جامعة القدس
Al-Quds University

FACULTY FOR INFORMATION TECHNOLOGY

Student's Manual

Dual Studies in Information Technology (DSIT)

bj-5028/12

C O N T E N T S

1. Characterization of the Degree Program for Information Technology

The dual studies IT program combines academic learning with the direct application and expansion of knowledge in professional practice. Two partners, the AQU and the companies, take on the task of training qualified new recruits.

AQU DS graduates can look forward to promising professional and career opportunities in interesting specialist and management positions. The vast majority of graduates will already hold employment contracts before they have even finished their studies.

The DS Bachelor degree program at the AQU lasts for four years. Alternating between theoretical academic (50%) and practical phases in industry (50%) instils the study with diversity and variety. The graduates usually take on responsible, professional tasks when they are still young.

AQU DS IT students are at the same time employed by their respective companies and are paid a monthly wage. This provides the first stage in becoming financially independent.

1.1. Quality Assurance Procedures

The responsibility of quality assurance issues at Al-Quds University is in the hand of the Quality Assurance Unit (QAU). This department is responsible for:

- The ongoing review of academic processes and its quality assurance, i.e. in all faculties, libraries, labs, etc.,
- The ongoing review of administration and financial processes in order to reach an acceptable level of international standards,
- Monitoring all ongoing academic program outcomes through communicating with the ALUMNI unit,
- Cooperation with the Students' Affairs Department for reviewing the students' needs from their view.

All academic programs of Al-Quds University have to be submitted to the national accreditation authority AQAC in the Ministry of Education and Higher Education. In order to ensure a high international academic standard the evaluation team consists mostly of foreign professors. In the case of Dual Studies the documents were evaluated by a German accreditation team in Germany. The appointed accreditation team

consisted of German professors with a profound dual study background. The accreditation of the DSIT program is currently under review. The final accreditation award is expected for November 2015.

The performance of all AQU full- and part-time professors are evaluated by the students at the end of each semester and yearly by the responsible department and the faculy.

1.2. Degree

Upon successful completion of Dual Study program in this degree program, the following academic degree will be awarded:

Bachelor of Science (**B.Sc**.) **in Dual Study Information Technology (DSIT)**

2. Data related to the Degree Program *Information Technology*

2.1. Degree Programs on Offer

DSIT is a new program that focuses on integration between theory and practice. Thus, there is no directly related program at AQU or other institution's degree programs on offer.

2.2. Possible Specialisations within the Degree Program

There are no specialisations offered so far.

3. Rationale for the Degree Program in Information Technology

3.1. Justification of a Dual Studies Program

The Dual Studies program has been designed to satisfy the current and future market needs of the Palestinian IT sector by having highly qualified graduates. After 10 years of launching he Information Technology bache-

lor program, Al-Quds University (AQU) has decided to study the market in order to see where the current graduates are standing after graduation.

Many studies have shown that most Palestinian universities are lacking practical training of IT students and graduates. In addition to the education system in Palestine still depends on memorization and old-style teaching methods and lacks the practical application, therefore the opportunity for employment with a bachelor degree is very limited.

Al-Quds University had the idea, to incorporate more practical training into the university studies similar to the approach followed by several higher education institutions in Germany, such as the Cooperative State University Baden-Württemberg (Duale Hochschule Baden Württemberg - "DHBW"). The results of a study showed a strong interest of the private sector in this new effective style of study.

In the year 2015 AQU has established a dual study program under the roof of the Dual Studies College. A curriculum of a Bachelor of Science in Information Technology was developed in collaboration with a German Dual Studies expert and with Palestinian IT companies who agreed to become official partners of Dual Studies. AQU conducted a workshop with the IT partner companies and jointly developed a curriculum that corresponds to the needs of the Palestine market. Subsequently, the traditional IT bachelor program is suspended, starting academic year 2015/2016 as it would be a redundant program that is missing the value of integrated practical experience.

AQU positions itself as a leader in education to create an environment of innovation, economic growth and job creation. The main aim of the Dual Studies program is "More Job Opportunities for the Palestinian Youth". AQU directly contributes to the Palestinian authority employment strategy which is" Reversing the Perspective for Youth – from High Unemployment and Low Paid Jobs to a Qualitative Perspective with Career Possibilities" [1]

This problem-based learning, mentored by the industry partners result in an add-on compared to a standard study program. Social competences, generic skills and customer-oriented practice are some of the competences filling the gap between the needs of industry and the skills delivered by University.

Outcomes from dual study programs - sometimes called work- integrated learning programs - are generally positively confirmed and include improved professional attitudes in students, enhanced employment out-

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[1] National Employment Strategy, November 2010, Palestinian National Authority Ministry of Labour

comes for students, increased industry relevance, and savings in recruitment and training costs for them. Experience in Germany, Canada, US shows that approximately 85 % of the graduates remain within their training companies. The other great advantage is the low dropout rate of less than 20%, due to the high motivation of these students and the preselection by the company.

3.2. Demand among Prospective Students

In the first academic year almost 100 students applied for the newlt established DSIT programme.

3.3. Positioning of the Graduates on the Labour Market

The IT sector plays a vital role in the Palestinian economy and it is one of the fastest growing sectors. The growth of this sector has created a high demand for well skilled IT professionals. Today over 250 Palestinian companies serve the broad IT sector, demanding a great number of software developers for all application areas, IT system architects, network specialists and application oriented computer scientists.

