



Philadelphia University
Faculty of Information Technology
Department of Computer Science

Student
Handbook
(MSc)

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This handbook contains important general information for students undertaking a Postgraduate Degree program in the Department of Computer Science. This handbook is also available on the web. Your degree program is subject to regulations contained in the **University Students' Guide**. This departmental handbook interprets the regulations and your tutors may give advice, but the University Students Guide defines the regulations.

I. Introduction

Recent steps taken by the Philadelphia University to restructure the IT education has been widely welcomed. In order to enhance the thrust in this direction further, the need for introducing graduate and research programmes have been overstressed. As an effort to strengthen the teaching and research of Computer Science and Information & Communication Technologies, the following masters level specialized degree programme has been proposed in the frontier and emerging areas of IT.

The proposed areas of specialization are expected to meet the growing manpower needs of IT specialists in the Arab Regions in particular in addition to meet the needs of IT specialists forecasted by the Jordan Government to boost IT export in the coming years.

The Computer Science Department started the MSc programme in September 2005. The programme was accredited by the Jordanian Higher Education Accreditation Council (JHEAC) in August 2006.

The administrative responsibilities of the M.Sc. programmes at the University level are the task of the Deanship of Scientific Research and Postgraduate Studies. The Departments that offer the programmes are responsible for the actual implementation of the programmes through their respective faculties.

II. Aims, Vision, Message, Goal, Value, and Objectives

Aims:

This programme aims to produce postgraduates in Information Technology with specialized knowledge in order to make them competent specialists, besides their capabilities to opt for **R&D** career in the area of Information and Communication Technologies, the programme aims to achieve the following:

- Support the local, regional and international markets with well qualified graduates in Computer Science and Information Technology.
- Encourage the scientific research through supervising master theses, and research project for the postgraduate students.
- Increase the opportunities for students to continue their postgraduate studies in Jordan.
- Cover the increasingly urgent needs of educators and researchers in the field of Computer Science.
- Increase the quality and the standards of education at the Department of Computer Science by enhancing the scientific background for both faculty members and students.
- Participate in the growth of the local community and to cooperate with industrial and commerce sectors in mutually beneficial scientific and development projects.

Vision:

To be one of the distinguished departments of Computer Science in teaching, learning, scientific research, and community service according to international standards to achieve the desired growth and development.

Mission:

The mission of the Computer Science Department is derived from the mission of the Faculty of Information Technology and the university, where the department strives to:

- Provide the best education in undergraduate and graduate programs by relying on the latest developments in an excellent learning environment.
- Focus on the theoretical and applied aspects in the field of Computer Science.
- Conduct research at the local and international levels through its staff and students.
- Support the community through encouraging and sharing technology transfer.

Goals:

The department reaches a prominent position locally, regionally and internationally and the research activities are supportive of the growing technological development.

Values:

Justice: Dealing with equity with all and respecting the value, dignity, and freedom of the individual.

Transparency: Dealing clearly in all university operations with students, faculty, and the staff.

Integrity: Full adherence to professional ethics and ethics within a framework of trust, honesty, and sincerity.

Belongingness: A sense of responsibility towards the university, society and the nation.

Collaboration: Teamwork among university staff in all its operations as well as with students.

Creativity: Assimilation, encouragement, and sponsorship of ideas and innovative solutions in the fields of teaching, learning and scientific research.

Professionalism: Ability to demonstrate knowledge, skill, and competence in the specialization.

III. Scope and Input Resources

1. Program Objectives

Program Objective #1 (PO1): Students will be able to demonstrate a broad knowledge of Computer Science which includes data structures, operating systems, computer programming skills, computer organization, algorithm design, and automata theory.

Program Objective #2 (PO2): Students will gain a substantial knowledge of one of the following Computer Science specialties: Database, Networking, Artificial Intelligence, Information Security, and Software Engineering.

Program Objective #3 (PO3): Students will demonstrate the ability to recognize, design and implement efficient software solutions to problems.

Program Objective #4 (PO4): Students will demonstrate knowledge and understanding of professional ethics and responsible behaviour.

Program Objective #5 (PO5): Students will demonstrate the ability to communicate effectively and to work as a team.

Program Objective #6 (PO6): Students will become successful professionals able to gain Employment and/or to be accepted into a Computer Science Ph.D. program.

2. Learning Outcomes

Learning outcomes describe what you should know and be able to do if you make full use of the opportunities for learning that we provide. All these skills are described in the following areas (A, B, C, and D). In the individual module syllabi, the categories of learning outcomes (A, B, C, and D) and the individual learning outcomes appropriate to the module are identified.





A-Knowledge & Understanding

Students will be able to:

- A1)** Acquire knowledge of a range of advanced topics in Computer Science beyond undergraduate level and at the forefront of research.
- A2)** Have knowledge & understanding of research methodology & practice.
- A3)** Understand, apply and develop leading-edge technologies.

B. Intellectual Skills

Students will be able to:

- B1)** Develop and evaluate original ideas in a research context.
- B2)** Perform problem-solving in academic and industrial environments.
- B3)** Develop original ideas in a research context (synthesis).

C. Practical Skills

Students will be able to:

- C1)** Develop applications to satisfy given requirements.
- C2)** Organize & pursue a scientific or industrial research project.
- C3)** Use, manipulate and develop large computational systems.
- C4)** Perform independent information acquisition and management.

D. Transferable Skills and Personal Qualities

Students will be able to:

- D1)** Work and communicate effectively as a team member.
- D2)** Prepare and present seminars to a professional standard.
- D3)** Understand ethical issues related to professional activities.
- D4)** Write theses and reports to a professional standard.
- D5)** Perform independent and efficient time-management.

3. Staff

A. Academic Staff

• Qualifications

The academic staff members are divided into two categories: full-time and part-time. The number of full-time staff members is 4, while the number of part-time staff depends upon the number of students and the needs of the Department. According to the accreditation requirements, the Department provides 2 fulltime professors and 2 fulltime associate professors for the purpose of this programme. For some specialized topics within the programme, the Department asks for assistance from other staff members in the Faculty of IT or from outside. The academic staff members, who are between 30 and 66 years of age, have relatively adequate experience ranging from 5 years to 30 years.

• **Specialisations**

Full-time as well as part-time teaching staff members have various specialisations that cover all the MSc programme. At present, there are several research teams at the Faculty of IT, made up of staff members as well as MSc students.

B. Non-Academic Staff

Besides the academic staff, the Department has 3 other full time members, all of them hold a B.Sc. degree in Computer Science. Those staff members have 3 to 7 years working experience and some of them have been appointed from Philadelphia University graduates who hold bachelor degrees with a grade of “Excellent” or “Very Good”.

