

CURRICULUM

for the Bachelor's Degree course in

INFORMATION TECHNOLOGY

at the Faculty of Business Administration and Informatics at the Alps-
Adriatic University of Klagenfurt

Board of Studies

“Informatics, Technical Mathematics”

pursuant to the Ruling dated 31.05.2006

Pursuant to the provisions of the Federal Act concerning the Organisation of Universities and Studies (Universities Act 2002) and the Articles of the Alps-Adriatic University of Klagenfurt, Part B: Study Regulations, the Senate of the Alps-Adriatic University of Klagenfurt adopted the curriculum for the Bachelor's Degree in “Information Technology” at its Session on ???.2006.

Sec. 1 General objectives of the degree course and qualifications profile

The field of information technology is one of the major drivers of technical and economic progress not only in Europe but throughout the world. Information technology systems determine our daily professional and private life. We work with notebooks and PCs, listen to music with MP3 players and are integrated in global networks by means of the internet and mobile phones. When we are travelling, we are helped along by driver assistance systems in the car or automatic passenger information in public transport. In medicine, high tech equipment is available to diagnose and assist the treatment of illnesses and injuries. In the industrial sector, robots assemble complex equipment and networked sensors monitor chemical processes.

Information technology is always mentioned when information is generated, processed, transported, stored and output using technical means. Information is created in various forms, such as language data, pictures, videos or measurement data.

Information technology systems are also being literally embedded increasingly frequently in everyday objects, transforming them into “intelligent objects” that assist humans in their activities without being noticed. In this context, other terms used are “ambient intelligence”, “pervasive computing and communications” and the “internet of things”. This is also reflected in the transformation of information technology into a cross-section discipline for other key technologies such as medical technology, nanotechnology and biotechnology.

In order to be able to create information technology innovations, there is a need for excellently trained and creative engineers. Their function is to develop new concepts and products and to offer services that make use of modern information and communications technology to make life easier and more efficient, and – not least of all – to make the world a little smaller. However, the field of information technology is also characterised by permanent and rapid change. New knowledge and the latest products soon become outdated, and for this reason, there is in particular a need for engineers who have undergone a broad and well-founded training and who are capable of thinking analytically and understanding complex relationships.

The **courses in information technology** at the Alps-Adriatic University of Klagenfurt communicate this knowledge and these skills. The courses available comprise two technical courses of study: a Bachelor’s Degree in “Information Technology” and a Master’s Degree in “Information Technology”. Studying the two courses one after the other will provide a basis in mathematics and technology and enable the student to acquire the skills, knowledge and methods needed by engineers. Alongside a broad basic knowledge, students will be able to acquire in-depth knowledge in a specialisation within the field of Information Technology. The range of courses, laboratory classes, team projects and work experience in industry emphasises the practical focus of the courses. The technical content can be supplemented by non-technical subjects to broaden the student’s skills and to strengthen soft skills.

The **Bachelor’s Degree in “Information Technology”** serves to provide an initial academic professional training and qualification for occupations in the field of the design and operation of modern information and communication technologies that require the application of scientific knowledge and methods. It communicates both a solid theoretical foundation and a

practice-based methodology. At the same time, the course offers the students the opportunity to acquire knowledge in areas of information technology specialisation such as in the field of mobile and wireless networks, embedded systems, intelligent traffic systems or applied mechatronics. The profile is rounded off by project-specific content (e.g. work experience outside the University or a team project) and by elective subjects whose aim is in particular to extend the student's skills.

The **graduates** of the Bachelor's Degree course work as specialists in the development or production of information technology systems, for instance. They have a broad specialist and methodological knowledge allowing them to develop new solutions for technical problems systematically. After a number of years of professional activity, they are also able to work at managerial level and to lead small to medium-sized development teams and projects.

The **personal preconditions** for the course of study include in particular an interest in technical questions and an analytical and systematic mind. In addition, the students should enjoy understanding and analysing complex problems. As in every technical course of study, basic mathematical knowledge is necessary. Creativity in solving new kinds of problems is just as important as the ability to deal with things carefully and systematically. Also desirable are a basic knowledge of English and an openness towards other cultures.

