific contents, see ICC11331
- Advanced Professional English, line-specific contents, see ICC11322
- Avancerad facksvenska, line-specific contents, see ICC11312

CCC11331
2nd Foreign Language, Basics, 2 cu

Learning Objectives

The objective is to acquire the basic skills of the language.

Knowledge: The student is familiar with the central vocabulary and syntax of the language.

Attitudes: The student has a positive attitude towards the language to be studied and the culture it represents and is motivated to improve his/her skills of this language.

Skills: The student has abilities to manage in the situations of every-day life using the language in question and an ability to utilise his/her skills to maintain and improve the

language skills.

Contents

Basics of syntax, central vocabulary, reading comprehension and speech activation.

Previous knowledge

The study unit is for the beginners.

Study Methods

Lectures, exercises, pair work, active participation in contact teaching, independent studying and home assignments.

Learning Material

Book or material compiled by the teacher.

Assessment of Learning

Exams, continuous assessment, completed assignments.

CCC11332
2nd Foreign Language, Working Language, 2 cu

The language can be chosen during the first study year according to the student's own wishes, and the institute's possibilities to arrange courses.

Learning Objectives

The student has abilities with which s/he is able to improve his/her language skills also in work-related situations.

Knowledge: The student is familiar with the basic structures and central vocabulary of the language and general language, learns according to the possibilities professional vocabulary and learns to communicate orally and in writing in various situations. The student is aware of the differences between Finnish/his or her own culture and the culture represented by the language studied.

Attitudes: The student has a positive attitude towards the language to be studied and the culture it represents and is motivated to improve his/her skills of this language.

Skills: The student develops the mastery of general language and in that way his/her ability to communicate orally or in writing in every-day working life situations and is able to understand professional texts using a dictionary.

Contents

Central structures and vocabulary of the language, oral and written exercises, use of tools, such as dictionary and grammar as aids in language learning.

Previous Knowledge

2nd Foreign Language, Basics; Comprehensive school level or equivalent.

Learning Material

Book or material compiled by the teacher.

Assessment of Learning

Exams, continuous assessment, completed assignments.

ICC 11331

2nd Foreign Language, Professional Language, 2 cu

The language can be chosen during the first study year according to the student's own wishes, and the institute's possibilities to arrange courses.

Learning Objectives

The objective is to develop professional language skills. The student deepens his/her language skills and develops it actively. The student becomes familiar with the oral and written communication in his/her own field of study and develops the ability to communicate in various professional situations.

Knowledge: The student develops during the language studies both the general language skills and language required in the trade and its characteristic way to communicate. The student has sufficient knowledge to understand texts and speech of the trade and is able to communicate orally and in writing in various communication situations in working life. The student increases his/her knowledge of business culture in the field of study and other cultural characteristics in countries in question.

Attitudes: The student has a positive attitude towards the language to be studied and the culture it represents. The student wants to actively improve his/her language skills.

Skills: The student is able to manage in the communication situations in his/her own profession and to understand texts containing professional terminology and is able to use the

language when acquiring information during the studies/in working life.

Contents

The contents are integrated into the field of study - texts, oral and written exercises, communication situations of working life.

Previous Knowledge

Higher secondary school level or equivalent .

Study Methods

Lectures, exercises, pair work, active participation in contact teaching, independent studying.

Learning Material

Material compiled by the teacher.

Assessment of Learning

Written exams, continuous assessment, listening comprehension test, oral proof, completed assignments.

Data Processing

Learning Objectives

The objective of the basic studies of Data Processing is that the student gets familiar with the computer system and data networks of the Polytechnic and knows how to use most important applications that are needed during the studies. In addition, the student understands the basics of writing web sites and computer programs.

CCC11401

Basics of Data Processing, 1 cu

Learning Objectives

A student will be able to use a personal computer in his studies.

Contents

The use, structure and operation of computer hardware, operating systems and user interfaces, the basics of MS Word, Ms Excel and Email. The integrated use of Programs.

Learning Material

Blissmer. Introducing Computers, Wiley & Sons.

Henno. Computer-hypermedia book, Computer.tbk, VITECH local area network, VITECH.

Assessment of Learning
Lectures, exercises and examinations.

ICC11401
Basics of Programming, 2 cu

Learning Objectives

The student will have a good understanding of the modern software process and the principles of programming in the microcomputer environment. He will also have a good conception of the compatibility of software, computer hardware and operating systems and their impact on software development. The primary objective is to learn to create simple programs.

Contents

Different phases of software process and the lifetime of a program. Principles of using the C-language by using a modern tool. Structure of C, its commands and control structures, strings and tables.

Previous Knowledge

Basics of Data Processing.

Learning Material

Tucker Allen B.[..et al.]. Fundamentals of Computing I: logic, problem solving, programs and computers, McGraw-Hill, 1995

Assessment of Learning

Lectures, exercises, individual design and programming projects. Examination.

CCC11402
Basics of Internet, 2 cu

Learning Objectives

The student will be able to perceive the formation of computer networks and is able to use Internet and produce documents for it.

Contents

Computer network and its structure, the basic use of Internet, electrical communication, digitalisation of picture, the use of www-tools making the student's own homepage and principles of maintaining the websites.

Previous Knowledge

Basics of Data Processing.

Learning Material

WWW-pages of the study unit.

Assessment of Learning
Lectures, exercises and examinations.

Mathematics

Learning Objectives

The aim of the mathematical education is to equip a student with the mathematical knowledge needed in studies and work. In most professional studies mathematics is used for various kinds of calculational tasks. Understanding of the basics of mathematics is essential for a fluent application of the mathematical methods.

After graduation a student must be able to apply mathematics for the tasks of his profession, read the literature of his specialty and, in general, be able to communicate with engineers performing tasks similar to his. A sufficient familiarity with the mathematical methods used in engineering sciences is a part of the knowledge required from an engineer. After graduation the education received by an engineer should be, also in mathematics, of such quality that he may be classified as a person with a bachelor level education, and is considered sufficiently able to perform even international tasks.

ICC11510
Algebra and Geometry, 2 cu

Learning Objectives

Proficiency in algebra and geometry of students graduated from vocational schools is brought to the level of the general mathematics course of higher secondary school.

Contents

Equation systems, functions (polynomials, ratios, power-, exponential and logarithmic functions), exponential and logarithmic equations, graphical and numerical solutions of equations, plane geometry, vectors in the plane, classical space geometry, trigonometric functions.

Previous Knowledge

Mathematics of vocational school or equivalent.

Study Methods

The basics of learning constitutes of lectures where the theory is explained and examples are given. An essential ingredient of learning, however, consists of exercises which are gone

through during the lectures, and independent homework performed by the student. A mere attending lectures and listening to the lecturer is not sufficient for a proper learning. In practice, an independent pondering of the contents of the course becomes best realized when a student solves independently, at home, the problems given by the lecturer. Solutions to the problems are given during the lectures.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC11503

Analytic Geometry and Linear Algebra, 2 cu

Learning Objectives

Proficiency of students in algebra and geometry is brought to the engineering level.

Contents

Trigonometric relations and equations, complex numbers, 2nd degree curves in the plane, basics of determinants and matrices, inequalities and linear optimisation, space vectors.

Previous Knowledge

Mathematics of vocational school and higher secondary school.

Study Methods

See Algebra and Geometry.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC11504

Differential Calculus, 2 cu

Learning Objectives

Basics of differential calculus with applications and achievement of calculational ability.

Contents

Limit, continuity and derivative, differentiation of functions, composite function and inverse function, inverse circular functions and hyperbolic functions, differential, study of the properties of functions, applications to optimization problems.

