

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ ΠΑΝΕΠΙΣΤΗΜΙΟ ΔΥΤΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ ΣΧΟΛΗ ΘΕΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ ΤΜΗΜΑ ΠΛΗΡΟΦΟΡΙΚΗΣ HELLENIC REPUBLIC UNIVERSITY OF WESTERN MACEDONIA SCHOOL OF SCIENCES DEPARTMENT OF INFORMATICS



# **STUDY GUIDE**

September 2022

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# INTRODUCTION

The Department of Informatics of the University of Western Macedonia was founded in May 2019 according to the Law No. 4610 (Government Gazette 70/A/7-5-2019) and belongs to the School of Science of the UOWM. It is the result of the further development of the former Department of Informatics Engineering T.E. of the Technological Education Institution (T.E.I.) Of Western Macedonia (founded in June 2013, in accordance with the Presidential Decree 90 (Government Gazette 130/A/5-6-2013)), which had integrated the former Department of Informatics and Computer Technology of the T.E.I. of Western Macedonia, founded in July 2004, according to N.3255 (Government Gazette 138/A/22-7-2004) and seated in Kastoria, a town in northern Greece in the region of Western Macedonia.

The Department aims at promoting science and expertise in the field of informatics. This is achieved by conducting theoretical and applied research and by offering students the necessary assets for their scientific and professional future.

This study guide has been designed in order to inform both students and readers about:

- the structure and organization of the University of Western Macedonia,
- the regulation on studies and exams of the university,
- the rights and obligations of the students of the Department,
- the mission, the goals, the contents, the structure of studies, the programme of studies, as well as the description of the graduate of the Informatics Department
- the professional rights of the graduates of the Department
- the trans-European educational programmes, the teaching and administrative staff, the facilities and the technical equipment.



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### GENERAL DESCRIPTION OF THE INSTITUTION

The University of Western Macedonia began its operation as a Juridical Person under Public Law in 1999, when it was founded according to the Presidential Decree 200 (Government Gazette 179/6-9-1999 Issue A'). Some of the new Departments founded according to the Law No. 4610/2019 (such as the Department of Informatics) were based upon Departments of the former T.E.I. of Western Macedonia, which was seated in Kozani and had four branches in Kastoria, Florina, Grevena and Ptolemaida, with around 15.000 students.

The seat of the University of Western Macedonia is in Kozani, the capital city of the region of Western Macedonia, in northern Greece. The aim of the UOWM is to share and promote knowledge through research and teaching, to foster arts and culture, to contribute to the shaping of responsible citizens, to encounter the social, cultural, educational and developmental needs of the society committed to the principles of the sustainable development and social cohesion, to form the appropriate conditions for the search and dissemination of knowledge, as well as the enhancement of new researchers by seeking for cooperation with other universities and research entities, and finally to fully use knowledge and human potential for the well-being of the country and the international community.

### ACADEMIC STRUCTURE (ADMINISTRATION AND SERVICES)

The University of Western Macedonia is self-governing and operates under statutory bodies.

#### THE ADMINISTRATION OF THE UNIVERSITY:

The bodies of the university are:

- the Rector
- the Rector's Council
- the Senate

#### Rector

The Rector is the head and represents the University in cooperation with the Rector's Council and the Senate. The Rector's responsibilities are the following:

- is the head of the university and manages it, is in charge of the proper functioning of its services, supervises its lawful functioning and compliance with the Statute and Internal Regulation, and ensures the cooperation among the bodies of the institution, the teaching staff and the students,
- represents the university in judicial and extrajudicial matters,
- convenes the Senate, sets the daily agenda, appoints a member of the Senate to introduce the issues to be discussed or in case that a member has not been appointed, (s)he proposes the issues herself/himself, presides over the procedures and ensures the execution of their decisions,
- attends the meetings of the Council without having the right to vote. (S)he can also attend the meetings of all the other collegial bodies of the institution without the right to vote.

- prepares the drafts of the Statute and Rules of Procedure and submits them to the Council for approval,
- prepares and reformulates i) the annual regular budget and the final report of the university, as well as the one of the public investment programme, ii) the annual report on the activities and the general function of the institution, which he submits to the Council for approval,
- announces the seats of the teaching staff, issues the acts of appointment of the university's staff and administers absence leave to the personnel,
- can delegate the right to sign documents to the heads of services of the university,
- can request information and documents for every case related to the institution from any university body, apart from the Senate
- convenes any collegial body, apart from the Senate, whenever it illegally fails to make decisions, and presides over its procedures without having the right to vote,
- takes specific measures to face urgent matters, when the competent administrative bodies, except the Council, are not able to function and decide,
- is in charge of taking measures for the protection and safety of the institution's staff and property,
- defines the general managers of the institution,
- allocates the budgetary appropriations to the educational, research and other activities of the university according to the approved programme planning,
- makes a decision, which is issued after the Senate's opinion and the Council's approval, on the organization and termination of the study programmes.