All of the non-academic staff members are qualified as laboratory tutors and assist lecturers in the laboratory hours. In addition, some of them are responsible for maintenance of computer hardware and software in the laboratories.

4. Departmental Learning Resources

• **Code of Practice for Student Computer Usage**

At registration, you will be required to assent to the following departmental code of behavior, which relates to the responsible use of Computer equipment. Misuse of the facilities is regarded as serious disciplinary offence.

This code of practice is supplementary to University regulations concerning the use of computing equipment to which you are required to assent at Registration.

1. Every student is allocated one PC in every laboratory session. But for UNIX laboratory, you have been allocated one or more usernames for your own personal use: you must not use other usernames or permit other people to use your username. You must not use computers to which you have not been granted access, or attempt to access information to which you have not been granted access.
2. You must not deliberately hinder or annoy other computer users.
3. You must not use machines belonging to the Department for commercial purposes without the prior written permission of the Head of Department. You must not sell the results of any work you do using Departmental facilities without the prior written permission of the Head of Department.
4. You must not write or knowingly store, on machines belonging to the Department, software that, if executed, could hinder or annoy other users, except with the prior written permission of the Head of Department.
5. You must not make an unauthorized copy, in any form, of copyright software or data.
6. You must not store personal information, except in a manner permitted by the Data Protection.
7. You must follow all rules, regulations and guidelines imposed by the Faculty of IT and the University in addition to the Department's Code of Practice.

• **Explanatory Notes**

The following notes indicate ways in which the Code of Practice applies to postgraduates for use of computers. It is not intended to be a complete list of possible abuses of the equipment. Each note refers to the corresponding paragraph above.

1. Postgraduate students are not normally granted access to the computers in the network, or to other students' files. You should not attempt to use another student's account even if they have not set a password. Of course, it is still important to set a password for your own privacy and security.
2. This will be interpreted very broadly. It includes
 - Tampering with another user's files.
 - Tampering with another user's screen.
 - Setting up processes which persist after you log out and annoy subsequent users of the machine.
 - Broadcasting of offensive messages.
 - Display or storage of offensive pictures.
 - Abuse of the mail system.
 - Occupying a machine to play games while other students need it to do their laboratory work.
3. Clearly, the Head of Department would have to be convinced that any such use of the machines would not conflict with their primary purpose.
4. Note carefully that this means you are not allowed to write or introduce a virus program, even if it is never executed.



5. Note that this does not prevent your taking copies of your laboratory work home, or making copies of non-copyright material, but does prevent your taking random pieces of software away on a CD. You should assume that all material is copyright unless it specifically states otherwise. If in doubt, ask.
6. Personal information includes names, addresses, mailing lists, etc. You should contact the Data Protection Officer, Mr. Mohamad Thalji, if you need to store such information.
7. In fact, you agreed to abide by the University and Faculty rules when you registered. Please direct queries concerning the code of practice to Department Chair.

• **Support for Computer Equipment**

Students are encouraged to own their own machines. Please note, however, that you are NOT REQUIRED to own your own computer. The Department has excellent facilities and postgraduate students are allowed to use the facilities provided in the buildings of the Faculty of Information Technology and the Faculty of Science. Whenever the buildings are open between 08 AM and 07 PM, access is also allowed in this range of time, from Sunday to Thursday during term.

• **Learning Resource Center**

Photocopying facilities are available in the Learning Resource Center, room 103, Extension. 453. Reference copies of textbooks are available for consultation. Copies of previous weeks' tutorial solutions are also available. The resource center holds non-loan copies of postgraduate textbooks. Lending copies of textbooks are available in the University Library.

• **Photocopying**

Out of the library, photocopying may be done at different Bookshops, at an affordable cost.

• **Printing**

You can take printout (free of charge) in any lab of the Department. Each lab contains at least two printers for this purpose.

• **Departmental Computer Club**

This is organized and run by students. It arranges various activities from time to time. See the notice boards in the Faculty.

• **Administrative Infrastructure**

It is composed of seven offices (Dean, 2 Advisory services, Dean Secretary, and Department's Chair, Department Secretary, and Meeting Room).

• **Academic Infrastructure**

It is composed of

- 8 Department classrooms plus other classrooms shared with other faculties and one lecture theatre equipped with support facilities: computer, data show.
- 12 laboratories (each contains 20 to 25 PCs or Monitors and 1 to 2 printers): Windows 7 Laboratories.
- 1 Learning Resource Center that contains computers, textbooks and related reference books and journals.
- 4 staff offices where each staff member is supplied with a PC.
- 1 room for staff meetings
- 1 office for the students' guidance and examination committee.

• **Lecture Support Facilities**

In the Department, there are 14 data shows used to support modules and seminars' presentations.

• **University Computer Centre**

This centre provides the Department with training and maintenance facilities.

• **Networking Facilities**

Ethernet: The PCs in each laboratory are connected to an Ethernet platform 10/100 Mbps.

Intranet: All computing facilities of the University are connected to a Gigabit Intranet backbone.

Internet: The University is connected to the Internet by 100 Mbps lines.

- **Type and Level of Access**

For communication, computing, or information searching, the Department provides free access to networking facilities at any time for the staff and the students.

- **Library Infrastructure**

This structure includes the University Main Library, which provides students and staff members with the required recent text and reference books, journals, and CD ROMs. Through its collaboration and co-ordination program, the library has relations with more than 120 universities and scientific organisations. It opens from 08 AM to 04 PM. It includes:

- **Conventional Library**, which contains books and journals. The books room contains more than 8130 different English titles in computing, where more than 70% were published in the year 2016 and later. The room of journals contains 30 computing journals that are useful for research and teaching and free access to Science Direct and Scopus database.
- **Electronic Library**, which contains CD ROMs for the taught programming languages and module support tools. It is connected to approximately 800 universities' electronic libraries via the World University Library that is endorsed by the United Nations University. The World University Library has four databases that contain more than 3300 periodicals available online. The online resources in the electronic library include sites that list more than 40000 online books and access to online libraries and encyclopaedias and other databases on the Internet.
- **Internet Access Service**, available in all laboratories each containing 20 PCs.

- **Bookshops:** contain books, exercises with solutions, solutions to previous examinations and so on.

- **Extracurricular Activities**

The University provides some entertainment for the students to enrich their talents in their free time. This includes

- **A Deanship of Student Affairs** that organises the social, cultural, and sport activities for the students in the University. It also has an alumnae office that keeps track of the graduates' information and news.
- Several spaces for different sports.
- Several spaces for cultural activities.
- Several common rooms for meetings, snacks, and cafeterias.
- Three Internet cafes each one containing 15 PCs.
- One Students Club.

IV. Student Support and Guidance

1. Department chair office

The **Department chair office** is mainly for students advisory services. It also deals with all routine postgraduate enquiries.