Previous Knowledge

Analytic geometry and linear algebra.

Study Methods

See Algebra and Geometry.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC11505

Basics of Mathematical Software, 1 cu

Learning Objectives

The student is familiarised with software for numerical and symbolic mathematics and its use in producing documents.

Contents

General review of mathematical software for PC's, the use of DERIVE and MATHCAD in solving mathematical problems, applications specific to the degree programme.

Previous Knowledge

Basics of data processing.

Study Methods

Contact teaching (14 h) in groups in the PC class. The working of the mathematical softwares is presented with a video projector.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC11506

Integral Calculus, 2 cu

Learning Objectives

Basics of integral calculus with applications and achievement of calculational ability.

Contents

Definite and indefinite integrals, formulas of integration, techniques of integration, geometric and engineering applications of integration (area, arc length, mantle area and the mean value of a function, among other things), numerical integration, basics of differential equations and their numerical solution.

Previous Knowledge
Previous courses or equivalent.

Study Methods
See Algebra and Geometry.

Learning Material
Lecture notes.

Assessment of Learning
Exercises and examination.

ICC11511
Series and Multivariable Analysis, 2 cu

Learning Objectives
Ability to use series in applications, modelling and application of multivariable functions.

Contents
Sequences, discrete functions and the basics of the theory of series, power expansions with applications, elements of Fourier series, analytic space geometry, linear mappings, calculus of multivariable functions (partial derivatives, optimization, curve fitting).

Previous Knowledge
Previous courses or equivalent.

Study Methods
See Algebra and Geometry.

Learning Material
Croft, Davison & Hargreaves, Engineering mathematics. Addison-Wesley.
Lecture notes.

Assessment of Learning
Exercises and examination.

ICC11509
Statistics and Probability Theory, 1 cu

Learning Objectives
Understanding of the basic principles of statistics and probability concepts using observational data, analysis and modelling of data, quality control.

Contents
How to collect, treat, present and draw conclusions from a statistical data. Calculation of indices, axioms of probability, probability distributions.

Previous Knowledge
Previous courses or equivalent.

Study Methods
See Algebra and Geometry.

Learning Material
Croft, Davison & Hargreaves, Engineering mathematics. Addison-Wesley.

Assessment of Learning
Exercises and examination.

Natural Sciences

Learning Objectives
The student will acquire a wide view on the scientific theory system, which underlies technology in general. The student will become familiar with the scientific way of thinking, and (s)he will learn how to solve problems in a scientific manner. The student will obtain a basic knowledge of science, which will make her/him able to successfully participate in the courses of professional studies. Further, with the acquired scientific knowledge, (s)he will be able to continue her/his studies at the University level, as well as enjoy life-long learning in her/his fields of interest.

ICC11612
Mechanics, 2 cu

Learning Objectives
The student will familiarise her/himself with the basic concepts of classical mechanics, (s)he will understand the physical contents of the three Newton's laws and the laws of conservation, and (s)he will be able to apply all these. The student will acquire a general view of physics as an important building block of all science.

Contents
Velocity, acceleration, Newton's laws of motion, linear momentum, energy, the law of conservation of energy and of linear momentum, uniform circular motion and rotational motion, gravity, static equilibrium, elasticity and dynamics of fluids.

Previous Knowledge

The short course of physics in a vocational school or in a secondary high school.

Study Methods

The relevant theories of physics, together with associated problems and applications, are studied on a course of lectures. In addition, the student will individually solve a number of given homework exercises.

Learning Material

Raymond A. Serway and Robert J. Beichner. Physics for Scientists and Engineers with Modern Physics, Chapters 1 – 12, 14 and 15.

Assessment of Learning

Homework exercises and an examination.

**ICC11613
Thermodynamics, 1 cu**

Learning Objectives

The student will learn the concepts of heat and temperature, and (s)he will become familiar with the behaviour of a given material as a function of its temperature.

Contents

Temperature and heat, specific heat, phase transitions, humidity, heat transfer, the laws of thermodynamics, thermodynamic processes.

Previous Knowledge

The short course of physics in a vocational school or in a secondary high school.

Study Methods

The relevant theories of physics, together with associated problems and applications, are studied on a course of lectures. In addition, the student will individually solve a number of given homework exercises.

Learning Material

Raymond A. Serway and Robert J. Beichner. Physics for Scientists and Engineers with Modern Physics, Chapters 19 – 22.

Assessment of Learning

Homework exercises and an examination.

**ICC11614
Electricity and Magnetism, 2 cu**

Learning Objectives

The student will become familiar with the quantities and laws of electricity and magnetism, (s)he will understand the concepts of electricity, magnetism and electromagnetism.

Contents

Electrostatics, direct current, magnetism, induction, alternating current.

Previous Knowledge

Mechanics.

Study Methods

The relevant theories of physics, together with associated problems and applications, are studied on a course of lectures. In addition, the student will individually solve a number of given homework exercises.

Learning Material

Raymond A. Serway and Robert J. Beichner. Physics for Scientists and Engineers with Modern Physics, Chapters 23 – 34.

Assessment of Learning

Homework exercises and an examination.

**ICC11604
Wave Motion and Atomic Physics, 2 cu**

Learning Objectives

The student will learn the basics of oscillatory motion and wave motion, (s)he will understand the nature of atomic-level phenomena, and (s)he will be able to use her/his knowledge in solving problems related with the topics of the course. The student will adopt a responsible attitude to radioactivity.

Contents

Simple harmonic oscillations, damped oscillations, wave motion, sound, electromagnetic oscillations and the associated wave motion, the basic phenomena of optical physics, interference and diffraction, basics of quantum physics, the photon, Bohr's atomic model, applications of atomic physics, atomic nuclei, radioactivity and its applications, nuclear energy.

Previous Knowledge
Mechanics, Electricity and Magnetism.

Study Methods

The relevant theories of physics, together with associated problems and applications, are studied on a course of lectures. In addition, the student will individually solve a number of given homework exercises.

Learning Material

Raymond A. Serway and Robert J. Beichner. Physics for Scientists and Engineers with Modern Physics, Chapters 13, 16 – 18, 35 – 38, 40 – 45.

Assessment of Learning

Homework exercises and an examination.

ICC11610
Laboratory Exercises of Basic Physics, 1 cu

Learning Objectives

The student will familiarise her/himself with some of the basic phenomena of physics by means of experimental studies and associated analysis in a laboratory environment. (S)he will learn how to write a report about a measurement, and how to estimate the accuracy and reliability of the measured values. The student will recognise that physical phenomena form the basis of technology, and (s)he will adopt a critical attitude to experimental data.

Contents

Measurements done in teams of few students. The experimental work is related with the basic phenomena of mechanics, thermodynamics and electricity. The measurements and the obtained results are reported by a written document, which contains the main parts of the underlying theory, the experimental data, the associated analysis and error calculus.

Previous Knowledge
Mechanics.

Study Methods

The measurements are done in small teams, and the reports are written either individually or with the team mates.

Learning Material

Instructions written by the teacher.

Assessment of Learning

The grade is based on the reports and on a written examination.

ICC11611
Laboratory Exercises of Modern Physics, 1 cu

Learning Objectives

The student will become familiar with some of the physical phenomena related with wave motion, atomic physics and nuclear physics, and (s)he will learn how to use modern data acquisition techniques. The student will deepen her/his ability to write a report and make proper error analysis. (S)he will understand that atomic- and nuclear-level phenomena are an essential part of modern technology and our every-day life.