In order to assist her/his work, the Rector appoints the Vice Rectors, to whom (s)he delegates specific of her/his responsibilities. The Vice-Rectors are UoWM full or associate professors elected for a four-year term. At UoWM, the four Vice-Rectors are elected for:

- Academic Affairs and Student Welfare
- Research and Lifelong Learning
- Finance, Planning and Development
- Administrative Affairs

# **Rector's Council**

The Rector's Council is composed of the Rector, Vice-Rectors, one student representative, who comes from and is nominated by the co-opted student members of the Senate, as well as one administration staff representative, also member of the Senate.

The Rector's Council:

- submits proposals to the Senate about UoWM's strategy as regards the progress of the University at a local, national, European and international scale, and builds up its distinctive status and profile in the context of its mission,
- prepares draft programme planning agreements, according to which the Senate determines the relevant directions for the University progress,
- prepares and reviews the annual regular financial budget and UoWM's public investment programme budget, as well as the final financial report, submits them to the Senate for approval and supervises the implementation of the relevant decisions. The budgets allocate funds for the educational, research and other activities of the University, thus, applying the respective programme agreement,

- makes recommendations about the University Organisation and Internal Regulations planning to the Rector, to be submitted for approval to the Senate,
- proposes to the Senate about relevant committees to examine or handle issues that fall under their remit,
- is responsible for observing statutory, Organisation and Internal Regulation obligations,
- oversees the Organisation of the University administration services and allocates administrative staff,
- submits proposals to the Senate about academic staff allocation and reallocation in Departments,
- exercises specific duties assigned by the Senate, for a specific time, and after a justified decision.

Additionally, the Rector's Council is assigned tasks based on the University Organisation and Internal Regulations.

# Senate

The Senate is composed of the Rector, Vice-Rectors, School Deans, Heads of Departments, students' representatives, representatives of the Special Teaching staff, Special Laboratory Teaching staff and Special Laboratory Technical staff and one representative of the administrative staff.

Based on Law 4485/2017, the Senate draws up the University strategy, develops and specifies the relevant actions required for the growth of the University at a local, national, European and international level. It also takes up responsibilities not assigned by law specifically to other bodies of the University, and assumes duties based on UoWM Organisation and the Internal Regulations.

More specifically, the Senate:

- determines the individual directions for the UoWM academic strategy and development, on the basis of which the Rector's Council draws up draft programme planning agreements,
- oversees UoWM operation,
- approves of the annual review of UoWM activities and its overall operation,
- sanctions all Curricula content.
- sanctions UoWM annual regular financial budget and the public investment programme with the relevant amendments, as well as the annual review of financial reports, upon the recommendation of the Rector's Council,
- draws up UoWM's educational and research policies in compliance with quality assurance and upgrading, and establishes the University Quality Assurance Unit (QAU),

# BODIES OF THE SCHOOL:

The statutory Bodies of the School are:

- the Dean,
- the Deanship of the School and
- the General Assembly of the Department

The Deanship of the School allocates the budgetary appropriations, organizes the school's services and coordinates the educational actions of the Departments which belong to the School. The Dean of the School, the Heads of the Departments and the students' representatives take part in the Deanship. The Dean of the School is the head of the School's services.

# **BODIES OF THE DEPARTMENT:**

Each School consists of Departments having a group of related fields of studies.

The statutory Bodies of the Department are the General Assembly of the Department, and the Head of the Department.

The General Assembly of the Department consists of the Teaching Research Staff of the Department and students' representatives and has all the responsibilities for issues related to the Department according to the Law.

The Head of the Department is the director of the Department's services.

### ADMINISTRATIVE STRUCTURE OF UOWM

The administrative, financial and secretarial support to the educational and research work of all the units of the UOWM is conducted by its administrative services, which ensure the proper functioning and management of its property and financial resources.

# UNDERGRADUATE STUDIES AT UOWM

According to the Law No. <u>4610/2019 (Government Gazette 70/A/07.05.2019)</u>, the academic structure for the Undergraduate studies of the UOWM includes the following:

### School of Engineering, seated in Kozani

- Electrical and Computer Engineering
- <u>Mineral Resources Engineering</u>
- Product and Systems Design Engineering
- Mechanical Engineering
- <u>Chemical Engineering</u>

School of Humanities and Social Sciences, seated in Florina

- Primary Education (Florina)
- Early Childhood Education (Florina)
- <u>Psychology (Florina)</u>
- <u>Communication and Digital Media (Kastoria)</u>
- School of Fine Arts, seated in Florina

#### • Fine and Applied Arts

#### School of Economic Sciences, seated in Kozani

- International and European Economic Studies (Kozani)
- <u>Management Science and Technology (Kozani)</u>
- Accounting and Finance (Kozani)
- Economics (Kastoria)
- Business Administration (Grevena)
- Regional and Cross-Border Development Studies (Kozani)
- Statistics and Insurance Science (Grevena)

# School of Science, seated in Kastoria

- <u>Mathematics (Kastoria)</u>
- Informatics (Kastoria)

# School of Agriculture, seated in Florina

- <u>Agriculture</u>
- School of Health Sciences, seated in Ptolemaida
  - Occupational Therapy
  - <u>Midwifery</u>

# SCHOOL OF SCIENCE

The School of Science and its Departments are seated in Kastoria and consists of two (2) Departments:

- 1. Department of Informatics (Kastoria)
- 2. Department of Mathematics (Kastoria)

# THE DEPARTMENT OF INFORMATICS

In May 2019 the Department of Informatics of the University of Western Macedonia was founded under the Law No. 4610 (Government Gazette 70/A/7-5-2019).