Contacted IT companies have expressed their demand for skilled IT professionals and their willingness to cooperate in a Dual Study (DS) program by employing students. They expect that the new DS IT curriculum, in which theory and practice are linked, will close the existing gap in the traditional IT curriculum between theory and practice and consequently shorten the period of professional adjustment for graduates.

In a study by the Palestinian Information Technology Association of companies (PITA[2]), it is found that there is a significant gap between the Palestinian H.E. IT education system and the need of the IT market in Palestine.

The following findings can be cited:

- It is obvious that the IT sector in all areas of the Palestinian territories the IT sector grows.

- Most of the companies specialized in Information Technology are small ones or IT departments of larger companies and their business and market are carried out locally or regionally but all are linked with international networks.

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[2] Comparative Study: The Palestinian Education System vs. The Needs of the Private ICT Sector, Sept 2014, www.pita.ps

- The willingness and readiness of the private sector in the field IT is high for cooperating in Dual Studies and such improving the employment situation.

Computer scientists can work for example as:

- SW Application Developer
- Technical Manager for Companies in the IT sector
- Network Administrator
- System Programmer
- Security Service Specialist
- Sales manager for companies of IT
- IT System Designer and Analyzer
- Graphic and Multimedia Specialist
- Entrepreneur setting up his/her own IT related business

4. Concept and Objectives of the Degree Program in IT

4.1. Mission Statement

The mission of the Information Technology dual study program is the preparation of a distinct experienced generation of graduates through co-operation with private sector, who are characterized not only as creators and innovators in their specialization field, but also capable to prove themselves as unique computer scientists in a world of accelerated progress of technology and economics. They will be equipped with the necessary knowledge and appropriate skills for a decent place in the world of leadership of excellence and business, as well as to enable them to take the wheel of evolution, and to continue the march of advancement and prosperity in Palestine.

Most of the economy of a country depends directly or indirectly on the use of Information Technology systems. The availability and use of modern, reliable IT systems is vital for the private and public sector. To achieve this, the graduates of the Information Technology dual study program will play a key role and enable the growth of the Palestinian economy. Candidates are desired, who have clear goals and do not want to waste time,

want to quickly complete the study, and, at the same time, wish to have a practical training in a company.

4.2. Educational Objectives

The educational objectives of the IT dual study program are centred on the graduation of qualified computer scientists with solid foundations in all areas of computer sciences and information technology, who are characterized by the following features:

- The ability and creativity in solving problems, and dealing and coping with the pace of modern hard- and software technologies in the different areas of information technology.

- Demonstrate proficiency in the design, analysis, improvement and implementation of modern IT systems.

- Compete effectively in a world of fast technological changes, and to become leaders, businessmen and managers, innovators or teachers in a broad field of information technology.

- Work effectively in a professional environment, and show the necessary communication skills, leadership, and commitment to professional ethics.

- Pursue post-graduate studies and research in the disciplines of advanced topics and information technology as well as to become consultants in their respective fields.

- Work professionally bolstered by a technical background and solid scientific and adequate skills in the field of information technology, and the ability not only to design IT systems, but also to administrate these systems and solve IT-related problems.

- Adapt to different roles and responsibilities in a multicultural work environment through respect for diversity and professional within the organization and society at the national and international levels.

The proposed Dual Study IT (DSIT) program is a new approach of multi-disciplinary Information Technology program that covers the latest trends in the field of the use of Soft- and Hardware in computer sciences.

4.3. Profile of Study Offer

The IT Dual Study undergraduate program of AQU is designed as a combination of academic learning and professional experience during the four-year study. The Dual Studies IT combines academic learning with the direct application and expansion of knowledge in professional practice. A Dual Study student will spend an essential part of his study time (approximately 50%) in a training company and the rest at the University. Theoretical learning phases alternate approximately every three months with practical training phases in the home company of the student. The close links between theory and practice contributes significantly to the achievement of the qualification objectives.

The profile is from the academic side a broad, versatile and general study program in Information Technology. In Dual Study programs a specialisation is mainly implemented in the 6 specific, individual practice periods and finally by the graduation project. The student will be involved in professional projects related to the products and services of his company. According to the working area of the employer and the educational plan the student specialises by corresponding projects and he or she is individually and closely supervised by the tutor of the company and the University academic staff.

4.4. Credit Point System

This curriculum of a dual studies Bachelor degree (B.Sc.) in Information Technology (DS-IT) differs from the normal University Computer Science program (CS) at certain points. The degree "Duals Study IT" accentuates the application specific character of computer science, which is essential for the business oriented creation and operation of IT systems. Students are taught specific skills from the area of application, implementation and operation of IT systems in the business environment. Skills, which are necessary for creating and applying software systems for various areas. The mathematical foundations are also geared to the area of application.

However, such a program, as described here, also fulfills the standard national requirements for accreditation. Incorporating practical periods in the curriculum concludes in a reduction of the time for pure theory and at the same time an increase of the time for exercising and application of the knowledge.