Differences to other courses

Information technology developed out of **electrical engineering**, and builds on its foundations. However, while a course in electrical engineering covers not only information technology but also the fields of energy technology, materials and components, automation technology and high-frequency technology, the degree in information technology focuses on the development, design and operation of modern information technology systems. The degree does not address subjects such as materials science, electrodynamics, energy technology or electrical machines that are typically included in an electrical engineering degree.

An alternative to a degree in information technology is the degree in informatics that is well established at the Alps-Adriatic University. This covers a field of subjects with a focus on software development and applied informatics leading to a qualification as a software engineer. In comparison, the degrees in information technology focus more strongly on information technology content and the communication of system technology models, such as by means of content from the fields of signal and system theory and communication technology. Information technology addresses the holistic problem solution by integrating hardware and software. Nevertheless, it goes without saying that the methods of informatics also play a very important role in information technology and are taken into account in the curriculum.

Sec. 2 Structure of the degree course

Sec. 2.1 General structure

The Bachelor's Degree comprises **6 semesters** with a total of 180 **ECTS credit points**.¹ It is broken down into the following subjects:

- (1) Introductory phase
- (2) Higher mathematics
- (3) Circuits and electronics
- (4) Signals and systems
- (5) Computer, network and control technology
- (6) Information technology specialist course
- (7) Informatics and software development
- (8) Practical experience
- (9) Electives
- (10) Bachelor's thesis

The degree course begins with an **introductory phase** whose aim is to help students find their way and obtain an overview of studying at a university, an introduction to the basic principles of the subject and the methods of scientific work. Particular account is taken of the following aspects: information about regulations and institutions of relevance to studies, reflection on the choice of studies, sensitisation to the student's professional future and decision making, socio-political aspects and an introduction to scientific theory issues by means of current case studies from the world of practice.

During the degree course, 18 ECTS can be obtained in **electives**. These are subjects that the student can select freely from the courses offered at all recognised Austrian and foreign universities. Evidence of the completion of the number of ECTS required must be submitted for the electives by the conclusion of the degree course in question.

At the end of the Bachelor's Degree course, a **subject examination** must be taken in the subject of "Information technology specialist course". The examination mode is laid down in the Examination Regulations.

Sec. 2.2 Course types

The following class types are included in the Bachelor's Degree course:

- **Lectures (Vorlesungen - VO)** are classes at which knowledge is communicated by means of a lecture. The examination takes place in a single event, which may be oral or written or both written and oral.

¹ The European Credit Transfer System (ECTS) is a European student-centred system for the crediting, transfer and accumulation of learning outcomes. The basis is the workload that the students must complete in order to achieve the objectives of a learning programme. The ECTS system is based on the principle that the workload for full-time students during one academic year amounts to 60 ECTS credits. According to the rules, one ECTS credit corresponds to a total workload of 25 working hours within or outside the course. ECTS is used in the following as a synonym for ECTS credits.

- **Courses (Kurse - KU)** are classes in which the students work through the contents together with the teacher, the focus being on experience and application.
- **Introductory seminars (Proseminare - PS)** are a preliminary stage to seminars. They communicate the basic knowledge for scientific work, introduce students to the specialist literature and deal with examples of problems in the subject by means of papers, discussions and case studies.
- **Seminars (Seminare - SE)** serve academic discussion. The participants make contributions of their own. As a rule, seminars are concluded by a written paper.
- **Lectures with course (Vorlesungen mit Kurs - VK)** comprise a lecture element and a course element, the two being closely linked didactically and graded together.

The **workload** associated with a class is defined by ECTS. Pursuant to Sec. 51, Para. 2, No. 26 of the Universities Act 2002, the allocation of ECTS must be based on the student's workload. The teachers must arrange the workload for the course including the examination accordingly

The **examination and assessment methods** are defined by the teacher at the start of the course (Sec. 28, Para. 2, Part B of the Articles). The course types KU, PS, SE and VK involve continuous assessment, and attendance is therefore compulsory. In addition, the students are expected to participate actively in the discussion and reflection process and in examinations, written work and/or oral presentations.