The Department of Informatics offers courses related to the following fields:

- Computer Hardware
- Computer Software
- Networks and Telecommunications

The Department aims at promoting the scientific field of informatics and the specialization in the aforementioned fields. This is accomplished by conducting theoretical and applied research and by offering its students the necessary assets for their scientific and professional life in the future.



The Department admits:

- Graduates of General High Schools or Vocational High Schools after successful participation in national exams and if they have accumulated the required grade.
- Graduates of Higher Educational Institutions through the process of the qualifying examinations and after a successful examination in three courses of the study program (. The candidates are examined in: Introduction to Computer Science, Linear Algebra and Introduction to Computer Programming.) defined each year by decision of the Department.

The academic and research profile and activity of the Department is shaped in accordance with its course subjects and contributes to the promotion of the scientific fields of Informatics, while at the same time supporting the deepening and specialization in them in the context of undergraduate and postgraduate education. The main objectives concerning the research activities of the Department concern:

- The targeting/specialization in specific research fields that define the research 'stigma' of the Department through the further development of research activities.
- The interconnection of teaching and research with the initiatives of the teachers and the active participation of the doctoral candidates of the Department.

The Department is manned with experienced teaching and research staff and is backed by up to date IT infrastructure and training equipment, while it is continuously developing.

The academic staff of the Department of Informatics consists of ten (10) members of Teaching and Research Staff, one (1) member of Special Teaching Staff, one (1) member of Special Technical Laboratory Staff and two (2) members of Administrative Staff for the Secretariat.

#### -

#### **MEMBERS OF THE TEACHING STAFF**

#### **KALOGIRATOU ZACHAROULA, PROFESSOR**

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#### SPECIAL TEACHING STAFF

#### **TASKASAPLIDIS GEORGIOS**

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#### SPECIAL TECHNICAL LABORATORY STAFF

#### **AGGELIS STYLIANOS**

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#### ADMINISTRATION

The Administration of the Department is exercised by the Head of the Department. The Head of the Department proposes the various issues to the Assembly of the Department and ensures the implementation of its decisions, ensures the implementation of the curriculum, educational procedures and the Internal Regulation, keeps records of scientific and educational activity, has disciplinary jurisdiction, sets up committees for the study and processing of issues and is in charge of the services of the Department:

#### Head : Dr Michael DOSSIS, Professor

# Secretariat : Mr Georgios-Christos DOROS, Administrative personnel Mrs Vassiliki MIRKOPOULOU, Administrative personnel

The Department's Secretariat office hours for students and the public are every Monday to Thursday from 11:00 a.m. to 1:00 p.m.

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URL: <u>https://cs.uowm.gr/</u>

#### **Postal Address:**

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#### ACADEMIC ADVISOR

In the context of better support for students during their academic career in the Department of Informatics, the Academic Advisor has been established. The Academic Advisor, in accordance with similar initiatives in Greece and internationally, is the point of contact for students throughout their studies with the Department and advises them on matters of academic progress, participation in the academic community, access to Department services, attendance and learning difficulties, questions about academic matters, as well as personal issues that create difficulties in their studies. The responsibilities of the Academic Advisor are summarized below:

- Providing support to students with disabilities or students facing difficulties in the progress and successful completion of their studies, for any problems (e.g. personal, academic, etc.) that affect the students by their studies and search, in collaboration with the Department's Secretariat or Assembly and providing advice on possible ways to better deal with them.
- Providing clarifications on the content of the courses and the ways of utilizing the Department's infrastructure (e.g. laboratories, Secretariat, etc.).
- Providing assistance in choosing a course of study according to students' interests, abilities and skills.
- Providing advice on curriculum structure, course content and knowledge required to attend specific courses.
- Providing advice on the content of elective courses, with the aim of choosing courses that are closer to the student's personal and academic interests.
- Providing directions for the preparation of postgraduate studies in the Department, in Greece and/or abroad.
- Providing clarification on career prospects after graduation (public and private sector opportunities, freelancing, jobs abroad).

The Academic Advisor is obliged to work closely with the University's services and act as a link between the students and the Institution's services, with the aim of better organizing and successfully completing their studies. It is important to have permanent and personal contact between students and the respective Academic Advisor. However, in no case the Academic Advisor of Studies replaces the Department Secretariat.

According to the decision of the General Assembly of the Department 17/2022 by the academic year 2022-2023 and henceforth, every student of the Department of Informatics is appointed to the respective Academic Advisor, who is a member of Department's teaching staff. The distribution of students into Academic Advisors is based on the last 2 digits of each student's registration number according to the correspondences below:

Academic Advisors	Student's registration number last 2 digits
Vardakas Ioannis	00 up to 09
Vergados J. Dimitrios	10 up to 19
Dimokas Nikolaos	20 up to 29
Dossis Michael	30 up to 39
Kalogiratou Zacharoula	40 up to 49
Nikolaou Spyridon	50 up to 59
Sinatkas Ioannis	60 up to 69
Stampoultzis Michael	70 up to 79
Toulopoulos Ioannis	80 up to 89
Fotiadis Dimitrios	90 up to 99

#### **ADMISSION/ REGISTRATION**



Student enrollments are carried out at the Department within the time limit and requirements defined by the Ministry of Education.