Thus, the main difference of Dual Studies Information Technology with respect to normal studies is the method of delivering the skills and competences to the learner. Some of the skills and subjects are better learned

and exercised in a working environment others are better taught at the University. But both places have to undergo quality assurance processes, because credits are given only if quality and learner's success are assessed.

	Dual Study IT (DSIT)
Semesters per year	2
Duration per semester	24 weeks
Structure of each semester	12 weeks theory 12 weeks practice
Learner's workload/semester	1 credit hour = 48 hrs
Credit hrs Theory/year	25
Workload **Theory**/year	1200 hrs
Graduation project	10 credit hrs
Total Theory: (incl. graduation project)	**110 credit hrs**
Practice Period / year	24 weeks
Hours of **Practice /** year	1000-1152 hrs
Credit hrs / year	10 credit hrs
Total Practice Periods (Excl. graduation project)	**30 credit hrs**
Total Credits	**140 credit hrs**

In summary the credit points for the DS-IT amount to 140 credits for the whole degree course. Out of the 140 credits, 110 are achieved in academic phases at the University, 30 in the practical training in the company.

Hence the DS-IT is different from the normal track because another form of learning is used to transfer additional skills, knowledge and professional expertise.

Out of the 52 weeks of a year a student spends:

- 24 weeks at University (2x 12 weeks)

- 24 weeks in his company (2x 12 weeks)

- 4 weeks holidays (taken in the companies periods)

4.5. Intended Learning Outcomes (ILOs)

It is worth noting that the proposed DS-IT program is a multidisciplinary one and designed to be offered to students working within the dual study program in different IT fields such as software engineering, networks, IT-systems, IT security and multimedia and game development.

Students will be educated and trained in numerous specialization areas of the IT sector offered by the Dual Study Programs at Al-Quds University. This dual study program will enable students to know: How to develop software, how to set up networks and how to design and use information systems. What methods to apply to provide customers with IT problem solutions. How can IT companies guarantee reliability, security and safety of the IT networks and software applications. The ILO's of the Information Technology dual study program adhere to international accreditation standards. Thus, upon completion of this program, students will have:

- The ability to apply knowledge of mathematics, science, and computer sciences

- The ability to design IT solution, to analyse and interpret IT problems

- The ability to design a system, a component, or a process to meet desired IT needs

- The ability to function in multidisciplinary teams

- The ability to identify, formulate, and solve computer science problems

- An understanding of professional and ethical responsibility

- An ability to communicate to customers effectively

- The broad education necessary to understand the impact of computer science solutions in a global and societal context

- Recognition of the need for, and an ability to engage in life-long learning

- Knowledge of contemporary and actual professional issues

- An ability to use the techniques, skills, and modern IT tools necessary for computer science practice

- An ability to transfer and apply theoretical knowledge into practical applications

- A knowledge of the professional environment

- Well-developed social competences

- An enhancement to increase the work-readiness of IT graduates

- An ability to understand customer's problems and to suggest appropriate solutions

5. Curriculum, Structure of the Subjects on Offer

The following list shows all courses offered in Information Technology. The first 2 numbers (80) define the dual study program, the next 3 numbers (023) define the department Information Technology the next number defines the year of study (1,2,3,4) and the last two numbers are consecutive numbering of the courses.

Table #: Course numbers and corresponding credits

Course Number	Courses		
	Name	Credit hours	Year
8000101	University Requirement I	2	1
8000107	English Skills I	2	1
8010103	Mathematics I	3	1
8010101	Introduction to Computer	3	1
8010102	Fundamentals of Programming	3	1
8000108	English skills II	2	1
8010104	Mathematics II	3	1
8013108	Introduction to Networks	2	1
8015109	Software Engineering	3	1
8010110	Basics of Business Administration	2	1
8000102	University Requirement II	2	2
8000109	English skills III	2	2
8010203	Data Structure & Algorithm I	3	2
8010204	Information Systems	2	2
8010205	Object Oriented Programming	3	2
8010206	Introduction. to Research Methods	1	2
8010207	Computer Architecture & Organization	2	2
8011208	Data Structure & Algorithm II	3	2
8010209	Statistics and Probability	2	2
8011210	Operating Systems I	3	2
8012211	Project management	2	2
8000301	German I	2	3
8012302	Human Computer Interface	3	3
8010303	Database I	3	3
8014304	Mobile and Web Development	3	3
8012305	Information Ethics	2	3
8010306	Compiler Design and Language Processing	3	3
8011307	Database II	2	3
8014308	Computer Graphics and Image Processing	3	3
8000103	University Requirement III	2	3
8000310	German II	2	3
8010401	Special Topics I	2	4
8012402	Knowledge Systems	3	4
8012403	SW Quality Control	3	4
8000404	German III	2	4
8011491	Project Study I	3	4
8010406	Special Topics II	3	4
8011407	Parallel & Distributed Computing	3	4
801XXXX[3]	Elective	3	4
8011492	Project Study II	3	4
8011190	Practice I	10	1
9011290	Practice II	10	2
8011390	Practice III	10	3
8011490	Practice IV - Graduation Project -	10	4

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[3] Any level 2 (2xx) course from the "Elective" courses list below.

5.1. Course Content

8000101   University Requirements I (Jerusalem through history)   (2 credits)

This course offers historical accords of Jerusalem and discusses the important historical phases that Jerusalem has gone through. It starts with the era of establishing the city until recent times, focusing on the process fn the political, economic, and social circumstances in each era.