2. Academic Guidance

All new students should have an academic (personal) tutor, who is the chair of the department postgraduate committee. The students remain with this tutor till their graduation. The tutor deals with all routine postgraduate inquiries, advises on academic registration at the beginning of each semester, and any other raised problems. However, problems, which cannot be dealt with by the tutor, will be referred to the head of the Department, the Dean of the Faculty, the dean of postgraduate studies and scientific research, or to an appropriate member of academic staff. The academic guidance is available on specified dates in the terms, and any advisory service offered by the Assistant Dean is available daily to all students in the CS Department (including both Full- and Part-time students).

Time: 08.00 AM to 04:00PM (for morning) and the time 4:00PM-7:00PM (for evening) all days during term.

The advisory service offers advice on departmental and University matters and helps with anything that concerns you, whether in your studies, in the Department, in the University or in your life outside the university. Each of the staff in these offices is available with knowledge of the Department and University and who is willing to listen and help with whatever you bring. Note that:

- All visits to the advisory service offices are strictly confidential.



- If you have difficulties with material on particular course units you should normally first approach your tutors (or lecturers/project supervisors). You may also consult your tutors on matters that are more general but you can equally well call in at the Assistant Dean Offices.
- If you have health problems, you are welcome to consult an advisor in the Department but may prefer to go directly to your doctor or to the University Clinic.

Feel free to make use of these services at any time on any matter.

3. Students Support

- The University grants scholarships to students who obtain excellent average to resume their PhD degree.
- In each semester, an outstanding student is granted partial financial assistance by being involved in Labs supervision or research assistance depending on the University needs and a reduction of 50% of the programme fees for the next semester.

4. Postgraduate studies and scientific deanship

This deanship is the main administrative structure responsible of postgraduate studies (management tasks). The faculty of IT deals only with academic tasks.

5. Students' Affairs Deanship

Confidential, individual counseling on any matter affecting personal well-being or effectiveness is available at the Philadelphia University Students Affairs Deanship. The Deanship sees well over a hundred students a year and gives expert advice on problems such as low motivation, personal decision making, relationships, and anxiety and family difficulties. People there, are willing to help in finding fresh ways of coping with the emotional and personal aspects of problems and seek to do so in a collaborative, straightforward and empowering way with the individual concerned. Advice is available concerning referral to other services, helping others and dealing with common student problems such as exam anxiety.

The Deanship is open from 8.00 AM to 4.00 PM, from Sunday to Thursday throughout the year and appointments can be made by calling into the office of the Dean of Students affairs. All inquiries will be treated confidentially.

6. Tutoring Arrangements

Some of your course units will have tutorials, where you can discuss topics on a course unit and run through exercises. Usually, the lecturer of the course unit runs the tutorial. There will be an opportunity for you to ask questions on matters you do not understand.

As you have a personal tutor from the beginning of your University life, your tutor is here to help you in your way through University life. He/she will watch your progress and offer help and advice wherever necessary. If you get into difficulties, you should contact your personal tutor or visit the Assistant Dean at the earliest possible opportunity. Do not let things slide until it is difficult to rectify the situation, especially if you are getting behind with your work. Your personal tutor will also advise on your choice of course units, on departmental or University procedures and will provide references for jobs and other purposes.

Course lecturers are always available to discuss questions or problems with the course unit material. Each lecturer fixes at least six office hours on his timetable, which is fixed on his office door. You can call at these hours. For any reason, if these lecturers could not see you during these office hours, they may arrange an appointment at another time. It is important that any matter that affects your ability to work is notified to the Department - through your personal tutor, through the Assistant Dean or otherwise. The following are examples of matters that may affect your work: illness, personal or family difficulties (including illness in the family) or financial problems. In assessing your performance, the Department has a policy of trying to compensate for difficulties you have encountered whilst studying. We can only do this if we are notified of difficulties and have some idea of their extent.

7. Student Progress

Work and Attendance. The University regulations governing the Work and Attendance of students are given in the Student Guide 2011/2012. Full attendance is required at all lectures, laboratories, and any tutorials, which may be scheduled. Completed laboratory work should be handed in on time. Attendance at laboratories and at many lectures is monitored and attendance registers kept. Please note that the expectation is that students will undertake approximately thirty six hours per week of study i.e. an average of two hours private study will be required for every scheduled hour of lectures, laboratories etc. and some students may require much more time than this. **Being a student is a full time occupation!** Absence for holidays is not permitted in term-time. The experience of the Department confirms that lack of attendance leads to study problems and any student with problems should consult his/her subject tutors or personal tutor. In addition, failure to attend can result ultimately in refusal by the University to allow a student to sit for the degree examinations. The duty of the lecturer is to keep continuous review of the work and attendance of the students with whom he is concerned. If the rate of student absences, in a course unit, is greater than 15% (or 20% for student representing the University in sporting or cultural activities) of the completely accredited hours and the student has no

acceptable justification, then this student is excluded from that course unit. If the Dean of the faculty accepts the justifications of absence, then this student is mentioned as **withdrawn** without refunding the registration fees. A formal process is defined to tackle the problem of any student whose work and attendance appear unsatisfactory. Direct approaches by lecturer to solve the problem are as follows: He may choose to issue an "informal" warning, which has a precisely defined format and permits recovery of the situation. If this is unsatisfactory, a "formal" warning is issued. This is again of a precisely defined format. Failure to recover the situation at this stage leads to an exclusion from the course. A copy of this correspondence is held in a student's file.

8. Interruption of Degree Program

Any interruption (taking at most 2 years) of your degree program requires special permission from Faculty.. Permission will only be granted if satisfactory reasons are given. A written case with supporting evidence must be presented to Faculty. Reasons might include prolonged illness. Consult your tutor for advice.

9. Withdrawal from Modules

If you are contemplating withdrawing from a module, please discuss the situation with your personal tutor at the earliest opportunity.

- You can withdraw a module at most during the thirteenth week of the first or second term, and at most during the seventh week of the summer term.
- The minimal number of modules (which is 6) required in each term should be followed.

V. Organization of the programme

1. Study System

- The Masters Programme in Computer Science requires a minimum duration of two years. Students have to complete 33 credit hours by selecting one of the two streams offered by the Master Degree programme: The **Comprehensive Examination** stream or **Courses and a Thesis** stream.
- The academic year for postgraduate study is divided into two obligatory semesters:
 - Fall : Beginning of October – End of January
 - Spring : Beginning of February –End of June
 The mode of study in this programme is Evening mode.
- The pass mark in each module is 70% and the minimum accumulated average is 75%.
- More information can be found in the related regulations.