It is prohibited to enroll or/and attend two Schools or Departments at the same time. Those who have succeeded in the graduate admission exams, need a specific decision of the Department in order to enroll, according to the law.

Students who work for at least 20 hours per week can enroll as part-time students, after having their application accepted by the deanship of the School. The specific provisions and procedures are defined by the Statute of the Institution. A declaratory act is issued by the dean in cases of deletion.

Students are obliged to renew their enrollment each semester. Renewal of registration is only done electronically through the electronic secretariat platform and on dates set by the Department and announced on the Department's website.

#### **STUDIES DURATION**

In order to graduate, the minimum possible duration of studies is eight (8) semesters and can be extended to four (4) more semesters (12 semesters in total), according to the programme of the Department. Students who have not completed their studies by the end of the aforementioned period, can register only if they fall into the rules defined in the Statute of the Institution.

In the case of part-time students, the duration of studies equals to the double time of the minimum possible semesters leading to a degree, according to the programme of the School. After completing the maximum period of study, the dean's office of the School issues a deed of deletion (Article 34 of Law 4777/2021)

#### STUDIES INTERRUPTION

Students may, following their application to the dean's office of their School, interrupt their studies for a period of time that does not exceed two (2) years. Student status is suspended during the interruption of studies. The internal regulation of the University determines the procedure for ascertaining the interruption of studies and the supporting documents accompanying the application.

#### STUDIES STRUCTURE

The length of studies is four (4) academic years. Each academic year consists of two semesters (Winter – spring). Each semester lasts for at least 13 full weeks of teaching, which include a minimum number of credit units. If the minimum number of teaching weeks and credit units are not covered, the course is considered to be non-taught and cannot be examined. In this case, if exams are carried out, they are not valid and the grade is not accounted for in the degree. Each course is examined both at the end of the semester in which it was taught and at the examination period in September.

The dates when courses, exams and holidays begin and end are set under the studies regulation of the UOWM and are announced on the Department's website (Academic calendar). During the semester, neither courses nor exams take place on the holidays mentioned in the Academic Calendar.

Studies at the University are organized in accordance with semester courses. Each Department offers compulsory, elective-compulsory and optional courses.

### COURSES ORGANISATION

Compulsory courses are those which are obligatory for all students of the Department.

Elective-compulsory are the courses which students choose from a table of various courses. They can be in groups, so the student must choose all courses of a group, unless some of them cannot be taught. In this case students are free to choose other courses in other to complete the courses of the group.

The optional courses are general education or in-depth, infrastructure or interdisciplinary courses.

Each course unit and dissertation carries a certain number of credits according to the studies programme approved by the General Assembly of the Department. Educational visits do not carry credits.

In order to receive the degree of the Department the minimum number of units the student must have is defined by the Rules of Studies of the Institution.

If the knowledge offered in a course is needed to successfully attend another course, the first course is characterized as prerequisite of the second. A course can be both prerequisite of another course and dependent on another course. For each course there can be up to two (2) prerequisite courses and for each prerequisite course there can be up to two (2) dependent courses.

The courses interconnected in this way form groups which include up to three (3) courses and are considered to be course chains. The total number of prerequisite courses is from 15% to 30% and the total number of interconnected courses is from 15% to 45% of the total number of courses required to graduate.

Based on the outline of programme studies, the General Assembly of the Department decides on:

a) the specific analysis of the outline and the weekly hours of each course,

b) the prerequisite and dependent courses.

In order to distribute the courses of the Department in the semesters, the General Assembly of the Department makes sure that the regular programmes of the first three semesters do not include optional courses, the proper interconnection between prerequisite and dependent courses is ensured and the regular studies programme of each semester includes courses which sum up to a total of 30 teaching hours per week.

The regular programme courses are categorized by their type (compulsory, elective-compulsory and optional) and teaching methods (lectures, lab work, exercises or tuition).

### COURSE SELECTION

The regular studies programmes of the Department are indicative and not obligatory for the students. The student can form his own studies programme for each semester including the courses

(s)ne wisnes and intends to attend during this semester. At the beginning of each semester all students must submit a course selection statement electronically (via the electronic secretariat platform) during their registration to the Department or registration renewal. During that period, the student can make changes to his/her first course selection statement.

The number of the courses allowed per semester in the course selection statement is determined by the Department, which decides whether or not to accept late applications. Students up to the 8th semester of their studies may register up to nine (9) courses per semester, that belong to their current semester of studies or previous. From the 9th semester of studies onwards, they can register up to eleven (11) courses per semester. Exceptionally, students in their 6<sup>th</sup> semester of studies or lower can apply to the General Assembly of the Department for the right to register in courses of the following year of studies, provided that their total courses per semester do not exceed nine (9) courses. The Department's Secretariat registers the course selection statements in individual files for each student and promptly sends to the teaching staff a list of students per course.