Contents

The measurements are done in small teams, and the reports are written either individually or with the team mates. A report includes the main parts of the related theory, the measured data and the associated error analysis.

Previous Knowledge

Laboratory Exercises of Basic Physics.

Study Methods

The measurements are done in small teams, and the reports are written either individually or with the team mates.

Learning Material

Instructions written by the teacher.

Assessment of Learning

The grade is based on the reports and on a written examination.

ICC11609
Chemistry and Environment, 2 cu

Learning Objectives

The student will become familiar with the basic concepts of chemistry and conscious about the importance of chemistry in relation to environmental issues.

Contents

Structure of matter, states of matter, amount of substance, chemical reaction, basic concepts of solution chemistry and electrochemistry.

Applications especially to energy production and its environmental effects.

Study Methods

Lectures and exercises.

Learning Material

Material prepared by the lecturer.

Assessment of Learning

Examination.

PROFESSIONAL BASIC STUDIES

Design Methods

Learning Objectives

The purpose of the Design Methods study block is to give basic skills for designing IT systems.

IEI12101

Electronics and Software Documentation, 2 cu

Learning Objectives

The student learns to understand and read various drawings needed in electronics, information technology and mechanical and electrical engineering. Having completed the study unit the student understands the significance of drawing up documents and knows how to use computer-aided documentation methods.

Contents

Basic knowledge of the drawings in electronics, information technology and electrical and mechanical engineering. Computer-aided drawing and design. Gathering information from CAD files. The use of various commercial programs in electronics and software documentation.

Previous Knowledge

No previous study units required.

Study Methods

Lectures and exercises.

Learning Material

Material presented by the teacher at the beginning of the study unit.

Autocad program

Anttila, J. Dokumenttien hallinta

Assessment of Learning

Exercises and exam.

IEC12102

Electrical Safety, 1 cu

Learning Objectives

The student knows the dangers connected with electrical work and safety regulations and learns to take care of work safety in the laboratory, electrical work and their design and to act correctly in an electrical accident situation.

Contents

Dangerousness of electricity, reasons for electrical accidents and procedure in case of an electrical accident. Regulations and safety regulations to be complied in electrical work. Touch voltage protection and earthing systems in various electric networks. First aid in electrical accident situations.

Previous Knowledge

No previous study units required.

Study Methods

Lectures and first aid training.

Learning Material

Electrical safety regulations, A1-93, publication of Electric Inspectorate
General work instructions of electrical laboratory.

Assessment of Learning

Participation in compulsory first aid training and exam. A passed exam is a prerequisite for performing laboratory exercises in the electrical laboratory.

IEI12102

Computer Aided Design of Electronics, 2 cu

Learning Objectives

The student will learn the CAD systems operating in microcomputers or UNIX based workstation computers. He will get familiar with the characteristics of design programs and their use.

Contents

Operations and use of electrical and electronic design programs operating in workstations. Carrying out design task using a workstation. Additional operations, such as information management, filing, reporting, word processing. Utilizing symbol and other library operations and creating new symbol libraries.

Previous Knowledge

Electronics and Software Documentation, Basics of Data Processing.

Assessment of Learning

Lectures, exercises and examinations.

IEC12103

Product Development and Production Engineering, 2 cu

Learning objectives

Having completed the study unit the student has a conception of how to organise and implement a product development project and how to manage a large project. The student understands modern production methods and manufacturing technology in outline.

Contents

Integrated product development, main phases of a product development process, management, co-ordination and information sources of product development. Design of a product line, methods of quality assurance, market research and production engineering design. Production systems and production control.

Previous Knowledge

Electronics and Software Documentation, Computer-aided Electronics Design.

Study Methods

Lectures, exercises

Learning Material

Simo Keskinen. Tuotekehitys ja projekti-toiminta, opetusmoniste.
Jaakkola & Tunkelo. Tuotekehitys - ideoista markkinoille.
Ihalainen, Aaltonen, Aromäki & Sihvonen. Valmistustekniikka, Otakustantamo.

Assessment of Learning

Exercises and exam.

IIT12104

Application Development, 2 cu

Second study year course, description in Study Guide year 2004-2005

IEI12106

C-Programming, 2 cu

Learning Objectives

The student will continue to develop his knowledge on programming using C-language. The student get familiar with software developments tools. After the unit the student will be able to solve engineering problems using C-language.

Contents

Background and basic concepts of programming technology. The operation of complex functions and the operation CPU stack is handled as well as modular programming structures.

Previous Knowledge

Basics of Data Processing, Basics of Programming.

Assessment of Learning

Lectures, exercises, individual programming projects in C. Examinations.

Theory of Electrical Circuits

IEI12201

Direct and Alternating Current Circuits, 2 cu

Learning Objectives

The student becomes familiar with the basic phenomena and quantities of electrical engineering both in DC and AC circuits. The student learns the basic calculation methods and knows how to apply learned methods in the calculation of simple phenomena of circuits.

Contents

Phenomena and quantities of static field, electric strength of insulator structures, rudiments of magnetic circuits, DC circuits and related quantities and laws. Generation of alternating current, AC circuits and electromagnetic induction. Resistance, inductance and capacitance in single-phase AC circuits.

Coupling of circuits and basic calculation methods.

Previous Knowledge

No previous study units required.

Study Methods

Lectures and exercises.

Learning Material

Esala, H. Teoreettinen sähkötekniikka 1, opetusmoniste 2000.

Assessment of Learning

Exercises and exam.

IEI12202

Circuit Analysis, 2 cu

Learning Objectives

The student masters the routine of phasor calculation of circuits, knows how to apply them in practice and to choose the best method for each application and knows how to use PC calculation programs.

Contents

Phasor calculation, basics of power calculations in AC circuits, resonance circuits and their applications. Mesh current, node voltage, superposition, Thevenin and Norton methods. Bipolarity and tetrapolarity, use of decibel in electrical circuits, circuits containing amplifiers and basics of three-phase systems.

Previous Knowledge

Direct and Alternating Current Circuits or corresponding.

Study Methods

Lectures, calculation exercises and PC exercises.

Learning Material

Verkkonen, V. Teoreettinen sähkötekniikka 2, opetusmoniste 2003.

Assessment of Learning

Calculation exercises, exam, compulsory participation in PC exercises.

IEC12204

Transients and Frequency Analysis, 2 cu

Learning Objectives

The student knows how to solve and take into account transients appearing in electrical circuits, becomes familiar with the calculation methods required by polyphase electricity and with the principles of travelling waves as well as with solving problems of electrical circuits using PC.

Contents

Transients are studied in simple cases with methods based on the solution of differential equations and on the part of more complex circuits, with methods based on the Laplace transformation. In case of polyphase electricity, the student learns to define harmonics using the Fourier series and to define RMS values and power. In the part concerning travelling waves, the student becomes familiar with the phenomena taking place in points of discontinuity and arbitrary loads. In PC exercises the most important applications of circuit calculation methods are introduced.

Previous Knowledge

DC circuits, AC and magnetic circuits and circuit calculation methods.

Study Methods

Lectures, calculation exercises and PC exercises.

Learning Material

Verkkonen, V. Teoreettinen sähkötekniikka 3, opetusmoniste, 2003.

Assessment of Learning

Calculation exercises, exam and compulsory participation in PC exercises.

IEC12205

Electrical Circuits Laboratory Exercises, 1cu

Learning Objectives

The student will learn the basics of electrical circuits, measuring methods and components. An aim is to illustrate the differences between the ideal circuits and real circuits. Special attention is paid to the importance of electrical safety.