Maximum class sizes. The following maximum number of participants applies to the following course types:

- Course (KU) or lecture with course (VK): 30 students
- Introductory seminar (PS) or seminar (SE): 20 persons
- Course (KU) in the form of a laboratory class: 15 students

When allocating course places, account must be taken of the fact that students whose application is not accepted should not have to extend the time needed to complete their degree (Sec. 54, Para. 8, Universities Act 2002).

Sec.3 Curriculum for the Bachelors' Degree

Subject/course	Course type	Hours per week	ECTS	Semester
(1) Introductory stage		9	12	
(1.1) Introduction to the study of information technology and current case studies from the	VK	1	0.5	1
(1.2) Electrical engineering and the physical basis of information technology	VO KU	2 2	3 3	1
(1.3) Introduction to Informatics	VO KU	2 1	3 1.5	1
(1.4) Introduction to working, writing and presentations in the field of engineering	PS	1	1	3
(2) Advanced mathematics		24	36	

(2.1)	Analysis I	VO	4	6	1
		KU	2	3	
(2.2)	Analysis II	VO	4	6	2
		KU	2	3	
(2.3)	Linear algebra and Geometry	VO	4	6	2
		KU	2	3	
(2.4)	Stochastics I	VO	2	3	3
		KU	1	1.5	
(2.5)	Stochastics II	VO	2	3	4
		KU	1	1.5	

(3) Circuits and electronics			12	18	
(3.1)	Circuit technology	VO	2	3	2
		KU	2	3	
(3.2)	Microelectronics	VO	2	3	2
		KU	2	3	
(3.3)	Designing digital circuits	VO	2	3	3
		KU	2	3	

(4) Signals and systems			12	18	
(4.1)	Signal presentation and transmission	VO	2	3	3
		KU	2	3	
(4.2)	Digital signal processing	VO	2	3	4
		KU	2	3	
(4.3)	System theory and engineering	VO	2	3	4
		KU	2	3	

(5) Computer, network and control technology			12	18	
(5.1)	Computer organisation	VO	2	3	3
		KU	2	3	
(5.2)	Communication networks	VO	2	3	3
		KU	2	3	
(5.3)	Measurement, sensor and control technology	VO	2	3	4
		KU	2	3	

(6) Information technology specialist course			10	18		
(6.1)	Lecture with course	VK	2	4	5, 6	
(6.2)	Lecture with course	VK	2	4	5, 6	
(6.3)	Course <i>or</i> introductory seminar	<i>or</i> laboratory class	KU/PS	2	3	5, 6
(6.4)	Course <i>or</i> introductory seminar					
(6.5)	Seminar	SE	2	4	5, 6	

(7) Informatics and software development			18			
(7.1)	Introduction to structured and object-based programming	VO	2	3	1	
		KU	2	3		
(7.2)	Lecture Course <i>or</i> lecture with course	VO	VK	2.5	12	2 – 6
		KU				

(7.3)	Lecture Course	VO KU	3..5		2 – 6
(7.4) ²	Lecture Course	VO KU	3..5		2 – 6
(8) Practical experience				12	
(8.1)	Team project <i>or</i> laboratory <i>or</i>	KU	8	12	4 – 6
(8.1')	Work experience (8 weeks)			12	4 – 6
(8.2')	Review of work experience	KU	1		4 – 6
(9) Electives				18	
(10) Bachelor's thesis				12	
(10.1)	Bachelor's thesis I (related to 6.5)			6	
(10.2)	Bachelor's thesis II (related to 8.1 or 8.2')			6	

Sec. 3.1 Information technology specialist course

The courses in “Information technology specialist course” are to be selected from at least two different information technology specialisations offered at the Alps-Adriatic University of Klagenfurt as follows:

- (a) Mobile and wireless systems
- (b) Intelligent transportation systems
- (c) Pervasive computing
- (d) Media Engineering
- (e) Embedded systems
- (f) Applied mechatronics

Sec. 3.2 Informatics and software development

The courses under (7.2) - (7.4) are to be selected from the following:

Algorithms and data structures	VO KU	2 1	3 1.5	2, 4
Object-based implementation of algorithms and data structures	VK	2	3	2, 4
Software design, testing and development process	VO KU	3 2	4.5 3	3, 5

² Falls durch (7.2) und (7.3) bereits 12 ECTS erreicht wurden, entfällt (7.4).