Participation in course examination is allowed for registered students during the specific semester, according to the above. Students who have not submitted an electronic course selection statement within the dates announced by the Secretariat, do not have the right to be examined in any course for the given semester.

The teaching of each course includes one or more of the following methods: lectures, seminars, tuitional, practical and laboratory exercises, individual or group assignments, and educational visits and trips. Lectures demonstrate a wide area of a field of study and the related scientific reflection. Special exercises for the consolidation of theory may be part of this teaching method. Furthermore, a part of the syllabus may be assigned to students in order to present it individually or in groups. This multi-part application of knowledge, methods and procedures is conducted in specially chosen subjects that the professor assigns to students, individually or in groups. The goal of the seminars is to deeply reflect on subjects using cooperation, guidance and related bibliography as a help.

Laboratory and practical exercises are carried out periodically in university facilities or workplaces, where students, individually or in groups, are trained to apply theoretical, professional or technological methods, to operate technical systems and to write descriptive reports with the guidance and supervision of the teaching staff in order to obtain the necessary skills.

# PROCEDURES OF ACADEMIC ACKNOWLEDGEMENT

The programmes of the first and second cycle of studies offered by the university are structured in accordance with the European System of Accumulation and Transfer of Credits (ECTS), which helps Academic Institutions to acknowledge the level of students' academic knowledge through the use of measuring methods (credits and grades), and understand the national systems of tertiary education.

The European Credit Transfer System is based on the workload required by the students to succeed in the goals of a studies programme depending on the learning outcome and the knowledge, abilities and skills, which are to be obtained after its successful completion.

The workload refers to the time needed by the student in order to successfully complete all the educational procedures and achieve the learning outcome defined for each part of teaching or activity of the studies programme, such as attendance of lectures, exercises or labwork, participation in exams, dissertation, etc.

Credit units are given to each course, practical exercise or dissertation and to whatever is necessary, according to the studies programme, to accomplish specific learning outcomes. Students accumulate credit units only after they have succeeded in the exams and have achieved the aforementioned goals and outcomes. The minimum number of credit units that a student must accumulate in order to graduate is defined by the Internal Regulation of the Institution.

Students' assessment is conducted based on the scale from zero (0) to ten (10). Depending upon their achievement, students are categorized to groups of successful and unsuccessful.

To apply the European System of Accumulation and Transfer of Credits properly, the university provides information with the description of all the studies programmes offered and their learning outcomes in written and electronical form.

The Department also issues a Grades Transcript Certificate in Greek and English, which certificates students' achievement. A Diploma Supplement according to the standards of the European Union is issued in Greek and English to the graduates, which provides information about the type, the level of studies, the general educational frame, as well as the content and rules of the studies completed successfully by the student.

The university participates in the students' mobility programme Erasmus and provides full recognition of courses for the period the students have spent abroad if they have successfully completed the agreed programme of studies. For the recognition of the credit units the university issues an Erasmus Recognition Sheet with the courses from which each student, who has successfully completed his/her period of studies at a university abroad, is exempted.

It also issues a Proof of Recognition, which certificates that there have been recognized all the courses that the student has chosen, attended and passed abroad, their credit units and grades.

# ALLOCATION OF CREDIT UNITS

The Department's Curriculum is structured based on the workload as defined in article 14 of Law N.3374/2005. Credit Units (ECTS) are awarded in each course.

The courses of the Department's curriculum are distributed over the first 8 semesters of the Department's studies. Each semester the student is required to attend 5 or 6 courses and the weekly teaching hours of each semester varies between 20 and 24 hours.

# ECTS (European Credit Transfer System) Coordinator of the Department

The ECTS Coordinator of the Department is the contact person between the students and the Teaching-Research Staff within the Department and deals with all practical and academic matters related to the implementation of the European system of transfer and accumulation of credit units in the Department and provides students with all possible advisory support and guidance on all issues of transferring or accumulating credits.

# ACADEMIC DEGREE

After the successful completion of studies, students are awarded the Diploma (BSc) in Informatics.

### PROFESSIONAL RIGHTS (GOVERNMENT GAZETTE A58/2009)

The graduates of the Department of Informatics, based on the general and specialized scientific knowledge acquired during their studies, have a knowledge background related to the hardware and software for the collection, classification, processing and transmission of information, and have the ability to deal indicatively with activities such as study, design, analysis, implementation, installation, supervision, operation, evaluation, expertise and certification in the scientific fields:

- a) Information Technology
- b) Computer hardware and software,
- b) Computer systems and applications,
- c) Communication networks, telecommunications systems and internet applications.

Their professional rights were recognized and published in articles 2 and 3 of PD.44 Official Gazette 58 A/8-4-2009. In the Public Sector they can be employed as teachers in secondary education (PD 118/1995 Official Gazette 75 A/1995, Presidential Decree 268 Official Gazette 268 A/2004, Law 4521/2018 Official Gazette 38 A/2018).

#### **POSTGRADUATE STUDIES**

According to the provisions of article 34 of Law 4485/2017 "Holders of a degree from the first cycle of university studies of Greece or of similar institutions abroad are accepted in Postgraduate Studies. The selection of students is made in accordance with the provisions of this Chapter and the provisions of the Postgraduate Studies Regulation.