2. Terms of Admission

For the purpose of selecting suitable students for this programme, the Ministry of Higher Education and Scientific research imposes the admission criteria:

- Securing an average of at least “good” in BSc degree in Computer Science or related topics.
- BSc degree holders must have been attending a regular study at authorized universities.
- Securing at least 500 marks in TOEFL or equivalent (regulations are changing).
- Academic ability interview.

3. Curriculum Design, Content, and Organisation

a. Introduction

The curriculum is constantly evolving to cope with new technologies and rapidly developing software. The first curriculum was designed in 2005 and updated in 2007, and 2012. This development is through regular internal monitoring and reviews, and is updated to recent local developments in teaching and learning. Proceeding in this way provides a curriculum that matches the aims and objectives of the Department and the University. The Scientific Committee with the Syllabus setup committee of the Department usually recommend development and modification of curriculum

The Master Programme in Computer Science requires a minimum duration of two years. Students have to complete 33 credit hours by selecting one of the two streams offered by the Master Degree programme: The **Comprehensive Examination** stream or **Courses and a Thesis** stream.

The credit hours (33) are spread into the two streams as follows:

- **Master Degree by a Comprehensive Examination**
 - 27 credit hours for compulsory modules (including 3 credit hours for a project)
 - 6 credit hours for elective modules
- **Master Degree by Courses and a Thesis**
 - 18 credit hours for compulsory modules
 - 6 credit hours for elective modules



- 9 thesis

The registration for the thesis is done in the third semester after completing the minimum credit hours (21 hours) as per the regulations of the University.

b. Organization and Design of the Programmes

• Programme Structure

The Master Programme streams contain two types of modules, namely **Core** and **Electives**. The core modules are compulsory for all specialization streams. Each core subject accounts for 3 credit hours.

In both streams, core and elective modules are offered.

The structure of the **MSc** programme for the two streams is as follows:

Type of Modules	MSc Program			
	by a Comprehensive Examination		By Courses and Thesis	
	No. of Modules	Credit Hours	No. of Modules	Credit Hours
Core	9	27	6	18
Elective	2	6	2	6
Thesis	---	---	1	9
Total	11	33	9	33

• Guidance Plan

MSc Programme Stream	No. of Credit Hours/ Semester				Notes
	1 st Sem.	2 nd Sem.	3 rd Sem.	4 th Sem.	
Comprehensive Examination	12	12	6 + 3 (Project)	Comprehensive Examination	Total= 33 credit hours
Courses and Thesis	12	12		9 (Thesis)	Total= 33 credit hours. In 3 rd semester, students register on the thesis.

• Core Modules

The core modules are designed to give an in depth exposure in the Computer Science subjects at the advanced levels in Operating Systems, Software Engineering, Database Systems, Algorithms, and Intelligent Technologies. In addition, the students are also exposed to the IT research methodologies to make them competent with the foundations of research management and project making skills. The compulsory modules are as follows:

MSc Programme (Comprehensive Examination Stream): (27 credit hours)

Module No.	Module Name	Cr.
0750713	Advanced programming Languages	3
0750724	Algorithms and Advanced Data Structures	3
0750734	Operating Systems	3
0750743	Information Security	3
0750744	Computer Networks	3
0750754	Intelligent Systems	3
0750763	Database Systems	3
0750792	Scientific Research Methodolgy	3
0750798	Project	3

MSc Programme (Courses and Thesis Stream): 27 Credit Hours

Students must take 6 core modules and register for the thesis of 9 credit hours to make 27 credit hours. The Department assigns a thesis supervisor to the student to do research work after he/she passes 18 hours.

Module No.	Module Name	Cr.
0750724	Algorithms and Advanced Data Structures	3
0750734	Operating Systems	3
0750743	Information Security	3
0750754	Intelligent Systems	3
0750763	Database Systems	3
0750792	Scientific Research Methodology	3
0750799	Thesis	9

• Elective Modules

All enrolled MSc students can select the two modules according to their streams from the following lists.

Comprehensive Examination stream

Module No.	Module Name	Cr.
0750712	Modern Compiler Design	3
0750745	Wireless and Mobile network	3
0750735	Computer Architecture	3
0750755	Soft Computing	3
0750765	Data Mining	3
0750773	Computer Vision	3
0750774	Modelling and Simulation	3
0750784	Formal Methods	3
0750785	Software Maintenance and Evolution	3
0750797	Advanced Topics in Computer Science	3

Thesis stream

Module No.	Module Name	Cr.
0750712	Modern Compiler Design	3
0750713	Advanced programming Languages	3
0750735	Computer Architecture	3
0750744	Computer Networks	3
0750745	Wireless and Mobile network	3
0750755	Soft Computing	3
0750765	Data Mining	3
0750773	Computer Vision	3
0750774	Modelling and Simulation	3
0750784	Formal Methods	3
0750785	Software Mmaintenance and Evolution	3
0750797	Advanced Topics in Computer Science	3

4. Criteria for Assessing Examination Work

First class (90 – 100 marks). First class answers demonstrate depth of knowledge or problem solving skills, which is beyond that expected from a careful and conscientious understanding of the lecture material. Answers will show that the student

1. has a comprehensive knowledge of a topic (often beyond that covered directly in the program) with an absence of misunderstandings;
2. is able to apply critical analysis and evaluation;
3. can solve unfamiliar problems not drawn directly from lecture material and can adjust problem solving procedures as appropriate to the problem;
4. can set out reasoning and explanation in a logical, incisive and literate style.

Upper Second class (80 – 89 marks). Upper second class answers provide a clear impression of competence and show that the student

1. has a good knowledge base and understanding of all the principal subject matter in the program;
2. can solve familiar problems with ease and can make progress towards the solution of unfamiliar problems;



3. can set out reasoning and explanation in a clear and coherent manner.

Lower Second class (70 – 79 marks). Lower second class answers will address a reasonable part of the question with reasonable competence but may be partially incomplete or incorrect. The answer will provide evidence that the student:

- has a satisfactory knowledge and understanding of the principal subject matter of the program but limited to lecture material and with some errors and omissions;
- can solve familiar problems through application of standard procedures;
- Can set out reasoning and explanation which, whilst lacking in directness and clarity of presentation can nevertheless be followed and readily understood.

5. Assessment Regulations

In general, every module is assessed as follows:

- 30% is given for a 2-hour midterm exam,
- 30% is given for coursework and/or seminars, projects, or essays, and
- 40% for the final exam that may be a written exam only or a written exam plus final laboratory exam (if applicable), final small project, or seminar presentation. The 40% of the final exam is from the University regulations.
- The minimum pass mark is 70% for any module, whereas the minimum passing accumulated average in each semester is 75%. Students will be warned if they do not obtain an average of at least 75%. In this case, students are encouraged to repeat studying those modules with low marks in order to increase their accumulated averages. However, students will be dismissed from the University if this average is not achieved in the third attempt.