8000107   English Skills   (2 credits)

This course aims to promote English language proficiency at undergraduate level. It focuses on core language skills such as listening, speaking, reading and writing by using traditional texts and interactive content.

8010103   Mathematics I   (3 credits)

System of linear equations and elementary row operations, linear transformations and matrix representation, vectors in plane and polar functions: vectors, polar coordinates and graphs- Introduction of complex numbers, operations and functions.
Derivates: the derivate as a function and as a rate of change, derivate of products, quotients and negative powers, derivates of trigonometric functions , the chain rule, implicit differentiation and related rates.

8010101   Introduction to Computer Science   (3 credits)

The course provides a comprehensive introduction to computers and computer science as a problem solving discipline. Topics covered in the course are: technical representation of information, digital number systems, basic architecture of processors components of a computer system, connections and peripheral devices, memory hierarchy (cache, virtual memory), processing of instructions in a simple processor (data path, control), role and basics of operating systems, problem solving, programming languages basic structures of data processing systems

8010102   Fundamentals of Programming   (3 credits)

The course is a supplement of Introduction to Computer Science course with focus on software, algorithmic problem solving and fundamentals of programming. The course communicates the basic principles of programming as well as elementary abstraction mechanisms of software development. The students learn to write small software modules, hence it includes a substantial part of lab work using computers.

Overview of software development and its importance, technical and formal basics of programming, basic linguistic aspects (syntax and semantics of programming languages).

Introduction to programming (value, elementary data types, function, variable, condition, control structures, statement, procedure)

8000108   English Skills II   (2 credits)

The aim of this course is to enhance student's communications skills. After having the necessary English skills in the previous course, students will focus on writing essays, delivering speeches, and presenting their work.

8010104   Mathematics II   (3 credits)

Infinite series: limit of sequence of numbers subsequences and bounded sequences, infinite series, test for convergence, alternating series, absolute and conditional convergence, trigonometry, 3D system, algorithm of numerical mathematics, logics.

8013108   Introduction to Networks   (2 credits)

This course covers topics around principles, design, implementation, and performance of computer networks, Internet protocols and routing, local area networks, TCP, performance analysis, congestion control, switching and routing, mobile IP, peer-to-peer overlay networks, network security, and other current research topics.

8015109   Software Engineering   (3 credits)

This course introduces software engineering as a discipline, discusses stages of the software life cycle, compares development models such as waterfall, agile development, v-model, prototyping and incremental/iterative, covers requirements analysis, effort and cost estimation, compares structured and object-oriented analysis and design methods.

8010110   Basics of Business Administration   (2 credits)

Important business terms (costs, revenue, profit, return of investment), factors of location decisions, purchasing, production, basics of marketing; management structures and decisions.

8000102   University Requirement II (Nature of Palestine)   (2 credits)

This course provides a basic introduction to the geography and demographics of Palestine. It present Palestine's geographical areas, before

focusing on the demographic changes Palestine has went through its history.

8000109   English Skills III   **(2 credits)**

Building on English Skills II, this course will focus on research techniques, documentation styles, and argumentative strategies. In this course we will screen documentaries, read newspaper articles, scholarly essays, short stories, and conduct formal interviews in order to thoroughly investigate, evaluate, and analyse selected topics. It also focuses on critical analysis of text, advanced composition writing, and class presentations demonstrating an excellent grasp of the art of persuasion. Based on the information gathered from different sources students will submit proposals for projects relevant to social and cultural issues. In a polarized society people often take positions on social, cultural, and moral issues without hearing all sides what to speak of studying and exhausting the available sources of information.

8010203   Data Structure & Algorithm I   **(3 credits)**

This course introduces basic algorithms design and asymptotic analysis of algorithms complexity followed by introduction of Elementary data structures and their operations mainly Lists, Linked lists, Stacks, Queues, Sequences, and trees. This is a heavy programming course in lab.

8010204   Information Systems   **(3 credits)**

This course introduces students to information systems, distinguishing the different types of information systems, systems analysis and design, data analysis and management, surveying information/systems technology for the management of enterprise information. Information systems are strongly database-oriented applications, often having very many users (thousands and more). They are transaction-processing systems, i.e., they perform their services in many little steps for the concurrently accessing users. At the same time, they must guarantee data integrity and accomplish high throughput together with short response times. Nowadays, information systems typically run in-memory on a powerful server and are client/server systems which provide graphical user interfaces, increasingly also via the Internet.

8010205   Object Oriented Programming   **(3 credits)**

This course teaches practical aspects of designing, implementing, and debugging object-oriented software. Topics covered include reusing design patterns and software architectures and developing, documenting, and testing representative applications using object-oriented frameworks and

Java. Design and implementation based on design patterns and frameworks are the central themes to enable the construction of reusable, extensible, efficient, and maintainable software. Heavy lab work related to the course

8010206   Introduction to Research Methods   (1 credit)

The course will introduce to the principal research methods applicable to Computer Science and Information Systems: case studies, surveys and qualitative and quantitative methods. This is a first base for the student's reports written during the practice periods.