A prerequisite for the selection is the sufficient knowledge of at least one language in addition to the language of the Postgraduate Programme of Studies. The level of language proficiency required, the academic criteria taken into account for the selection or the relevant examination procedure are defined in the Postgraduate Studies Regulations. The academic criteria include, in particular, the grade of the degree, the score in the courses related to the academic subject of the P.P.S., the performance in a dissertation, where this is provided for in the first cycle of studies, as well as the relevant research or professional activity of the candidate.

The Postgraduate Programmes of Studies are part of the strategic planning of the university, aim at the promotion of knowledge, the development of research and their goal is to meet the educational, research and developmental needs of the country. They have been structured to meet scientific standards, their specialisations are related to the scientific fields of the programmes of undergraduate studies and guarantee high quality studies level.

Since the academic year 2021-2022 the Department of Informatics, School of Science of the University of Western Macedonia, in collaboration with the Department of Informatics, School of Information and Communication Technologies of the University of Piraeus, organizes and operates an Intra-university/Joint Programme of Postgraduate Studies entitled «Master of Science (MSc) in Modern Information Technologies and Services».

The Intra-university/Joint Programme of Postgraduate Studies awards a Master's Degree entitled Master of Science (MSc) in Modern Information Technologies and Services) in the following specializations:

- A. Synchronous Telecommunication Systems, Internet Technology, Internet of Things and Systems Security
- B. Information and Communication Technology in Education

For further information: <a href="https://msc.cs.uowm.gr/">https://msc.cs.uowm.gr/</a>



### THE DEPARTMENT'S PROGRAMME FOR UNDERGRADUATE STUDIES

The Department of Informatics Programme for Undergraduate Studies lasts eight semesters and treats all the basic knowledge subjects of Computer Science by offering compulsory courses, but also in specialization by offering optional compulsory courses. The studies include theoretical teaching, laboratory exercises, practical exercises, tutorials, seminars, preparation of assignments (individual or group) on special topics with bibliographic research, educational visits and excursions. In addition, students have the opportunity to prepare a dissertation and gain work experience through an Internship.

The **Dissertation** enables the student to gain the experience of studying a subject in depth, with laboratory, research, or synthetic work in combination with the appropriate bibliographic review, with the objective of developing the student's personal abilities. The dissertation is the most complete work that students are expected to present at the end of their studies. The dissertation receives 12 ECTS and optionally replaces up to 2 elective courses.

The **Internship** is optional as an elective course, receives 6 ECTS, lasts 3 months and takes place in workplaces related to the subject of study, with the aim of consolidating knowledge, providing the opportunity to develop initiatives and abilities to solve problems and teamwork. The acquisition of professional experience by the students is also encouraged with the possibility of their participation and employment in research projects undertaken by the Department.

In addition, the Department of Informatics Programme for Undergraduate Studies optionally provides the possibility of obtaining a **Certificate of Pedagogical and Teaching Proficiency** according to the terms and framework defined by the Institution.

The **educational objectives** of the Department's Programme of Undergraduate Studies are:

- Students of the Department are given the possibility to choose and create a personalized scientific profile according to their interests, abilities and skills.
- Emphasis on programming skill in anything programmable (eg big data, artificial intelligence, software, hardware, internet of things, machine learning, signal and information processing, telecommunications, networks, etc.).
- In addition to the scientific culture, development of the perception of the basic knowledge objects in Informatics through specialized tasks and workshops.
- Guidance in course choices of students by the Advisor of Studies.
- Possibility of obtaining a Pedagogical and Teaching Proficiency certificate.

The Department's Programme for Undergraduate Studies has the following advantages:

- A degree that certifies, in addition to basic knowledge in Informatics, focused knowledge in directions through the optional compulsory courses offered.
- Dissertation and/or internship outside the University.
- Structure of the Studies Programme with the application of the European Credit Transfer and Accumulation System (ECTS)
- Streamlining the course load so that the correct credits (ECTS) are awarded per course.
- Solid foundations of knowledge of the subjects required to obtain a degree, and the increase of laboratory hours by creating independent laboratories.
- Possibilities of student mobility and transfer of up to 30 credits (ECTS) to courses related to the Studies Programme of the Department of Informatics.

#### LEARNING OUTCOMES OF THE STUDIES PROGRAMME

Upon completion of their undergraduate studies, the graduates of the Department acquire the necessary scientific and technological knowledge and skills, so that they can be employed in all areas of the knowledge subject of Informatics. In particular, the Undergraduate Studies Programme of the Department of Informatics fully responds to the needs of the modern labor market by offering students practical and technological skills, particularly attractive to companies and organizations that provide IT services and products to the private and public sector. In addition, the graduates of the Department of Informatics have the required qualifications to:

- understand the basic principles of Information Science and corresponding current state-ofthe-art βtechnologies, design, develop and evaluate applications to solve realistic problems.
- use the knowledge and understanding they have acquired in a way that shows a professional approach to their work or profession and they have skills that are typically demonstrated by developing and supporting arguments and solving problems within their field of knowledge.
- expand their knowledge on current issues related to the scientific interests of IT science, but also to be guided in terms of the current trends in the relevant sectors of the labor market and the required formal job qualifications.
- gather and interpret evidence within their field of knowledge to form judgments that include reflection on relevant social, scientific or ethical issues.
- demonstrate the skill and innovation required to solve complex and unpredictable problems in the workplace.
- manage complex technical or professional activities or work plans, taking responsibility for decision-making in changing environments.
- work effectively within working groups in the management and execution of group tasks of a
  professional level of high complexity and difficulty of implementation with modern IT tools
  widely accepted, and/or take responsibility for their coordination.
- research and develop innovative software and services in a wide range of modern IT applications with a wide range of subjects.
- learn, research and deepen, develop their critical thinking and analytical skills through the writing (and/or presentation) of research papers, in the context of courses and the dissertation, and become familiar with research tools and research methodologies.
- present ideas, proposals, problems and solutions to both specialist and non-specialist audiences.
- acquire the required knowledge to proceed to further studies at a higher level and to specialize in a wide range of modern fields of Information Technology and Communications.
- gain experience in the application of IT science in a real work environment through the institution of internship, increasing their professional rehabilitation prospects.
- acquire the necessary pedagogical competence to carry out teaching.

# Table 1. Department of Informatics - Programme for Undergraduate Studies and ECTS

### SEMESTER A

1 <sup>st</sup> Semester Courses	Туре	ECTS	Hours per week
Introduction to Computers	С	5	4
Introduction to Computer Programming	С	5	4
Linear Algebra	С	5	4
Electromagnetism	С	5	4
Electronics	С	5	4
English Terminology I	С	5	4
TOTAL		30	24

#### SEMESTER B

2 <sup>nd</sup> Semester Courses	Туре	ECTS	Hours per week
Operating Systems	С	5	4
Data Structures	С	5	4
Mathematical Analysis I	С	5	4
Discrete Mathematics	С	5	4
Combinatorial Digital Electronics	С	5	4
English Terminology II	С	5	4
TOTAL		30	24

#### SEMESTER C

3 <sup>rd</sup> Semester Courses	Туре	ECTS	Hours per week
Object-Oriented Computer Programming with C++	С	5	4
Compilers	С	5	4
Numerical Analysis	С	5	4
Probability-Statistics	С	5	4
Mathematical Analysis II	С	5	4
Sequential Digital Electronics	С	5	4
TOTAL		30	24

### SEMESTER D

			Hours
4 <sup>th</sup> Semester Courses	Туре	ECTS	per week
Computer Networks	С	6	4
Databases	С	6	4
Microprocessors - Microcontrollers	С	6	4
Computer Architecture	С	6	4
Object-Oriented Application Development with JAVA	С	6	4
TOTAL		30	24

#### SEMESTER E

			Hours
5 <sup>th</sup> Semester Courses	Туре	ECTS	per week
Distributed Systems	С	5	4
Web Programming	С	5	4
Software Technology	С	5	4
Computer Network Design	С	5	4
Special Programming Topics	С	5	4
Applied Mathematics	С	5	4
TOTAL		30	24

SEMESTER F			
6 <sup>th</sup> Semester Courses	Туре	ECTS	Hours per week
Internet Applications	С	6	4
Multimedia Technology	С	6	4
Telecommunications	С	6	4
Elective Courses (2 courses)			
Design of Digital Systems with VHDL	EC	6	4
Wireless Mobile Communications	EC	6	4
Computer Graphics	EC	6	4
Visual Programming	EC	6	4
Special Network Topics I	EC	6	4
Numerical Analysis Topics	EC	6	4
TOTAL		30	24

# SEMESTER G

7 <sup>th</sup> Semester Courses	Туре	ECTS	Hours per week
Research Methodology and Ethics	С	6	4
Computer Systems Security	С	6	4
Advanced Database Topics	С	6	4
Elective Courses (2 courses)			
High Speed Networks	EC	6	4
Design of Embedded Systems with VLSI	EC	6	4
Internet Technologies and Mobile Computing	EC	6	4
Cloud Computing	EC	6	4
Computability and Complexity	EC	6	4
Advanced Architectures	EC	6	4
Special Topics in Networks II	EC	6	4
TOTAL		30	24

#### SEMESTER H

8 <sup>th</sup> Semester Courses		ECTS	Hours per week
Selection of 5 Courses or Selection of 3 Courses and Dissertation			
Digital Signal Processing	EC	6	4
Artificial Intelligence – Logic Programming	EC	6	4
Microprocessors - Microcontrollers II		6	4
Data Mining		6	4
Network Security		6	4
Waiting Systems		6	4
Operation Research		6	4
Dissertation	EC	12	
TOTAL		30	20

# SEMESTER E or F or G or H

Internship
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**C** : Compulsory

**EC** : Elective Compulsory

**O** : Optional

In order to obtain the degree, the student is required to successfully attend 44 courses or 42 courses and to successfully prepare a Dissertation and therefore accumulate a total of 240 credits.