Contents

Laboratory exercises in the central subjects of the theory of electrical circuits: self and mutual inductance, operation principles of electric motors, superpositioned currents and voltages, changes in RLC circuits, propagation of pulse and reflection in transmission line and power measurements.

Previous Knowledge

Theory of Electrical Circuits, Electrical Safety.

Learning Material

Instructions for laboratory exercises.

Assessment of Learning

Laboratory exercises in groups of 3-4 students. Reports on the exercises. An examination.

Automation Engineering

IEC12301

Basics of Automation Engineering, 2 cu

Learning Objectives

This unit will present the student general information on the different areas and operations of automation engineering and help him to acquire a basic knowledge of the various aspects of an automation engineer's work.

Contents

Role, structure and operations of automation systems. Basics of process control and process measuring techniques. Controllable processes, controllers and control loops. Describing and implementing control tasks. Relay and programmable logic controllers.

Assessment of Learning

Lectures, exercises and examinations.

Electronics and Information Technology

Learning Objectives

In the basic studies of Electronics and Information Technology the most important components of electronics and IT and their most typical applications are introduced together with the basics of digital technology, applications and interface circuits. In addition, the basic structure and components of an user

interface, the structure of a microcomputer and microprocessor and the basics of data networks are dealt with.

IIT12406

Electronic Components, 1 cu

Learning Objectives

To provide students with the basic theories and practical understanding of the most common semiconductor devices.

Contents

The Diode, The Zener Diode, the BJT, the FET and the Operational Amplifier

Previous Knowledge

Direct and Alternative Circuits

Learning Material

Michael Hassul and Don Zimmerman, Electronic Devices and Circuits.

Assessment of Learning

Lectures, exercises and examinations.

IIT12402

Electronic Components Laboratory Exercises, 1 cu

Learning Objectives

The student will put into practice his knowledge about electronic components and their characteristics.

Contents

Use of components data sheet. Measurement techniques and instruments for electronic components and basic circuits. Proper handling of components.

Previous Knowledge

Electronic Components

Assessment of Learning

Laboratory exercises in groups of 3-4 students. Preliminary report on each exercise and a more detailed one after each working session. A written examination on the laboratory exercises. Completing and handing in the reports by the given deadlines and passing the examination.

IIT12407
Basics of Electronic Circuits, 1 cu

Learning Objectives

To equip students with the ability to analyse and design simple electronic circuits with semiconductor devices. The student will be able to design simple electronic circuits based on the required specifications. The student will also be able to use some ready-made circuit solutions and understand their operations and limitations.

Contents

Rectifiers, Clippers, Detectors, Simple Power Supply, Biasing Circuits, Switching Circuits, Amplifier Circuits and analogue filter design.

Previous Knowledge

Electronic Components

Learning Material

Michale Hassul and Don Zimmerman, Electronic Devices and Circuits.

Assessment of Learning

Lectures, exercises and examinations.

IIT12403
Electronic Circuits Laboratory Exercises, 1 cu

Learning Objectives

The student will build major skills in the design implementation and testing of most common electronic circuits.

Contents

Amplifiers, Oscillators, Waveform Generators, Filters and Modulators.

Previous Knowledge

Electronic Components

Assessment of Learning

Laboratory exercises in groups of 3-4 students. Each group should first make a theoretical study and simulation of the circuits using PSPICE before coming to the lab. A preliminary report on each exercise should be handed to the supervisor at the beginning of each laboratory session. A more detailed report should be returned after each working session. A written examination on the laboratory exercises. Completing and handing in the reports by the given deadlines and passing the examination.

IIT12408
Basics of Digital Electronics, 1 cu

Learning Objectives

The student will learn the basics of digital electronics and thus acquire a basis for further studies.

Contents

Number Systems and Codes, Logic Gates and Boolean Algebra, Combinational Logic Circuits, Digital Arithmetic: Operation and Circuits

Previous Knowledge

Electronic Components

Learning Material

Ronald Tocci, Digital Systems, Principle & Applications.

Assessment of Learning

Lectures, exercises and examinations.

IIT12409
Digital Systems

Learning Objectives

The student will learn to analyse the operation of most common digital circuits and techniques used in modern digital systems.

Content

Sequential Logic Circuits, MSI Logic Circuit, Counters and Registers, Memory Devices, PLD and Introduction to Microprocessors

Previous Knowledge

Basics of Digital Electronics

Learning Material

Ronald Tocci, Digital Systems, Principle & Applications.

Assesment of Learning

Lectures, exercises and examinations.

IIT12410
Digital Electronics Laboratory Exercises, 1 cu

Learning Objectives

The student will gain a better understanding of the theory of digital electronics through laboratory exercises.

Contents

Basic logic circuits implemented by basic components. Measurements of electronic components. Use of measuring instruments typically employed in digital electronics. Operation of processors.

Previous Knowledge

Digital Electronics or Basics of Computer Engineering, Electronics Laboratory Exercises.

Learning Material

Instructions for laboratory exercises.

Assessment of Learning

Laboratory exercises in groups of 3-4 students. Continuous assessment of the work in the laboratory. Reports and an examination.

IEI12401

Basics of Operating Systems, 2 cu

Learning Objectives

The student will learn the most common operating systems a bit more profoundly.

Contents

Basic structure and components of operating systems. Use of processes, signals and interrupts. CPU timing. Memory management and file systems of operating systems. UNIX-operating systems, especially Linux. Windows NT on network use. General principles of real time systems. Operating systems (NT and Linux) will be installed during the course and the network properties of operating systems in local and TCP/IP-networks will be introduced.

Previous Knowledge

Basics of Data Processing

Assessment of Learning

Lectures. Exercises in computer rooms. Individual design and programming exercises. An examination.

IEI12402

Microcomputers, 2 cu

Learning Objectives

The student will learn the basic structure of microcomputer system and understand the operation principles of the microcomputer system.

Contents

Microcomputer System hardware; Microprocessor architectures; Microcomputer buses, memory circuit technologies; peripheral circuits; assembler programming; evaluation of calculation capacity of computer systems

Previous Knowledge

Digital Electronics or Basics of Computer Engineering, Computer Engineering Labs.

Learning Material

William H. Murray, Chris H. Pappas, 802/386 Ohjelmoiti, Pagina Oy, 1990.

Assessment of Learning

Lectures, exercises, design projects, examinations.

IEC12405

Basics of Telecommunication, 2 cu

Learning Objectives

The student will get an overview of the basics of telecommunication and the phenomena appearing in it: What is noise (SNR) and how it affects to the signal in the channel? Decibel (dB) calculations. What are the principles of analogue and digital modulations, encoding techniques, transmission codes? Basic idea of different telecommunication systems e.g. telephone network PSTN. What are the error control methods?

Contents

Terminology, units and presentation methods used in telecommunication engineering. Signals in the time and frequency domains. Noise. Filters. Transmission lines antennas and propagation of radio waves. Modulation and coding. Telecommunication equipment, systems and networks. Error detection, correction and control.

Previous Knowledge

Theory of Electrical Circuits, Electronic Components or Basics of Electronics.

Study Methods

Lectures, Exercises and Presentation.

Learning Material

Hioki, W. Telecommunications, 4th ed., 2001, Prentice Hall

Assessment of Learning
Exercises, Presentation and Exam. Numeric grading

8.2.3 SPECIALISED PROFESSIONAL STUDIES

SPECIALISATION ALTERNATIVE OF ELECTRONICS AND COMPUTER ENGINEERING

Microcomputer Engineering

Learning Objectives

The student becomes familiar with the function of a microprocessor and studies the construction of embedded system in practice. The student acquires basic skills for designing microprocessor based systems independently and is able to participate in a project of designing an embedded system.