8010207   Computer Architecture and Organization   (2 credits)

Computer organization includes examining the hardware of a computer and figuring out how it works. Computer functions, Central Processing Unit Organization, Bus interconnection, Cache memory, internal memory, External memory, Input Output, BIOS, PC and mobile devices like tablets

8011208   Data Structure& Algorithm II   (3 credits)

This course is continuation of Data Structures & Algorithms I. Sorting, searching algorithms, Dictionaries, Heaps, and graph theory. The course focuses on design of data structures and relevant common algorithms and their complexity analysis. Brute Force, Dynamic programming, Divide and conquer, decrease and conquer, and greedy algorithms design techniques and strategies are introduced.

8010209   Statistics and Probability   (2 credits)

The course teaches statistical inference and introduction to experimental design.

It covers the fundamental concepts of statistical methods and probability, and focuses on the aspects that are specific to Computer Science and Information Systems applications, like blending of algorithms and statistics, many variables, short response time and high degree of automation, queuing theory, randomized algorithms, game theory, transmission of information, distribution functions (continuous and discrete), linear and non linear regression,

8011210   Operating Systems I   (3 credits)

The course will introduce the basic concepts, design and implementation of modern operating systems for PC and mobile systems. Topics to be covered include, operating system structures, process management, memory management, file systems, input/output systems. Concurrent

programming and primitives will be covered with hands on using UNIX, windows and Android based systems. Comparative study between various modern operating systems will be conducted

8012211 Project Management (2 credits)

Project Management concepts, lifecycle of a project, project team, planning, scheduling, controlling and monitoring, resource allocation, and performance measurement, Computer assisted systems.

8000301 German I (2 credits)

This is an introductory course that aims to provide students with the ability to understand, speak, read and write simple German. Primary goals are to introduce beginning students to basic structures of the German language by developing vocabulary and a command of idiomatic expressions; to familiarize students with sentence structure through written exercises and short compositions; to give students a basic foundation in German history and culture; and to interest students in traveling to German-speaking countries

8012302 Human Computer Interface (3 credits)

HCI draws on a variety of disciplinary traditions, including psychology, ergonomics, computer science, graphic and product design, anthropology and engineering.

This course is concerned with designing interactions between human activities and the computational systems (also mobile systems) that support them, with constructing interfaces to afford those interactions, and with the study of major phenomena surrounding them.

The emphasis of the course is on practical understanding, application and evaluation of HCI concepts and methods.

8010303 Database I (3 credits)

This course discusses the state of practice in modern database systems, with an emphasis on relational systems. Students gain hands-on experience with commercial database systems and interface building tools. In the lab programming projects are required. Topics include database concepts, database design, modeling, relational model, relational algebra, query language SQL, storage and file structures, query processing,

8014304   Mobile &Web Development   (3 credits)

In this course students are introduced to web and mobile applications development frameworks and tools and best practices of web and mobile software engineering. All development life cycles related to web and mobile applications is covered and students work on projects to have good exposure to activities that enhance their web and mobile development skills.

8012305   Information Ethics   (2 credits)

In this lecture, the relationship between computer science and society is discussed. For example: what are socio-technical systems and how you can model them? How behave people online and offline? Which legal or moral issues may arise from IT systems? Which business models are available in web-based systems?

8010306   Compiler Design and Language Processor   (3 credits)

Students get knowledge and skills for the systematic construction of compilers and other language-processing tool (e.g. programming environments, XML-processors) and deepen their understanding of programming and languages. Context free analyses: parsing, parser generation, design and use of abstract syntax, processing of XML documents, compilation techniques for procedural and object-oriented languages, intermediate languages for compilation, semantical aspects and optimization techniques, code generation

8011307   Database II   (2 credits)

An advanced course in database systems and a continuation and deepening of database I. The   management of very large, distributed database systems based on relational model and nonrelational (NoSQL) systems are studied. Topics include data modeling, normalization Theory, transaction management, distributed databases, and object-oriented databases, in- memory systems. GPU for analyzing.

8014308   Computer Graphics and Image Processing   (3 credits)

An introduction to the principles, algorithms, and devices (GPU) for display of images. Interactive graphic techniques are also covered including: Vector, char, and curve generations, in addition to applications and transformation in 2D and 3D. Practical techniques for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.

8000103   University Requirement III (Language and Logic)   (2 Credits)

This course introduces foundations of languages and the logical built of their structure. It discusses issues such as language as a set of cognitive abilities, humans and acquiring of a language, realization of linguistic abilities in the brain, structure and content of human thoughts and their representation within a language.

8000310   German II   (2 credits)

This course emphasizes on conversation skills and aims to enable students to effectively communicate with German speaking people. It focuses on interactive teaching materials.

8010410   Special Topic I   (2 credits)

In the 3rd study year it will be decided about the contents of this course. The course shall give the opportunity to deal with a theme, which has in the meantime (since start of study 3 years ago) become important in the field of Information Technology. Information Technology is such a dynamic area with very short product cycles and always new services, those actual unpredictable trends should be discussed.

8012402   Knowledge base System   (3 credits)

Topics include Knowledge, Knowledge representation, formal logic, database programming, And recursive programming. Topics will include knowledge base Construction, inference engines, reasoning from incomplete or uncertain information and user Interfaces. data mining: students know the most important methods in Data Mining and they are able to use them in practice.