6. Role of Internal and External Examiners

For each module, the Department assigns a module coordinator and an internal examiner who is one of the senior staff members. If many lecturers teach the same module concurrently, they should suggest exam questions (for the mid and final exams) and run the same exam for all sections. The main coordinator of the module will collect these questions from lecturers and select some of them to be in the exam paper.

On the other hand, external examiners validate the standard of degree program. The external examiners are expected to look at the question papers, inspect a selection of scripts and project reports (particularly those on borderlines). They supply an assessment report to the Department.

7. Appeal Procedures

If you have good reason to question a mark you have been given (in midterm exams or in coursework), you should in the first instance approach the module lecturer. If the problem is not solved, you must submit it to your primary tutor. He will find the appropriate solution with administrative structures.

Problems with final examinations are resolved by submitting complaints or appeals in writing (within three days of the announcement of examination results) to the Examination Committee of the Faculty. The examination committee will consider these cases and check for any mistakes in the summation of the marks and so on.

8. Unfair Practices

The University treats attempting to cheat in examinations severely. The penalty is usually more severe than a zero in the paper concerned. More than one student of this Department were dismissed from the University because of this. Plagiarism, or copying of course or lab work, is also a serious academic offense as explained in the University guidelines. In Management Information Systems Department these guidelines apply also to laboratory exercises.

9. Department Guidelines on Plagiarism

1. Coursework, laboratory exercises reports and essays submitted for assessment must be your own work, unless in the case of group projects a joint effort is expected and is indicated as such.
2. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
3. Use of quotations or data from the work of others is entirely acceptable, and is often very valuable provided that the source of the quotation or data is given. Failure to provide a source or put quotation marks around material that is taken from elsewhere gives the appearance that the comments are ostensibly your own. When quoting word-for-word from the work of another person quotation marks or indenting (setting the quotation in from the margin) must be used and the source of the quoted material must be acknowledged.
4. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

5. Direct quotations from an earlier piece of your own work, if not attributed, suggest that your work is original, when in fact it is not. The direct copying of one's own writings qualifies as plagiarism if the fact that the work has been or is to be presented elsewhere is not acknowledged.
6. Sources of quotations used should be listed in full in a bibliography at the end of your piece of work.
7. Plagiarism is a serious offence and will always result in imposition of a penalty. In deciding upon the penalty, the Department will take into account factors such as the year of study, the extent and proportion of the work that has been plagiarized and the apparent intent of the student. The penalties that can be imposed range from a minimum of a zero mark for the work (without allowing resubmission) through caution to disciplinary measures (such as suspension or expulsion).

10. Teaching Quality Assurance Committee

The Departmental Teaching Quality Assurance and Enhancement Committee is responsible for the quality of teaching in the Department, including the analysis of Course Evaluation Questionnaire responses.

11. Staff-Student Consultative Committees

Student representatives are elected onto the departmental staff-student committees at the start of each term. All simultaneous sections of a module have a staff-student committee. Each committee meets at least three times each semester and may discuss any matter of concern with the module. The staff members of each committee are the lecturers of the concerned sections.

12. Departmental and Deanship Meetings

The meetings, held by the head of Department and the Dean of the Faculty during term time, have mainly an advisory role, where students may raise their problems that need some concern from these authorized persons. These meetings are held separately for each year students.

13. Module Evaluation Questionnaires

The Department attaches great importance to the opinion of students on the quality of the teaching provided, and every student is asked to complete a Module Evaluation Questionnaire for each module. The questionnaires are anonymous.

14. Communications

• Official Notices

Official notices are posted on the notice boards at the Department and at the Faculty. Electronic mail is also used extensively for communication with the Department and University. Each lecturer provides the students with his/her e-mail at the beginning of the term. Most official information including copies of this handbook, the postgraduate syllabus and timetables are available on the University Web pages www.philadelphia.edu.jo. This includes directories of staff and students for internal use, completed with photographs.

• Electronic Mail

Electronic mail is used widely for administrative purposes within the Department. It is frequently useful for communicating between individuals and small groups (e.g. between a tutor and his/her tutorial group), and occasionally for broadcasting important messages to wider groups. It is important that you know how to use email. It will be covered in the introductory laboratory sessions. The code of practice for computer usage covers electronic mail, please note the points below.

• Obscene or Offensive Mail

DO NOT SEND OBSCENE OR OFFENSIVE MAIL. If you receive mail, which you regard as offensive or obscene, you may wish to complain to a member of staff so that appropriate disciplinary action can be taken against the offender.

• Group Mailing

You are strongly discouraged from sending email to groups of people. The newsgroups should be used for this purpose.

• Miscellaneous Hints

- *Be brief in your communications.
- *Compose your message as if ALL of your recipients were physically present.
- *Limit the distribution of messages to the people who are likely to be interested.
- *Keep a copy of the mail you send out, for future reference. Learn to use folders to keep useful messages.
- *Read all your incoming mail before replying to any of it. There may be other relevant messages for you to read.
- *Be careful when replying to messages. You probably want your reply to go only to original message sender - not to the whole of the distribution list.
- *When you reply to a message, it is frequently helpful to include some of the original message to help your recipients to remember and understand the context of the reply.

VI. Health and Safety in the University

The University has a Health and Safety Committee, which comprises representatives of all services within the University. It is the responsibility of this committee to investigate complaints and potential hazards, to examine the cause of all accidents and to carry out periodic inspections of all areas of the Department. At registration, you will be required to assent to the departmental code of behavior, which relates to health and safety.

1. Buildings



The Department comprises two kinds of buildings: the Rooms Building and the IT Laboratories. The buildings are generally open between 08.00 and 04.00 (Sunday – Thursday). In accordance with University policy, smoking is prohibited throughout all buildings.

2. Emergency Evacuation

It is the responsibility of every individual to familiarize themselves with the Department's buildings and be aware of the fire exits.

- After evacuation of any building, please assemble well away from the building, and do not block any exits.
- Do not return to any building until authorized to do so.

3. Fire Action

Fire Action notices are located at, or adjacent to, fire alarm actuation points, and all staff and students should make themselves acquainted with this routine.

4. Operating the Fire Alarm

The manual fire alarm system can be activated by breaking the glass in the red contact boxes sited at strategic points throughout the premises.

5. Use of Fire Appliances

Fire appliances are situated at strategic points throughout the Department to deal with fires. Fires should only be tackled provided there is no personal danger and after the alarm has been set off.

6. Action when the Alarm Rings

On hearing the intermittent alarm, you should prepare yourself to leave the building.

On hearing the continuous alarm, you should evacuate the building immediately by the nearest exit.

7. Personal Difficulties

Please inform the Department's counselors or your tutor of any difficulties with which the Department can be of assistance.