IEI21101 Industrial Electronics, 2 cu

Learning Objectives

The student will get familiar with the most common component and circuit structures and be able to select, design and test components and electronic to be used in industry.

Contents

Thyristors based circuits, DC/AC motors and their control circuits. Analogue and digital transducers and actuators circuits. Operational Amplifiers and linear ICs, FPGA and ASIC microcircuits. VHDL.

Previous Knowledge

Theory of Electrical Circuits, Basic Studies of Electronics and Computer Engineering.

Learning Material

Colin D. Simpson, Industrial Electronics,

Assessment of Learning

Lectures, exercises and examinations.

IEI21102 Microprocessors, 2 cu

Learning Objectives

The student will understand how microprocessors operate and how they are connected to other electronics. PC is used as an example of application.

Contents

Operation and internal structure of a processor. Device dependent programming in PC environment and the use, connecting and programming of internal peripheral circuits in PC. Interrupt vector table, I/O space and the use of memories. Study of the operation of a microprocessor by simulation.

Assessment of Learning

Lectures, exercises and examinations.

IEI21103 Electronic Design, 2 cu

Learning Objectives

The student will become familiar with computer based design methods and tools for electronics and be able to utilise these in documentation and simulation.

Contents

Implementing a circuit including analogue and digital parts. Drawing a circuit diagram, simulation of functions, designing a PC board and producing documents with CAD programs. Printed circuit board technologies, designing and fabricating on silicon. Testing electronic equipment.

Previous Knowledge

Basic Studies of Design Methods and Electronics

Assessment of Learning

Lectures, exercises and examinations. Individual design projects using a CAE program.

IIT21104 Computer Interfacing and Buses, 2 cu

Learning Objectives

To provide students with a good foundation in data acquisition using not only a personal computer but also the most common buses used in industry today.

Content

Interfacing to the PC Bus for both digital and analogue I/O. Signal conditioning and interfacing problems. Interfacing to the Common buses used in industry.

Previous Knowledge

Basics of electronic circuits, Digital Signal Processing.

Learning Material

Rigby and Dably. Computer Interfacing, 1995.

Assessment of Learning

Lectures exercises, individual project and/or exam

IEI21104

Microelectronics Laboratory Exercises, 2 cu

Learning Objectives

The student will get familiar with the components, circuit structures, production technologies, methods and processes employed in electronics industry.

Contents

Studies of materials and components, experiment on circuit solutions, printed circuit board technology, phases of surface mounting, inspections and testing of soldering and surface treatment, EMC and ESD protection.

Previous Knowledge

Theories of Microelectronics Module

Learning Material

Instructions for laboratory exercises.

Assessment of Learning

Laboratory Exercises and Examination/Project

Embedded Systems

Learning Objectives

The objective of Embedded System module is to give the student skills to design a real-time embedded system independently.

IEI21201

Embedded Systems Design, 3 cu

Learning Objectives

The student will learn design methods of embedded systems. The student learns, how the hardware and software design of small embedded system must be done

Contents

The design process of microcomputer based device. The software specifying methods of an embedded system. The use of emulators and other prototype testing devices. Programming of microcontrollers using assembler and C-language

Previous Knowledge

Microelectronics module

Learning Material

Handouts provided by the lecturer

Assessment of Learning

Lectures, exercises, design projects, examinations.

IEI21202

Real Time Operating Systems, 2 cu

Learning Objectives

The student will learn how a real time operating system works, how it is constructed and how it is used in applications.

Contents

Basics of real time, scheduling methods, use of priority pile. Different methods of implementing RT-environment. Implementation of RT-operating system using C-language. Use of commercial real-time system in embedded system. Programming of embedded system using Siemens C167 processor.

Previous Knowledge

Object Oriented Programming, Embedded Systems Design

Learning Material

Tuominen, P. RTOS - Embedded Systems
CMX- RTOS manual

Assessment of Learning

Lectures, exercises and examinations.

IET22205
Embedded Internet, 2cu

Learning Objectives

The student will be familiar with embedded internet device, TCP/IP-protocol stack and the operation of HTTP-protocol and simple web/wap-servers are studied. All major manners to implement embedded internet systems are handled. Students learn how to program applications to various hardware platforms and how to select best operating system for those.

Contents

Details of needed electronics and needed software. The implementation of TCP/IP-protocol stack The implementation of HTTP-protocol using C-language and using of embedded web-server is studied. The operation of Bluetooth is analysed. How to connect fieldbus based devices to the internet is detected.

Previous Knowledge

Data Processing.

Learning Material

To be announced at the beginning of the unit.

Assessment of Learning

Lectures, exercises and project work

IEI21204
Embedded Systems Project, 3 cu

Learning Objectives

The student group will design, build at laboratory, test and write documentation from embedded system.

Contents

The specifying, designing and building the prototype. Prototype testing and systematic fault diagnostic methods.

Previous Knowledge

Embedded Systems Design, Digital Signal Processing

Learning Material

Instructions for laboratory exercises.

Assessment of Learning

Laboratory reports, design projects, examinations.

SPECIALISATION ALTERNATIVE OF SOFTWARE ENGINEERING

Software Engineering

Learning Objectives

The student become familiar with the object-oriented programming. Having completed the module the student is able to implement a Java program using a database. The student masters the use of modern UML tools. The objective is to understand the software development process from the requirements of end-users to maintaining the applications.

IEI22101
Databases, 3 cu

Learning Objectives

The aim is to provide the student with a basic knowledge of the utilisation of modern databases and their creation. The student will acquire a good theoretic knowledge of various databases and their characteristics and learn the necessary practical skills to program database applications himself. He will also get practice in obtaining information from databanks on public networks.

Contents

Relational databases. Basics of the SQL language. Database programs in the microcomputer environment. Multi-user databases (Oracle). Databanks, information databases. Object-oriented databases. Designing user interfaces of databases and their integration into information systems.

Previous Knowledge

Data Processing.

Assessment of Learning

Lectures, exercises, design projects and examinations.

IEI22102
Object Oriented Programming, 3 cu

Learning Objectives

The student will get familiar with the patterns of thought and the basic theory of object oriented programming, as well as with its software tools and the recent developments. After the unit the student will understand concepts of

object oriented programming such as encapsulation, inheritance and polymorphism, and will be able to write and understand object oriented programs using Java. The unit may include also demonstrations of other object based languages and tools.

Contents

Background and basic concepts of object technology. Making object abstractions. Introducing main concepts of object oriented programming especially encapsulation, inheritance and polymorphism. The course also includes exception handling and Input/Output operations especially file I/O operations in Java. The course also includes a project work in object oriented programming.

Previous Knowledge

Basics of Data Processing, Basics of Programming.

Assessment of Learning

Lectures, exercises, individual programming projects in Java. Examinations.

IIT22103

Software Specification, 2 cu

Learning Objectives

The main goal of this unit is to give the student knowledge of various formal, semiformal and so called heuristic languages and methods for software specification. The main focus will be on introducing and implementing object oriented analysis methods, especially Unified Modelling Language (UML). After the unit the student will be able to apply at least one modern computer-supported graphical specification method for software design, and he will have sufficient capability to utilise other similar methods. The unit emphasises the impact of systematic, well-disciplined software work on productivity and the successful completion of projects.

Contents

Software engineering process, especially analysis process and software specification. How to write software requirements specification and how to make massive and systematic use of object oriented modelling using UML. Feasibility study. Estimation of software project. Functional models and data models. Descriptions of state behaviour using state models and hierarchical state graphs.