Clustering, anomaly/outlier detection, classification and pattern recognition, regression techniques

8012403   SW Quality Control   (3 credits)

This course allows students to have good understanding of issues and techniques related to software testing and quality assurance. Topics covered include test planning, test   design, coverage analysis, complexity, levels of testing (such as unit, integration, system, performance and stress testing) methodologies of testing, verification and validation, quality assurance processes and techniques and software quality metrics.

8000404   German III **(2 credits)**

This course aims to expand students' German linguistic skills as well as cultural knowledge, with a major emphasis on developing reading strategies and using the language to express ideas. By the end of the course students should be able to understand a range of authentic text types and increase their ability to communicate thoughts in German, both orally and in writing.

8011491   Project Study I **(3 credits)**

In the study project, which runs over one semester, the student will be assigned a specialized IT problem of limited scope under the supervision of a faculty member. The problem definitions spans from gathering all pertinent information and data through studying, analyzing and recording the problem. This study project must be done at Al-Quds University and may be a design project, an analytical paper or an experimental work in Hard- or Software. The project should be related to the state-of-art in IT and to one of the passed courses. The associated work is an individual effort that demands initiative, creativity and individual responsibility. The project allows the staff to do research or realize internal projects, where they are supported by students' projects.

At the end of the project, the result of the student's findings must be provided in form of a report, and an additional system demo and/or an oral examination.

8010406   Special Topic II **(3 credits)**

In the 3rd study year it will be decided about the contents of this course. The course shall give the opportunity to deal with a theme, which has in the meantime (since start of study 3 years ago) become important in the field of Information Technology. Information Technology is such a dynamic area with very short product cycles and always new services, that actual unpredictable trends should be discussed.

8011407   Parallel and Distributed computing **(3 credits)**

An introduction to concurrent and parallel programming, with an emphasis on language constructs. Major topics include: exceptions, coroutines, atomic operations, critical sections, mutual exclusion, semaphores, high-level concurrency, deadlock, interprocess communication, process structuring, shared memory and distributed architectures. Students will learn how to structure, implement and debug concurrent programs

801X2XX   Elective   **(3 credits)**

Course descriptions of elective courses are presented further below.

8011492   Project Study II   **(3 credits)**

In the study project, the student will be assigned a second specialized IT problem of limited scope under the supervision of a faculty member. The 2nd problem should be from another area as the first study project. One of the cooperating companies can also initiate the problem, but then it should be from general interest and open for publication. This study project must also be done at Al-Quds University and may be a design project, an analytical paper or an experimental work in Hard- or Software. The associated work is an individual effort that demands initiative, creativity and individual responsibility. The project allows the University staff to do research or realize internal projects, where they are supported by students' projects.

At the end of the project, the result of the student's findings must be provided in form of a report, and an additional system demo and/or an oral examination.

University requirements:

8000101   Jerusalem through history   **2 credits**

8000102   Nature and Environment of Palestine   **2 credits**

8000103   Logic and language   **2 credits**

5.2. Elective Courses

8011450   Automata Theory   **(3 credits)**

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine

8015451   Secure Software Development   **(3 credits)**

The goal of the secure software development course is to provide the theory and practice of software security, focusing on common software security risks, and identification of potential threats and vulnerabilities at the early stage of the software development life cycle. It integrates software security risks analysis and management throughout the software development life cycle.

8014260   Serious Gaming Fundamentals   **(3 credits)**

This course provides an introduction to the area of serious games covering the questions such as: why users prefer some games to others, why people play games, how the game players interact with each other in a gaming environment, what cognitive processes happen during/within game playing. Besides introduction, examples and motivation for serious games, the course offers a deep presentation of gaming tools such as rewards, storyboards, design approaches, social and cognitive factors. Moreover, the methods for targeting certain player behavior are thoroughly explained. Finally, the course emphasizes existing limitations, and risks of the presented methods and outlines the challenges related to game design and production processes.

PRACTICE Courses

General Objectives of Practice Periods in Dual Study Information Technology

The frame education plan defines which central contents are taught in practice and thus specifies the contents of the practical modules of the study area electrical engineering.

The aim of in-company training should it be in addition to the appropriation of skills and knowledge to develop the students' experience world "company operation" in its entirety.

This will be achieved through active participation, through the acquisition of personal responsibility and integration into working groups so that technical, methodological and social skills are acquired. This form of learning helps to promote personal development.

This way students are enabled to methodically structured collaboration on complex tasks and constructive participation in different working groups and organizations.

In the practical phase, students link their acquired knowledge from the theory phase with the practical activity in their company. According to a planning drawn up by the company a "practice plan" is set up. It has to be regarded that not for each theory module will be an equivalent activity in the company, i.e. courses and work in company have not to fit 1:1. This is obvious for example in math but also in other subjects. The practice schedule should be adapted in time and content to the specificities of the company and take into account the individual level of knowledge of students. Adjustments of the plan according to the priorities and needs of the company are possible.