Appendix A

The Study Plan of MSc in Computer Science (2016 – 2017)

Computer Science Department
Study Plan for Master Degree
(33 Credit Hours)
(2016-2017)

Comprehensive Examination Programme

1. Compulsory (27 Hours)

Module No.	Module Name	Cr.
0750713	Advanced programming Languages	3
0750724	Algorithms and Advanced Data Structures	3
0750734	Operating Systems	3
0750743	Information Security	3
0750744	Computer Networks	3
0750754	Intelligent Systems	3
0750763	Database Systems	3
0750792	Scientific Research Methodolgy	3
0750798	Project	3

2. Elective (6 Hours)

Module No.	Module Name	Cr.
0750712	Modern Compiler Design	3
0750745	Wireless and Mobile network	3
0750735	Computer Architecture	3
0750755	Soft Computing	3
0750765	Data Mining	3
0750773	Computer Vision	3
0750774	Modelling and Simulation	3
0750784	Formal Methods	3
0750785	Software Maintenance and Evolution	3
0750797	Advanced Topics in Computer Science	3



Computer Science Department Study Plan for Master Degree (33 Credit Hours) (2016-2017)

Thesis Programme

1. Compulsory (18 Hours)

Module No.	Module Name	Cr.
0750724	Algorithms and Advanced Data Structures	3
0750734	Operating Systems	3
0750743	Information Security	3
0750754	Intelligent Systems	3
0750763	Database Systems	3
0750792	Scientific Research Methodology	3

2. Thesis

750799	Thesis	9
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3. Elective (6 Hours)

Module No.	Module Name	Cr.
0750712	Modern Compiler Design	3
0750713	Advanced programming Languages	3
0750735	Computer Architecture	3
0750744	Computer Networks	3
0750745	Wireless and Mobile network	3
0750755	Soft Computing	3
0750765	Data Mining	3
0750773	Computer Vision	3
0750774	Modelling and Simulation	3
0750784	Formal Methods	3
0750785	Software Mmaintenance and Evolution	3
0750797	Advanced Topics in Computer Science	3

Appendix B

Outlines of Module Descriptions

The accredited content of each module is in its syllabus

2016 – 2017

0750712 Modern Compiler Design Course (3 Credit Hours)

Aims:

This course aims to provide students with deep theoretical and practical knowledge on modern compilers. It covers basic topics of compilers (compilers structure, lexical/syntactic analysis, semantic analysis, code generation) and then focuses on more advanced concepts such as optimization techniques; translators for imperative, object oriented, functional, logic and distributed programming languages.

Synopsis:

Lexical/syntactic analysis, semantic analysis, intermediate code and code generation, code optimization techniques, translators for imperative, object oriented, functional, logic and distributed programming languages.

Textbook:

- 1- Modern Compiler Design
Authors: Dick Grune, Kees van Reeuwijk, Henri E. Bal, Criel J.H. Jacobs, Koen Langendoen,
Published by Springer; 2nd ed. 2012,
ISBN-13: 978-1461446989.

0750713 Advanced programming languages (3 credit hours)

Aims:

The course covers elements of formal methods needed to establish properties of programming languages and prove properties of programs. This course is considered essential background for students considering advanced research in programming languages.

Synopsis:

Functional Programming (ML/OCaml), Logic programming, Small-step and large-step operational semantics, Denotation semantics, Fix-points induction, Axiomatic semantics, Type theory, Untyped and typed lambda calculi, Partial evaluation, non-determinism.

Textbooks

- 1- The Formal Semantics of Programming Languages,
Author: Glynn Winskel,
Published by MIT Press, 1993,
ISBN: 9780262731034.
- 2- Types and Programming Languages
Author: Benjamin C. Pierce,
Published by MIT Press, 2002.
ISBN-13: 978-0262162098

0750724 Algorithms and Advanced Data Structures (3 Credit Hours)

Aims:

This course aims to expand students' abilities to analyse, critique, design, and implement advanced data structures and algorithms.

Synopsis:

This course offers the advanced skills in Problem Solving, analysing running time for many kinds of algorithms, design divide-and-conquer algorithms, design dynamic programming algorithms, design network flow-based algorithms, write linear / integer programs, apply large-scale search / heuristic algorithms, efficiently store and answer queries about data, prove a problem is NP-complete.

Textbooks

- Data Structures and Algorithms in Java,



Authors: Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser,
Published by Wiley 6th edition, 2014,
ISBN-13: 978-1118771334.

0750734 Operating Systems (3 Credit Hours)

Aims:

The aim of this module is to study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems); Hardware and software features that support these systems.

Synopsis:

Centralized and distributed operating systems; distributed system structures; synchronization in distributed systems; processes and processors in distributed systems; distributed shared memory; protection and security. Distributed file systems.

Textbook:

Distributed Systems: Concepts and Design,
Authors: George Coulouris, Jean Dollimore), Tim Kindberg), Gordon Blair,
Published by Addison Wesley, (5th Edition), May 2011,
ISBN 0-13-214301-1.

0750735 Computer Architecture (3 Credit Hours)

Aims:

This course provides an in-depth study of the design, engineering, and evaluation of modern parallel computers. It begins with an overview of the field focusing on the convergence of many diverse architectural approaches around the communication architecture. A sound basis is built up in workload-driven evaluation, with a brief overview of parallel programming. It studies small-scale shared memory multiprocessors in some detail to lay groundwork for understanding large-scale designs.

Synopsis:

It extracts fundamental design issues: naming, replication, synchronization, latency, overhead, and bandwidth and explores these across the spectrum of modern machines. It then examines scalable multiprocessors thoroughly, including realizing programming models via network transactions, directory-based cache coherence, interconnection network design, software-based virtual shared memory, COMA techniques, and latency tolerance through multithreading and other means. Lectures will be interactive, drawing on readings from a new text-Parallel Computer Architecture: a Hardware/Software Approach.

Textbooks:

- 1- Computer Architecture, A Quantitative Approach, 5th Edition
Author : David A. Patterson,
Published by Morgan Kaufmann, 2011.
ISBN: 9780123838728
- 2- Parallel Computer Architecture: a Hardware/Software Approach
Author: David E. Culler,
Published by Morgan Kaufmann, 1997.
ISBN-13: 978-1558603431

0750743 Information Security (3 Credit Hours)

Aims:

This course provides a comprehensive study of the principles and practices of computer system security including the survey of state-of-the art technology used to address security problems.