Graphical tools for software specification. Rapid prototyping in software design. Validation of software. Specifications of embedded real-time systems. Automatic code generation. Introduction to object specification.

Previous Knowledge

Basics of Programming.

Assessment of Learning

Lectures, exercises, and small design projects using a CASE tool. Examinations.

IEI22104

Java Programming, 2 cu

Learning Objectives

The student learns how to write applets and graphical user interfaces and how to implement database communication in Java. Concepts covered are event handling system, swing and JDBC.

Contents

Structure and use of Java-programming language in applets, event handling, listeners, adapter classes, swing, JDBC.

Previous Knowledge

Basics of Programming, Computer Networks

Assessment of Learning

Lectures, exercises and examinations.

Information Systems

Learning Objectives

The students are able to participate in demanding information systems projects. They apply modern design and programming methods in definition, design and implementation of applications. The main programming language used in the module is C++. The students deepen their knowledge of projects by participating in a software design project and its implementation.

IEI22201

Information System Design, 3 cu .

Learning Objectives

The aim of this unit is to create an overview of the design process of information systems, of their design methods and working environ-

ments. The student will acquire the basic knowledge, especially of the management of software projects, modern computer-aided design methods (CASE) including computer-assisted project and quality control, as well as of some design methods typically used by large organisations. This unit prepares the student to participate in extensive, demanding software projects, and gives an idea how different programs such as databases, graphical user interfaces and hypermedia tools or other application programs are integrated.

Contents

Introduction to open and distributed information systems. Client/server architecture's. Performance of information systems. System design, modelling the design process, methodologies and models. CASE tools in software production. Design of real-time systems. Database oriented systems. Design of user interfaces. Management of software projects. Risk management. Development of quality.

Previous Knowledge

Basics of Programming, Databases, Structured Analysis and Software Specification, Object Oriented Programming and Computer Networks.

Assessment of Learning

Lectures, exercises, examinations

IEI22202

C++ -Programming, 2 cu

Learning Objectives

The student will get familiar with the basic features of C++ language and also patterns of thought and the basic theory of object oriented programming in C++, as well as with its software tools and the recent developments. After the unit the student will understand concepts of object oriented programming such as encapsulation, inheritance and polymorphism, and will be able to write and understand object oriented programs using C++.

Contents

Concepts of object technology implemented in C++. Making object abstractions. Object oriented features of C++, especially encapsulation, inheritance, polymorphism, overloading, operator functions, friend classes and virtual classes. File I/O operations in C++. Examples of the specifications of object oriented programs.

Implementation of an object-oriented program using a C/C++ CASE tool. Other tools and applications of object technology.

Previous Knowledge

Basics of Data Processing, Basics of Programming.

Assessment of Learning

Lectures, exercises, individual programming projects in C++. Examinations.

IEI22203

Windows Programming, 2 cu

Learning Objectives

The student will understand the internal operation of Windows, learns to read program code written in C-language in Windows applications, gets familiar with Windows-graphics and other internal processes as well as controlling and programming their operation. The functionality required of an application program will be learned in Windows-environment, event handling, communication between Windows-system and other applications in graphical user interface. Control of text, graphics and hardware using C-language will be gone through. The student will be able to design simple graphical applications in Windows-environment.

Contents

Introduction to Windows-programming with the help of API functions; SDI and MDI applications, resources of application, creation and treatment of the components of user interface, use of clipboard, DDE and OLE techniques; application builders (Borland C ++ Builder), use of application builder for graphical user interfaces (Open Interface).

Previous Knowledge

Basics of Programming, Databases, Structured Analysis and Software Specification and Object Oriented Programming

Learning Material

Salmenjoki, K. 1998. Windows Programming Neuron Data Inc, Smart Elements/Open Interface User Manuals, 1995.

Assessment of Learning

Lectures, exercises and examinations.

IEI22204
Information Systems Development Project,
3 cu

Learning Objectives

The aim of the project is to make the student familiar with practical applications and tools. He will learn to use various tools for developing information systems and programs as well as improve his skills to work both independently and in groups. The emphasis is on practical skills. Through laboratory work he will get a better understanding of the working field of software and systems engineers.

Contents

Modems, fibre optics, TDR tester, network analyser and net installation. Program debuggers and analysers, configuration of a CASE workstation, object based CASE tool (Select OMT Professional), test design program, document managers, image processing software, pattern recognition system, code generator, model simulators and animators, neural net simulators, TCP/IP, installation of WWW-server, programming an embedded system.

Previous Knowledge

Theories of Software Engineering and Information Systems.

Learning Material

Instructions for laboratory exercises.

Assessment of Learning

Laboratory exercises and projects in small groups of 3-4 students. Work reports and an examination.

SPECIALISATION ALTERNATIVE OF TELECOMMUNICATION ENGINEERING

Learning Objectives

The study block deals with digital communication technology, signal processing and computer networks.

Data Transmission Engineering

Learning Objectives

The student acquires the basic knowledge of digital data transmission. The student learns

how to process a signal by programming. The student also becomes familiar with the structure of computer networks. Having completed the module the student is able to design local area networks.

IEI23101
Communication Systems, 2 cu

Learning Objectives

The student will have a more extensive knowledge of the design and implementation of telecommunication equipment and systems.

Contents

Communication systems. Signals and spectra. Sampling. Transmission of analogue signals in digital format; line coding. Modulation methods for digital signals; Pulse Code Modulation PCM. Access networks; PSTN/ISDN and Common Channel Signalling System no#7, DSL-system

Previous Knowledge

Basics of Telecommunication.

Study Methods

Lectures and exercises.

Learning Material

Dunlop, J. and Smith, D.G.
Telecommunications Engineering, 3rd edition,
1994, Stanley Thornes.

Assessment of Learning

Exercises and Exam. Numeric grading

IEI23102
Mathematical Methods in Telecommunication, 1 cu

Learning Objectives

Ability to model discrete phenomena in telecommunications using Fourier analysis, Z-transforms and complex functions.

Contents

Fourier series, discrete Fourier transforms, z transforms, transfer functions.

Previous Knowledge

Integral calculus, series and multivariable analysis.

Study Methods

Theory, examples and exercises during the lectures. Independent homework. Computer-aided, independent problem solving.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination

IEI23103

Digital Signal Processing, 2 cu

Learning Objectives

The student will learn the terminology and the basics of signal processing.

Contents

Linear discrete-time systems. Sampling and reconstruction. Z-transforms. Various modes of presentation (block diagram, flow chart). Digital filters, effect of word length. DFT.

Previous Knowledge

Basic Studies of Electronics and Computer Engineering.

Assessment of Learning

Lectures, exercises, individual projects.

IEI23104

Computer Networks, 3 cu

Learning Objectives

The student will master the basics of various telecommunication protocols and telecommunication methods. He will be able to compare various computer networks to each other with respect to costs, efficiency and reliability and be able to design a computer network.

Contents

Computer Networks and Internet. Application Layer. Transport Layer (TCP/UDP). Network Layer (IP) and Routing. Link Layer and Local Area Networks. Physical Layer. Multimedia networking. Security in Computer Networks.

Previous Knowledge

Basics of Computer Engineering. Basics of Telecommunication.

Study Methods

Lectures, written assignment and exercises.

Learning Material

Kurose, J.F., Ross, K.W. Computer Networking, 2nd ed., 2003, Addison Wesley
Halsall, F. Data Communications, Computer Networks and Open Systems, 4th ed., 1996

Assessment of Learning

Exercises, Written Assignment and Exam. Numeric grading

IEI23105

Data Transmission Laboratory Exercises, 2 cu

Learning Objectives

The student will gain a better understanding of the theory of telecommunications engineering through laboratory exercises. He will learn to use measuring instruments necessary in the analysis, trouble shooting and performance estimation of telecommunications equipment and systems.