Operating systems	VO	2	3	4, 6
	KU	2	3	
Databases	VO	2	3	4, 6
	KU	2	3	
Logics and logical programming	VO	2	3	4, 6
	KU	1	1.5	
System security	VO	2	3	4, 6
	KU	2	3	
Interactive systems	VO	2	3	5
	KU	1	1.5	
Knowledge engineering for information management	VO	2	3	5
	KU	2	3	
Compiler construction	VO	2	3	6
	KU	2	3	
Distributed systems	VO	2	3	6
	KU	2	3	

The choice should take into account that some of the courses require knowledge from other courses.

Sec. 3.3 Practical experience

During the degree course, the student must complete either a team project, a laboratory class or relevant work experience.

Sec. 3.3.1 Team project or laboratory class

Depending on availability, the team project or the laboratory class can be selected from one of the Information technology specialist course special subjects specified in Sec. 3.1.

Sec. 3.3.2 Work experience

The following guidelines must be observed in the work experience.

- (1) The experience can be in a business, a public institution, a non-profit organisation or a non-university research institution. Its purpose is to try out and apply in practice the knowledge and skills acquired. This is a guided project in which activities related to information technology activities are carried out.
- (2) The work experience shall be for a period of at least 8 weeks, as a rule completed within one semester.
- (3) Students in employment can also carry out the work experience at their place of work, provided that it involves a relevant self-contained project and that there is no relationship between the provider of the work experience and the supervisor on the one hand and the student on the other hand that might lead to partiality. For instance, practical activities in a business belonging to a close family member are not recognised. In cases of doubt, the vice-rector for academic affairs shall decide.
- (4) If there is no possibility of obtaining work experience in a business, a public institution, a non-profit organisation or a non-university research institution, the work

experience can also be carried out as part of an in-university project with the approval of the supervising professor.

- (5) Students are entitled to propose the field of their work experience or to select from a number of proposals.
- (6) The work experience is supervised and graded by a professor. Following the work experience, the experience obtained is to be presented as part of a course (8.2') and reviewed from an academic point of view in the Bachelor's thesis to which it is related. The Bachelor's thesis is to be submitted to the supervising professor. This should be done at the latest in the second semester after the work experience.
- (7) In addition, a confirmation issued by the business shall be submitted to the supervising professor. This should be done at the latest in the second semester following the work experience. The confirmation must contain the following details in German or in English: details about the person, details about the business (including location and department), work carried out and duration thereof, and an assessment of the activity.

Sec. 3 4 Electives

To round off and consolidate the degree course, students must attend electives for at least 18 ECTS. These can be chosen from all the courses offered at a recognised Austrian or foreign university.

Students are recommended to use the electives in order to expand their cross-curricular skills, in particular to consolidate their soft skills. The following fields are particularly recommended:

- (a) English communication and language skills
- (b) Feminist science / Gender studies: Gender and technology)
- (c) Interdisciplinary technology and science research
- (d) Basic principles of law
- (e) Team and management skills

In addition, the courses "Mathematics 0" and "Introduction to programming" can make the start of the degree course easier.

Sec. 3.5 Bachelor's theses

- (1) Two Bachelor's theses must be submitted:
 - One Bachelor's thesis is to be submitted as part of the seminar from the subject "Information technology specialist course" (6). This should have a theoretical and conceptual focus, i.e. it should deal with a topic in accordance with the state of the art.
 - A second Bachelor's thesis is to be submitted as part of the subject "Practical experience" in the course (8.1) or (8.2'). This thesis should have an application-based focus, i.e. it should document the course and results of the project.

- (2) Bachelor's theses are to be notified to the course leader before the start of the course, and their scope, content and form laid down. In terms of formal structure, they should have the form of an academic publication or a project report, depending on course title.

Sec. 4 Examination regulations and conclusion of the degree course

(1) Course examinations

During the degree course, course examinations are taken in parallel with the studies. They serve to determine the success of the student's participation in the course and as evidence that they have mastered the knowledge and methods communicated.