The following extra-curricular qualifications and learning outcomes must be promoted throughout the course:

- Communication and cooperation skills, teamwork

- Problem-solving ability and creativity

- Reporting and documentation creation

- Learning, working and presentation techniques

The practical period should therefore be designed not only for deepening the professional experience but also for developing the important broad spectrum of non-professional soft qualifications and competences. Industry and the labor market claim that there is a broad gap and lack of competences from regular graduates. Such the Dual Study model aims to improve the employment conditions for graduates by having them incorporated for almost 4 years already in the IT work environment.

8011190   Practice Period I - 1st year   **(10 credits)**

In the first year, the basics of computer science will be taught. They enable students to understand the function of computer systems and to use them as tools. In addition, multidisciplinary basic knowledge is taught and skills are built up for personal development.

In the practical phases of the first year the IT student get to know the organization and area of business of their company. The students have learnt in theory to understand the basic expiries of IT processes of development and service aspects just as the economic connections and will apply this in this period under intensive monitoring. In addition to the understanding of the workflow processes, out of the knowledge and skills acquired in the theory modules, they will be applied and deepened through little practical tasks.

In the company students are part of a team and gain insight into the business processes. The student has to write a practice report and to submit it.

Examples of areas the student might focus in their mentor companies:

1. General computer science knowledge
   - Hard- and SW Components of Computers/Workstation/network
   - Internet and Internet-services (WWW, FTP,…)
   - Networks Technology (WAN, LAN, Topologies)
   - Data back-up, file management
   - Programming – any high level language
   - SW-Engineering - smaller parts for a project
   - Use of operational systems (Windows, Linux, Android, iOS,…)
   - Applications of mobile IT systems

2. Introduction to computer operation and use:
   - Phases of SW engineering in the business environment
   - Importance and basics of IT security

3. Structure and organization of the training company
   - Organization
   - teamwork
   - project management and control
   - documentation
   - English

8011290   Practice Period II - 2nd year   **(10 credits)**

In the second year of theory the software components of computer systems and the development and application of IT systems are in the foreground. Furthermore, the soft skills are further developed.

The practical phases of the second year are typically characterized by use in projects in which the students already perceive small, independent tasks. Ideally, the knowledge of the theory phases are immersed in at least one or two of the module topics. A personal project of the practical phase shall be documented as a practical report and be provided as a presentation for discussion.

Examples:

- Internet-services (WWW, FTP,…)
- IT Security, Malware - recognize and fight
- Networks (WAN, LAN, Topologies)
- Programming (Java, C++, HTML, XML,…)
- Boot
- shell scripts
- SW-Engineering
- Operational systems server systems, Kernel
- mobile systems OS
- single, multiuser systems
- SW- Quality process

Additional skills:

- Cost and budgets
- time management
- product quality
- production
- English

8011390   Practice Period III - 3rd year   **(10 credits)**

The third year will take care of the professionalization of students. It will deepen existing knowledge and topics and at the same time expanded the

horizon by the treatment of specific methods and research-related technologies. They can specialize in this year towards their future professional focus, normally in line with the demand of their employer. The students become in this year already valuable, esteemed staff members in their companies, taking over responsibility for limited tasks. They are integrated in teams and are socialized within the company. In addition to acquiring technical and methodological skills they learn entrepreneurial standards and rules for successful cooperation and communication. The students are accustomed to work under supervision on their own and to deliver their problem solutions in time.

Examples

- Android, iOS systems
- Database Applications
- Datawarehouse and Data Mining
- Distributed storage and processing system for large data base (like Hadoop)
- NoSQL Database
- IT Security
- Application Programming
- System Programming
- Network design and administration
- Cloud and distributed systems set-up

Additional skills:

- Cost and budgets
- time management
- project management
- Business skills

8011490   Practice Period IV - 4th year   (10 credits)

Graduation Project

The last year will take care of the professionalization of students. Theory and practice have to match and the student shows being capable of solving market related problems. The graduation project demonstrates the

student's ability to deal and solve practice-related problems from the respective field by using practical and scientific knowledge and methods.

The graduation project is a specific, well-described task out of the company. The students have to apply their acquired complex theoretical knowledge and practical experiences to solve this task by a scientific and systematic approach.

The project will be monitored and assessed by 2 counsellors:

- a lecturer from the university and
- a qualified supervisor from the company

Competences and Skills proven by the graduation project

(Extended Intended Learning Outcomes)

Knowledge and Understanding

- The student demonstrates in an autonomous work that he/she can work out or to develop solutions for complex technical problems in IT by applying scientific methods.
- The student understands the scientific basis of IT and has demonstrated that he/she can deepen and apply it.
- The student knows the current state of research in his/her specific project area.
- The student writes the project report according to the rules of scientific work.
- The student can create a project plan for monitoring and tracking of the project.

Cognitive/Intellectual/social skills

- The student has analyzed the problems and evaluated alternative solutions.
- The student can expand his knowledge and interpret current knowledge.
- He can formulate subject-specific solutions and can communicate to customers and colleagues.
- As a team member, he/she takes over responsibility for a task.