Contents

Exercises on the areas covered by Basics of Telecommunications, Data Transmission Systems, and Communication Systems and Computer networks. Modulation methods, line coding, PCM. Optical fibres and data transmission, Spectrum analyser as a tool in studying signals and modulation methods. Properties of antennas and transmission lines. Measurements and analysis of modems, ISDN, DSL, serial communication, and Ethernet.

Previous Knowledge

Basics of Telecommunication. Theories of Data Transmission Engineering.

Study Methods

Laboratory Exercises in groups of 3-4 students. Reports on the exercises. Learning diary

Learning Material

Laboratory handouts

Assessment of Learning

Laboratory performance. Reports on the exercises. Learning diary. Numeric grading

Telecommunication Systems

Learning Objectives

The objectives of the study block are that the student will have a thorough knowledge of mobile telecommunication systems, broadband digital transmission systems and digital signal processing.

IEI23201

Broadband Networks, 3 cu

Learning Objectives

The student will have a thorough knowledge of new broadband digital transmission techniques.

Contents

Use and production technique of optical fibres, SDH/SONET systems, B-ISDN concept. The emphasis of the unit lies on the ATM technology, its structure, signalling and coupling technique.

Previous Knowledge

Data Transmission Engineering, Computer Networks

Assessment of Learning

Lecture, exercises, examinations.

IIT23202

Mobile Telecommunication, 3 cu

Learning Objectives

Students will learn the digital mobile communication systems and receive a good starting point for various tasks in working life.

Contents

Access Technologies. Cellular Communications and Antennas. Mainly GSM and WCDMA systems with the emphasis on the WCDMA technology. Theoretical models and measuring techniques.

Previous Knowledge

Basics of Telecommunication, Communication Systems

Study Methods

Lectures, written assignment and exercises

Learning Material

Chao, G. Mobile Telecommunications, handouts.

Holma, H. and Toskala, A. WCDMA for UMTS, Radio Access for Third Generation Mobile Communications, 2002, Wiley

Assessment of Learning

Exercises, Written Assignment and Exam. Numeric grading

IEI23203

DSP Advanced Course, 2 cu

Learning Objectives

The student will learn to design digital filters and understands the mathematical background of discrete and fast Fourier transform

Contents

Types of signals, sampling theorem, frequency response and digital filters, discrete Fourier transform, Fast Fourier Transform and nonrecursive filter design

Previous Knowledge

Digital Signal Processing, Basics of Telecommunication.

Assessment of Learning

Lectures, exercises, individual projects.

IEI23204

Telecommunication Laboratory Exercises, 3 cu

Learning Objectives

The student will gain a better understanding of the theory of telecommunications engineering through laboratory exercises. He will gain advanced skills to use measuring instruments necessary in the analysis, trouble shooting and performance estimation of telecommunications equipment and systems.

Contents

Exercises related to broadband networks, digital mobile telephone systems and computer networks.

Previous Knowledge

Study block of Data Transmission Engineering. Theories of Telecommunication Systems.

Study Methods

Laboratory Exercises in groups of 3-4 students. Reports on the exercises. Learning diary

Learning Material
Laboratory handouts

Assessment of Learning
Laboratory performance. Reports on the exercises. Learning diary. Numeric grading

SPECIALISATION ALTERNATIVE OF PRODUCTION ECONOMICS

Industrial Economics

Learning Objectives
The objective of the study module is that the student, having completed it, has a concept of the significance of the core processes of the company to successful business process. S/he knows how to design and analyse the processes of the company as well as parameters related to it, and is able to assess the productivity of business process.

ICM22101 Management Accounting, 3 cu

Learning Objectives
The student will be able to control and analyse costs incurred in the operation of an enterprise, will be able to direct them and utilise them in planning and controlling the operation of an enterprise

Contents
Significance and role of management accounting. Cost concepts and terminology. Accounting by kind of cost. Cost pool accounting. Traditional output-based cost accounting. Activity-based cost accounting and activity-based management. Price determination from various perspectives. Investments and assessing their profitability and introduction to ABC software.

Previous Knowledge
Basics of Business Administration.

Learning Material
Horngren, Foster and Datar. Cost Accounting. A Managerial Emphasis. 10th Edition.

Assessment of Learning
Lectures, exercises, teamwork and examinations.

ICM22103 Production Control, 2 cu

Learning Objectives
The student will have an understanding of the production functions of an enterprise as an integrated process, s/he will learn about the different possibilities to implement and control the production process and the control measures required in different situations.

Contents
Different levels of organising production, production control methods and control requirements. Interrelation to economic processes. Rough loading, manufacturing and material control.

Previous Knowledge
Business Mathematics, Basics of Business Administration and Management Accounting.

Learning Material
Jay Heizer and Barry Render. Operations Management. 6th Edition. J.R Arnold. Introduction to Material Management. 3rd Edition.

Assessment of Learning
Lectures, exercises and examinations.

ICM22104 Financial Accounting, 2 cu

Learning Objectives
The student will learn how the accounting information is used in the financial statements. S/he will understand the role and significance of profit planning and be able to analyse the financial state of a company on the basis of financial statements.

Contents
Role and significance of financial accounting. Structure and basic principles of business book-keeping. Formation and terminology of the financial statements. Financial statement planning. Financial statement analysis. Consolidated financial statements and international financial statement practices. Relevant legislative framework. Principles of company taxation and value added taxation.

Previous Knowledge
Entrepreneurship.

Learning Material

Handouts provided by the lecturer.
Book keeping, Taxation and VAT laws.
Book keeping software.
Financial analysis software.

Assessment of Learning

Lectures, exercises and examinations.

ICM22105
Basics of Marketing, 2 cu

Learning Objectives

The student will appreciate the importance of both internal and external marketing for a successful company and will be able to plan, implement and analyse marketing operations according to the principles of customer oriented marketing.

Contents

The purchasing behaviour of consumer and organisations. Customer oriented marketing. Goals, operation environments, competitive weapons, profitability of marketing and factors related to these. Planning and control of marketing.

Previous Knowledge

Entrepreneurship and Business Administration

Learning Material

Brassington and Pettitt. Principles of Marketing. 2nd Edition.

Assessment of Learning

Lectures, exercises and examinations.

ICM22107
Marketing Research, 1 cu

Learning Objectives

The student will have an understanding of the market research, he/she will be able to plan, implement and analyse market research in different situations.

Contents

Role and significance of market research. Planning of market research. Definition of the universe and the sample. Research methods. Analysing and reporting the results of market research.

Previous Knowledge
Marketing.

Learning Material

Alvin C. Burns and Ronald F. Bush. Marketing Research. 3rd Edition.

Assessment of Learning

Lectures and project assignment. Assessment will mainly be based on an extensive market research project.

Business Process Development

Learning Objectives

The objective of the study module is that the student, having completed it, knows how to design and develop the processes of the company especially in productive companies. S/he understands the main process, order-delivery-process, requirements and operation of an industrial company and is able to work in an international business environment.

ICM 22307
Supply Chain Management, 3 ov

Learning Objectives

The student will acquire integral view of supply chain management and its activities with the flow and transformation of goods from the raw material stage to the end user. Emphasis will be on the role of supply chain management in creating customer value, in improving the competitiveness of the firm, and on the inter-relationship between the supply chain and different functional areas of the organisation.