Course examinations for lectures (VO) are preferably taken in written form after the end of the course and cover the material of the course.

Courses (KU) are assessed by means of continual assessment or, additionally, by means of written and/or oral examinations, and on the basis of the results of practical activities. The examination mode is announced at the start of the course.

In Seminars (SE) and Introductory seminars (PS), written contributions (in particular the seminar papers and introductory seminar papers) and oral contributions (in particular presentations) by the students are taken as the assessment criteria.

In Lectures with Courses (VK), the examination mode is determined in accordance with the character of the course and the teaching objectives.

(2) Subject examination

At the end of the degree course, a subject examination is taken in the subject "Information technology specialist courses" in combination with the Bachelor's thesis submitted in this course. The subject examination is taken orally.

The student must pass the continuous assessment courses within the subject "Information technology specialist courses" before registering for the subject examination.

(3) Completion of the degree course

The Bachelor's Degree is completed by:

- A positive grade in all course examinations according to the Subjects (1) to (7) and (9),
- A positive grade in the subject "Practical experience" pursuant to (8),
- A positive grade in the two Bachelor theses pursuant to (10).
- A positive grade in the subject examination.

(4) Subject grades and overall assessment

For each of the subjects (1) to (10), a subject grade is calculated, to be determined according to the following procedure:

- i. The grade for each part-examination belonging to the subject is multiplied by the ECTS credits for the course in question,

- ii. the figures obtained by (i.) are added,
- iii. the result of the addition is divided by the total ECTS credits of the courses, and
- iv. the result of the division is if necessary rounded to the nearest whole figure, with results greater than .5 being rounded up.

The **assessment of the degree course as a whole** is calculated on the basis of the subject grades of the subjects (1) to (10) and the grade for the subject examination pursuant to Sec. 73 Para. 3 of the Universities Act 2002.

(5) Holding and repeating examinations

The holding and repeating of examinations is subject to the provisions of the Articles of the Alps-Adriatic University of Klagenfurt, Part B: Study Regulations, and of the Universities Act as amended from time to time.

Sec. 5 Academic title

The graduates of the Bachelor's Degree course are awarded the academic title of "Bachelor of Science" (abbreviated "B.Sc.").

Sec. 6 Entry into effect

This curriculum enters into effect on 1 October 2006.

Schedule: Example of a course of studies

Hours per week/semester

ECTS

This example of a course of studies illustrates a possible course of studies, and is not part of the curriculum.

Semester 1 (Winter)	22	30
Introduction to the study of information technology and current case studies	1	0.5
Electrical engineering and the physical basis of information technology	4	6
Introduction to Informatics	3	4.5
Analysis I	6	9
Introduction to structured and object-based programming	4	6
Elective 1	2	2
Elective 2	2	2
Semester 2 (Summer)	20	30
Analysis II	6	9
Linear algebra and geometry	6	9
Circuit technology	4	6
Microelectronics	4	6
Semester 3 (Winter)	20	29.5
Introduction to working, writing and presentations in the field of engineering science	1	1
Stochastics I	3	4.5
Designing digital circuits	4	6
Computer organisation	4	6
Signal presentation and transmission	4	6
Communication networks	4	6
Semester 4 (Summer)	21	31.5
Stochastics II	3	4.5
Digital signal processing	4	6
System theory and engineering	4	6
Measurement, sensor and control technology	4	6
Informatics and software development: Lecture with Course 1	4	6
Elective 3	2	3
Semester 5 (Winter)	8	30
Information technology specialist course: Lecture with Course 1	2	4
Information technology specialist course: Laboratory class	4	6
Practical experience: Team project		12
Elective 4	2	2
Bachelor's thesis (related to team project)		6
Semester 6 (Summer)	14	29
Information technology specialist course: Lecture with Course 2	2	4
Information technology specialist course: Seminar	2	4
Informatics and software development: Lecture with Course 2	4	6
Elective 5	4	6
Elective 6	2	3
Bachelor's thesis (related to Seminar)		6

Subject examination in the Subject "Information technology specialist course"