Synopsis:

This course addresses various topics, where the following are paid a special attention: • Cyber stalking, fraud and abuse • Denial of Service attacks • Malware • Techniques used by hackers • Industrial espionage in cyberspace • Encryption • Computer security software • Security policies • Network scanning and vulnerability scanning In this MSc course, theoretic study and investigations will be supplemented by research and programming projects related to various security subjects

Textbooks:

1. Computer Security Fundamentals,
Author: Chuck Easttom.

- Published by Pearson, 3rd Edition, 2016.
2. Computer Security, Principles and Practice,
Author: William Stallings, Lawrie Brown.
Published by Pearson, 3rd Edition 2015
 3. Security+ Guide to Network Security Fundamentals,
Author: Mark Ciampa,
Published: 6th Edition, Cengage learning, 2018
 4. Charles Thies: Secure Software Design,
Author: Theodor Richardson,
Published: Jones & Barlett Learning, 2013

750744 Computer Networks (3 Credit Hours)

Aims:

The course aims mainly to discuss advanced topics in computer network including computer architecture, virtual networks, multimedia networking, network managements and quality of service.

Synopsis:

This course discusses Computer Networks in different advanced fields including: Computer Network architecture layering: Data Link Layer, Network Layer, Transport Layer Options (Silly Window Syndrome, Delayed ACK, Selective Acknowledgments, Selective Retransmission Request (SRR), Time Stamp, Window Scale); Virtual Local Area Networks (VLANs); Advanced Multimedia Networking Protocols: Real-time Transmission Protocol (RTP), Real-time Transmission Control Protocol (RTCP), Session Initiation Protocol (SIP); Network-Management Protocols: Simple Network Management protocol (SNMP), Structure of Management Information (SMI), Management Information Base (MIB); Quality of Service (QoS): Integrated Services (Intserv), Resource Reservation protocol (RSVP), Differentiated Service (Diffserv); Asynchronous Transfer Mode (ATM).

Textbooks:

- 1- Computer Networks : A system approach
Authors: L. Peterson, B. Daive,
Published by Morgan Kaufmann, 5th edition 2011,
ISBN-13: 978-0123850591.
- 2- Computer networks
Author: Tanenbaum,
Published by Prentice Hall 5th edition, 2010,
ISBN-13: 978-9332518742.

0750745 Wireless and Mobile networks (3 Credit Hours)

Aims:

This course highlights state-of-the-art research concerning the key issues surrounding current and future challenges associated with the software engineering of mobile systems and related emergent applications. This handbook addresses gaps in the literature within the area of software engineering and the mobile computing world.

Synopsis:

This course covers the following topics: Design of Mobile Geo-Applications, Interoperability of Mobile Agents, Map-based and Location-aware Applications, Mobile and Wireless Sensor Networks, Mobile Cognitive Radio Systems, Mobile Web Applications Development, Model-Driven Techniques, P2P Networking, Quality of Service (QoS) for mobile systems, Software Engineering and Design, Ubiquitous computing, Wireless Ad Hoc Networks.

Textbook:

Wireless and Mobile Networks: Concepts and Protocols,
Authors: Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri,
Publisher: Wiley, 2010,
ISBN: 9788126520695.

0750754 Intelligent Systems (3 Credit Hours)

Aims:

The aim of the Intelligent Systems is to convey knowledge and skills that enable students to analyze design and develop complex cognitive systems. Such cognitive systems are characterized by the fact that they can perceive their environment and react accordingly in an intelligent manner. Another significant feature of these intelligent systems is their ability to learn and to thereby adapt to complex and changing environments, requirements and



users. Such systems are especially relevant in the areas of robotics, virtual agents, multimedia and web information systems. Students are guided increasingly to work independently following scientific principles and methodologies. The program is explicitly designed to convey practical skills and abilities.

Synopsis:

Cognitive systems, complex and changing environments, requirements and users, virtual agents, development of autonomous systems (robots, avatars, dialog systems, intelligent assistants), virtual agents, computer game industry and scientific research.

Textbook:

Advances in Computer Science, Intelligent Systems and Environment

Authors: Sally Lin, David Jin

Published by Springer, 2011,

ISBN 978-3-642-23756-0.

0750755 Soft Computing (3 Credit Hours)

Aims:

The aim of this course is to provide students with deep theoretical and practical knowledge on neural networks, fuzzy systems, and optimization algorithms concepts and their relations.

Synopsis:

Neural Networks, Fuzzy set theory, Genetic algorithm, Rough set, Neuro fuzzy modeling, Neuro-Genetic information processing for optimization, Machine learning, Applications of computational intelligence.

Textbook:

Soft Computing and Its Applications,

Author: Kumar S. Ray,

Published by CRC Press, Volumes 1 and 2, 2014,

ISBN 1771880473.

0750762 Data Mining (3 Credit Hours)

Aims:

The aim of this module is to study:

1. Provide the student with an understanding of the concepts of data warehousing and data mining.
2. Study the dimensional modeling technique for designing a data warehouse
3. Study data warehouse architectures, OLAP and the project planning aspects in building a data warehouse
4. Explain the knowledge discovery process
5. Describe the data mining tasks and study their well-known techniques
6. Develop an understanding of the role played by knowledge in a diverse range of intelligent systems.
7. Test real data sets using popular data mining tools such as WEKA
8. Advanced topics in Data mining.

Synopsis:

Data Warehouse; Data preprocessing; What is data mining?; Data Mining Techniques; Cluster analysis; Data mining and neural network; DM and GA; DM and distributed data; DM and Big data.

Textbook:

Data Mining: Concepts and Techniques,

Authors: Han, J. and Kamber, M.,

Published by Morgan Kaufmann, third edition, 2011,

ISBN: 9780123814791.

0750763 Database Systems (3 Credit Hours)

Aims:

This course aims to provide students skills and techniques required to undertake Database techniques at MSc. level and to emphasize the concepts different advanced DB models. The practical aspect should be emphasized.

Synopsis:

Database management has evolved from a specialized computer application to a central component of a modern computing environment, and, as a result, knowledge about database systems has become an essential part of an education in computer science. This course aims to offer advanced skills in DB, we present the fundamental concepts of database management focusing on their advanced and practical aspects. So, the goal is to study some advanced technologies in the database area that have been adopted in real applications and to survey products and applications that embody these technologies. Advanced topics from the following will be covered: Relational

Database, Object Oriented and Object Relational Databases; XML/Semi-structured Data Management; Querying, Transaction and Distributed Databases; Data mining and Information Retrieval Techniques. The practical aspect should be emphasized.

Textbook:

Database System Concepts,
Authors: Abraham Silberschatz , Henry F. Korth, and S. Sudarshan,
Published by McGraw Hill, 6th Edition, 2010,
ISBN 0-07-352332-1.

0750773 Computer Vision (3 Credit Hours)

Aims:

The aims of this course are to introduce the principles, models and applications of computer vision, as well as some mechanisms used in biological visual systems that may inspire design of artificial ones. The course will cover image formation, structure, and coding; edge and feature detection; neural operators for image analysis; texture, colour, stereo, and motion; wavelet methods for visual coding and analysis; interpretation of surfaces, solids, and shapes; data fusion; probabilistic classifiers; visual inference and learning. Issues will be illustrated using the examples of pattern recognition, image retrieval, and face recognition.