Contents

Basic concepts include inbound logistics, material management, and physical distribution, and purchasing management.

Previous Knowledge

Entrepreneurship, Basics of Business Administration.

Learning Material

Handfield and Nichols. Introduction to Supply Chain Management. Lysons. Purchasing and Supply Chain Management. 5th Edition.

Assessment of Learning
Lectures, exercises and examinations.

ICM22209
Corporate Planning, 2 cu

Learning Objectives
The student will be familiar with the strategic and operational planning and management of a company. S/he will appreciate the role played by corporate planning to the business.

Contents
Concepts related to corporate planning. Motives and systems for corporate planning. Strategic planning, visions and operational strategies. Medium-term planning. Operational planning. Implementation of performance management system, and strategic information systems.

Previous Knowledge
Entrepreneurship, Basics of Business Administration, Management Accounting and Basics of Marketing.

Learning Material
Johnson and Scholes. 6th Edition. Exploring Corporate Strategy.

Assessment of Learning
Lectures, exercises, seminar work and examinations

ICM22208
Company Development, 2 cu

Learning Objectives
The student will appreciate the role and significance played by the continuous developing of a company and its different activities in the rapidly changing business environment. S/he will be able to discover development potential in different business activities. The student will go into some development potentials and development methods in greater detail.

Contents
Change trends in business environment. Traditional acquisition of knowledge. Information retrieval via Internet. Creativity. The subjects of the seminar work are related to product and production development, purchasing, leadership, personnel, financial administration, marketing and information systems. Use of computer networks in distribution of information.

Previous Knowledge
Entrepreneurship, Basics of Business Administration, Industrial Economics, Corporate Planning or the other equivalent study units.

Learning Material
Handouts provided by the lecturer.
Special articles related to the subject of the seminar work.

Assessment of Learning
Active participation (80%) in lectures, assignments and seminar work.

ICM22210
Industrial Marketing, 2 cu

Learning Objectives
The student will have an understanding of the factors that shape the decision-making of successful business marketing managers. Emphasis will be placed on negotiating, taking into consideration of different business cultures.

Contents
Nature of industrial marketing. Understanding Industrial markets. Industrial buying behaviour, communication strategies, and international industrial marketing.

Previous Knowledge
Marketing.

Learning Material
Brierty et. al. Business Marketing. 3rd Edition.

Assessment of Learning
Lectures and project assignment. Assessment will mainly be based on case studies in industrial marketing.

ICM22211
Management Simulation Game, 1 cu

Learning Objectives
The aim of the course is to develop the students skill in business analysis, planning, and decision making in a simulated competitive situation. The game helps to understand the interdependencies between different business activities and the effect of the operations of competing companies on the success or failure of a business.

Contents
Long and short term planning of marketing,

accounting and production. Strategic, profitability and financial planning of a company.

Previous Knowledge

Entrepreneurship, Basics of Business Administration, and Industrial Management.

Learning Material

Handouts provided by the lecturer.

Assessment of Learning

Lectures, exercises and examinations.

SPECIALISATION ALTERNATIVE OF IT PROJECT

Objectives and Implementation

The completion of the study unit introduces the student to design, production and/or installations in field of IT, to methods used and special tools as well as to special features of the field.

The specialization alternative is implemented in co-operation with the Polytechnic and economic life so that the students will be introduced to the activity in their special field in accordance with the program drawn up for them. In this connection, the students complete case-specific special assignments, such as studies of labour legislation and occupational safety requirements, programming and design assignments, etc. The students themselves will acquire the co-operation companies.

More detailed objectives and the schedule are specified for each student personally according to his/her wishes and other studies and supply of subjects. The teacher appointed by the unit will take care of the planning and implementation.

The number of the students participating in the specialization alternative can be restricted according to resources.

Completion and Assessment

The completion of the studies requires the participation in the activity, in accordance with the personal program, in the polytechnic, in a company or possibly in other institute.

To pass the specialization alternative requires the completion of all student-specific assignments. Assessment as pass or fail.

The completion of the specialisation alternative is comparable with practical training and entitles to the inclusion of 10 credit units of practical training into the polytechnic degree.

Basic Project in IT

IIT26101

Basics of Project Working, 2 cu

Objectives and Contents

The student will be introduced to the issues and special features of project working in accordance with the personal program. The contents are defined according to the student's personal program.

Completion and Assessment

Completion is defined for each project separately. Assessment as pass or fail.

IIT26102

Implementation of the Project, 8 cu

Objectives and Contents

The student is introduced to the assignments in his/her field of specialization and to their characteristics by taking part in a project in a company and/or Polytechnic in accordance with the personal program. The duration of the work period is 8 weeks.

Completion and Assessment

The completion is defined for each project separately. Assessment as pass or fail based on the report written on the project work.

SEPARATE PROFESSIONAL STUDIES

Technical Mathematics

Learning Objectives

The aim of technical mathematics is to complete the mathematical education received by a student during the basic courses of mathematics, make him able to perform graduate studies, and

to equip a student with the mathematical knowledge needed for demanding tasks where expertise and an ability to design complicated engineering systems is required.

ICC29101
Integral Transforms and Discrete Mathematics, 2 cu

Learning Objectives

Ability to model continuous and discrete phenomena using Fourier analysis and complex functions, introduction to Matlab.

Contents

Laplace transform, Fourier transform (continuous), Fourier series, discrete Fourier transform, z transform, introduction to the theory of complex functions.

Previous Knowledge

Integral calculus, series and multivariable analysis.

Study Methods

Theory, examples and exercises during the lectures. Independent homework. Computer-aided, independent problem solving.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC29102
Matrix calculations, 2 cu

Learning Objectives

To acquire basic knowledge of matrix calculations and linear spaces and an ability to model applications.

Contents

Linear spaces, linear mappings and their matrix representation, matrix decompositions, norms, matrix functions, numerical calculations with matrices, applications.

Previous Knowledge

Integral calculus, series and multivariable analysis.

Study Methods

Theory, examples and exercises during the lectures. Independent homework.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC29103
Numerical methods, 2 cu

Learning Objectives

To acquire abilities to apply numerical methods.

Contents

Error propagation, linear and non-linear equations and sets of equations, interpolation, numerical differentiation and integration, numerical solving of sets of differential equations.

Previous Knowledge

Integral calculus, series and multivariable analysis.

Study Methods

Theory, examples and exercises during the lectures. Independent homework. Computer-aided, independent problem solving.

Learning Material

Lecture notes.

Assessment of Learning
Exercises and examination.

ICC29104
Statistics, 2 cu

Objectives

Ability to use probability theory and statistics in confidence analysis and quality control. Introduction to statistical software.

Contents

Quality control issues, parameter estimation, dependence analysis, stochastic process handling, SPSS-software.

Previous Knowledge

Compulsory courses in mathematics.

Study Methods

The basics of learning constitutes of lectures where the theory is explained and examples are given. The use of SPSS-software is practiced in the computer class, and using this software a student prepares a minor study on a given subject.

Learning Material

Lecture notes.

Assessment of Learning

Exercises and examination.

ICC29105

Vector analysis, 2 cu

Learning Objectives

To acquire an ability to apply the techniques of vector analysis and integration in several variables.

Contents

Differential operators, line, surface and triple integrals, the theorems of Green, Gauss and Stokes.

Previous Knowledge

Integral calculus, series and multivariable analysis.

Study Methods

Theory, examples and exercises during the lectures. Independent homework.

Learning Material

Grossman. Multivariable Calculus, Linear Algebra and Differential Equations. HBJ.

Lecture notes.

Assessment of Learning

Exercises and examination.