5.3. Course Distribution

1st Year of Study		Credits			
Total credits per year	!C17 Is Not In Table	**Semester 1**		**Semester 2**	
Course	**Course Code**	**Theory**	**Practice**	**Theory**	**Practice**
University Requirement I	8000101	2			
English Skills I	8000107	2			
Mathematics I	8010103	3			
Introduction to Computer	8010101	3			
Fundamentals of Programming	8010102	3			
English Skills II	8000108			2	
Mathematics II	8010104			3	
Introduction to Networks	8013108			2	
Software Engineering	8015109			3	
Basics of Business Administration	8010110			2	
Practical Period I	8011190		5		5
Total		**13**	**5**	**12**	**5**

2nd Year of Study		Credits			
Total credits per year	10	**Semester 3**		**Semester 4**	
Course	**Course Code**	**Theory**	**Practice**	**Theory**	**Practice**
University Requirements II	8000102	2			
English Skills III	8000109	2			
Data Structure and Algorithms I	8010203	3			
Information Systems	8010204	2			
Object Oriented Programming	8010205	3			
Introduction to Research Methods	8010206	1			
Computer Arch. & Organization	8010207			2	
Data Structure and Algorithms II	8011208			3	

Course	Course Code	Theory	Practice	Theory	Practice
Statistics and Probability	8010209			2	
Operating Systems I	8011210			3	
Project Management	8012211			2	
Practical Period II	8011290		5		5
Total		**13**	**5**	**12**	**5**

3rd Year of Study		Credits			
Total credits per year	**35**	**Semester 5**		**Semester 6**	
Course	**Course Code**	**Theory**	**Practice**	**Theory**	**Practice**
German I	8000301	2			
Human Computer Interface	8012302	3			
Database I	8010303	3			
Mobile and Web Development	8014304	3			
Information Ethics	8012305	2			
Compiler Design and Language Processors	8010306			3	
Database II	8011307			2	
Computer Graphics and Image procession	8014308			3	
University Requirement III	8000103			2	
German II	8000310			2	
Practical Period III	8011390		5		5
Total		**13**	**5**	**12**	**5**

4th Year of Study		Credits			
Total credits per year	**0**	**Semester 7**		**Semester 8**	
Course	**Course Code**	**Theory**	**Practice**	**Theory**	**Practice**
Special Topics I	8010401	2			
Knowledge Systems	8012402	3			
Software Quality Control	8012403	3			
German III	8000404	2			
Project Study I	8011491	3			
Special Topics II	8010406			3	

Parallel & Distributed Computing	8011407			3	
Elective	801XXXX			3	
Project Study II	8011492			3	
Practical P. IV (graduation project)	8011490		5		5
Total		**13**	**5**	**12**	**5**

5.4. Examination Regulations

With regards to official assessment methods, the Dual Studies program follows assessment policies and procedures of Al-Quds University for the theoretical part as follows:

1. Grading: 0-100 scale is adopted as the grading scale across all courses
2. A student passes a course if he/she scores 60% or more
3. Grading within a course is usually divided as follows:
   a. First Hour Exam 15-30%
   b. Second Hour Exam 15-30%
   c. Project/assignments 20-40%
   d. Final Exam 30-40%
4. Depending on the nature of the course, the course instructor can adapt items a, b, c in point 3 to serve the course goals. (for example, he/she might have a mid-term exam and put more emphasis on project(s), assignments)
5. Minimum grade for the final exam is 30%.
6. If a course requires lab sessions, part of the project/assignments grade is allocated for the lab sessions.
7. Students will pass the lab if he/she passes the course regardless of his/her lab grade. If a student's fails the course and passes the lab, he/she is required to retake the course without retaking lab sessions.
8. A student should score a GPA 65% or higher for a status of Normal students
9. An Honor-listed student must score 85% or more in all subjects per semester
10. A student with GPA lower than 65% will be placed on probation and will be allowed to register a maximum of 6 credit hours
11. If a student's GPA is lower than 65% for the third time, he/she is dismissed from the program

As for the practical period, both partner companies and the Dual Studies faculty assess students' performance as follow:

1. Students register a course (Practice Period I – VIII) that is compliant with the 0-100 grading scale mentioned above
2. Upon conclusion of a practical period, students submit a report detailing all activities performed at the work place
3. Partner companies also submit an evaluation form that assesses student's performance (Annex 3)
4. Students make a presentation to the Dual Studies faculty and discussion of the report and evaluation form is initiated.
5. Final grade is distributed as follows:
   a. Student's report 30%
   b. Evaluation form 50%
   c. Presentation 20%
6. Pass grade for a practical period is 70%
7. If a student fails a practical period, he/she should retake it in the next available practical period. Delays are not permitted as each practical period is a prerequisite for the next one.

Absentees and withdrawal:

A. Theoretical Period
   1. Students must attend classes
   2. If a student skips 20% of classes he/she is considered withdrawn from the course
   3. If a student skips 30% of classes he/she automatically fails the course
   4. Cases with acceptable excuses (i.e. sick leaves) are excluded
   5. Students can normally withdraw a course in the first week of the semester. They will be able to retain course fees and add another course if they like
   6. Late withdrawals are permitted before the second hour exam. Students will lose the course fees and will not be able to add a replacement course

B. Practical Period
   1. Students should adhere to company's policies and regulations regarding showing up to work
   2. Company can take whatever measure it sees fit in order to encourage students to adhere to company's policies and regulations
   3. Attendance is an item that companies assess students in the evaluation form, mentioned above
   4. Students cannot withdraw from a practical period unless for emergency situation (i.e. long-term illness, political unrest/violence/inability to reach workplace, etc.)