Synopsis:

Image representation, enhancement of digital images; concepts and methodologies for image analysis, mathematical and artificial intelligence methodologies required for image analysis and computer vision, implementation of image analysis and computer vision algorithms, recent research in image retrieval in digital libraries and medical image analysis, image acquisition, digitization, digital image concepts and preprocessing, introduction to colour fundamentals, texture analysis and morphological processing, review of mathematical concepts in statistics and neural networks, image segmentation, classification and decision making, and also their application involving, image retrieval in digital libraries and medical image analysis.

Textbook:

Computer Vision: Algorithms and Applications,
Author: Richard Szeliski
Published by Springer, 2011
ISBN: 978-1-84882-934-3

0750774 Modeling and Simulation (3 Credit Hours)

Aims:

The course aims at giving the students knowledge of the concepts in the area of modeling and simulation for both discrete and continuous system.

Synopsis:

Discrete Event Simulation: Basic simulation concepts and terms, queuing theory models for discrete event systems, structure of discrete event simulations, problem formulation and specification, input data representation, output data analysis, verification and validation, and the design of simulation experiments.

Continuous Simulation: differential equation representation of systems, formulation of state variable equations, numerical integration, and techniques for numerical solution of differential equations including the Taylor algorithm and the methods of Runge-Kutta. Application domains considered include physical and biological systems.

Textbook:

Discrete and Continuous Simulation: Theory and Practice,
Authors: Susmita Bandyopadhyay, Ranjan Bhattacharya,
Published by CRC Press, 2014
ISBN 9781466596399

0750784 Formal Methods (3 Credit Hours)

Aims:

In this course MSc students will be seamlessly introduced to theoretical issues and practical applications of formal methods within the software development process with the broad aim of understanding how the use of such methods even if pragmatically applied might conduct to the construction of maintainable and high quality software systems while keeping acceptable development costs.

**Synopsis:**

Role of formal specification and analysis techniques in the software development process; program assertion languages and analysis approaches; formal approaches to software modeling and analysis; tools in support of formal methods.

Textbook:

Specification of Software Systems, Graduate (Texts in Computer Science),

Authors: V.S. Alagar, K. Periyasamy,

Published by Springer-Verlag, 2 nd Edition, 2011,

ISBN-13: 978-0387984308.

721785 Software Evolution and Maintenance (3 Credit Hours)**Aims:**

This course aims to provide students with the skills and techniques required to undertake Software Maintenance at MSc level and present theoretical and practical techniques, tools, and methodologies that help software developers to achieve this unavoidable task with a maximum of success. The practical aspect should be emphasized.

Synopsis:

software maintenance: software change (introduction to software maintenance methods and tools: corrective, adaptive, perfective, and preventive maintenance methods and tools), change management (software configurations management scm: concepts, repository, changes set, workspace, system/product model, composition, database, long transaction, versioning, tools, researches, ...), program comprehension – reverse engineering (code reading: code reading, top down reading, unfamiliar pl code reading; code understanding: software architecture, software understanding tools), evolution of legacy systems (fundamentals and re-engineering by migration: characteristics of legacy systems, challenges for their evolution, the re-technologies: reverse-engineering, re-structuring, and re-engineering by migration; restructuring methods and tools: error avoidance tools, architectural tools, reuse tools, application; change impact analysis methods and tools: static analysis, dependency graph, slicing), looking to the future.

Textbooks

1. Model-based development and evolution of information systems: a quality approach,
Author: John Krogsti,
Published by Springer, 2012,
ISBN: 978-1-4471-2935-6.
2. Software evolution,
Authors: Tom Mens, Serge Demeyer,
Published by Springer, 2008,
ISBN: 978-3-540-76439-7.
3. Software maintenance, concepts and practice
Authors: Penny Grubb, Armstrong A. Takang.
Published by World Scientific, 2003
ISBN-13: 978-9812384263

0750792 Scientific Research Methodology (3 Credit Hours)**Aims:**

This course aims to offer a grounding in various aspects of research and project management, from the most theoretical (philosophy of science), through the subject-specific (how to choose, refine and develop a research topic), to practical advice on undertaking research, including how to contribute to research, manage research projects, cope with the day-to-day research activity, etc. students will acquire insight into the philosophical and methodological fundamentals of scientific research. Such knowledge is necessary in order to complete a higher degree programme. In scientific theory, students will gain understanding and basic knowledge of central scientific paradigms and approaches. The intention is that students will develop the ability to understand and reflect on the demands of scientific research, how knowledge is defined and how it is verified. In this way, they will be able to evaluate the premises for knowledge production, its limits and possibilities. This knowledge will also form a basis for launching and pursuing individual student research efforts, and will also facilitate critical reflection on the research of others. Through instruction in research techniques, students will acquire an understanding of the ethical standards which must be satisfied in the planning and execution of research projects. Students will also

learn about qualitative and quantitative methods, including the interpretation and application of statistical material.

Synopsis:

The Research Process, Questions & Ethics, MSc Research Guidelines, Finding Articles, Reading & Evaluating Papers, Preparing & Making a Research Presentation, Measurements and Variables, Statistical Analysis of Data, Naturalistic and Case-Study Research, Correlational and Differential Research, Hypothesis Testing, Validity, and Threats to Validity, Controls to Reduce Threats to Validity, Experiment Design, Writing a Paper, Field Research & Surveys.

Textbook:

Research Methods: A process of Inquiry,
 Authors: Anthony M. Graziano and M. L, Raulin,
 Published by Pearson, 8 edition, 2012,
 ISBN-13: 978-0205907694.

0750797 Advanced Topics in Computer Systems (3 Credit Hours)

Aims:

Contemporary topics and research directions in computer systems.

0750799 Thesis (9 Credit Hours)

Aims:

The aims of the thesis are to:

- Put into practice theories and concepts learned on the programme;
- provide an opportunity to study a particular topic in depth;
- Show evidence of independent investigation;
- Combine relevant theories and suggest alternatives;
- Enable interaction with practitioners (where appropriate to the chosen topic);
- Show evidence of ability to plan and manage a project within deadlines;
- Define, design and deliver an academically rigorous piece of research;
- Understand the relationships between the theoretical concepts taught in class and their application in specific situations;
- Show evidence of a critical and holistic knowledge and have a deeper understanding of their chosen subject area;
- Appreciate practical implications and constraints of the specialist subject;
- Understand the process and decisions to be made in managing a project within strict deadlines.

Synopsis:

Preparation of an academic research under the supervision of a faculty member, work must be non-trivial, ability to write a dissertation, A successful defense of the thesis .