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# SEMESTER A

#### **INTRODUCTION TO COMPUTERS**

#### GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	INFORMATICS		
STUDIES	UNDERGRADUATE		
CODE	SEMESTER A		
TITLE	INTRODUCTION TO COMPUTERS		
TEACHING ACTI	TIVITIES HOURS PER CREDI WEEK UNIT		CREDIT UNITS
	Lectures 2		
	Laboratory 2		
	4 5		
ТҮРЕ	COMPULSORY		
PREREQUISITE:	NONE		
LANGUAGE OF TEACHING AND EXAMS:	Greek		
OFFERED TO ERASMUS STUDENTS	YES (in Greek)		
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS108/		

#### LEARNING OUTCOMES

#### Learning outcomes

- 1. To know the basic computer terms.
- 2. To recognize and evaluate the technical characteristics of devices and components.
- 3. To calculate quantities related to memery capacity, speed of data transfer, etc.
- 4. To assess the appropriateness of certain configurations and applications.
- 5. To organize and suggest effective computing systems, applications and network systems.
- 6. To compare and evaluate devices, configurations and various software.
- 7. To build a computer using the basic components.
- 8. To install various operating systems on a computer.
- 9. To build a limited local area network.

#### **General competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

Basic principles, the concept of information, calculations and assistive means, historical development of informatics, arithmetic systems, information codification, introduction to Boolean algebra and basic logical circuits, hardware, description and analysis of the basic computer components, peripherals, computer organization, structure and function of the processor, computer memory and its organization, algorithms, programs and programming, operating systems, data processing, computer networks, internet, information systems and applications.

Specifically the units are :

- Introduction to arithmetic systems
- Representation of numbers and codes
- Computer arithmetic
- Boolean algebra, logical gates

- - Computer operational structure, basic unit
  - Computer memory, organization, peripheral memory
  - Computer building
  - Peripheral devices
  - Software, Operating systems
  - Operating systems installation
  - Digitalization. The concept of documents, types of documents
  - Computer networks and communication
  - Internet

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class and laboratory		
USE OF INFORMATION AND	Use of ICT in teaching.		
COMMUNICATION TECHNOLOGY	Learning support through Open eClass platform.		
	Laboratory teaching.		
TEACHING ORGANIZATION	Activities	Semester workload	
	Lectures	26	
	Study	60	
	Laboratory practice	39	
	Total (25 hours of workload per credit unit)	125	
STUDENTS ASSESSMENT	There is a mid-term examination which scores 30% of the final grade. The final examination scores 40% of the fina grade.		
	Concerning the laboratory part, there is an examination with the use of a specialized software, scoring 20% of the fina grade. There is also a written exam with multiple choice questions scoring 10%.		

#### **RECOMMENDED BIBLIOGRAPHY**

- 1.. «Εισαγωγή στους Υπολογιστές και την Πληροφορική», Φωτιάδης Δημήτρης, Αριστογιάννης Γαρμπής, Εκδόσεις Αράκυνθος
- 2.. «Η επιστήμη των Υπολογιστών», j. Glenn Brookshear, Εκδόσεις, Κλειδάριθμος
- 3.. «Εισαγωγή στους Υπολογιστές» Norton, Εκδόσεις Τζιόλας
- 4.. «Εισαγωγή στην Επιστήμη των υπολογιστών», Behrouz A. Forouzan, Εκδόσεις Κλειδάριθμος
- 5.. «Εισαγωγή στην Πληροφορική», Τσουροπλής Αθ., Κλημόπουλος Στ., Εκδόσεις Νέων Τεχνολογιών
- 6.. «Τεχνολογία Υπολογιστών», Λ. Φορόπουλος, Εκδόσεις ΙΩΝ
- 7.. «Εισαγωγή στην Πληροφορική», George Beekman, Εκδόσεις Γκιούρδας Μ.

### INTRODUCTION TO COMPUTER PROGRAMMING

#### GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	INFORMATICS		
STUDIES	Undergraduate		
CODE	SEMESTER A		
TITLE	PROGRAMMING I		
TEACHING ACTI	VITIES	HOURS PER WEEK	CREDIT UNITS
	Lectures 2		
	Laboratory 2		
		4	5
ТҮРЕ	COMPULSORY		
PREREQUISITE:	NONE		
LANGUAGE OF TEACHING AND EXAMS:	Greek / English		
OFFERED TO ERASMUS STUDENTS	NO		
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS102/		

#### LEARNING OUTCOMES

# Learning Outcomes

After the successful completion of the course, the student will be able to :

- 1. Discover the structure of each problem.
- 2. Estimate the capabilities of the programming solution of the problem.
- 3. Design the appropriate algorithm to face the problem.
- 4. Recognize and choose the right programming commands in C.
- 5. Create-apply the chosen algorithm in C language.
- 6. Compare and assess program performance.

#### **General competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

- 1. Introduction to the concept of problem, algorithm, programming, programming languages
- 2. Introduction to C, output commands, input commands, formatters
- 3. Stables-parametres-variables, arithmetic and logical operators, check-choice structure, complicated checks
- 4. Structure of repetition, condition repetition, infinite repetition
- 5. Simple types of data, charts, indicators
- 6. Functions, local, universal, static variables, extern και register type variables, recursion
- 7. Arithmetic operations, random numbers, applications on problems
- 8. Classification and search, monitor operation management
- 9. Alphanumeric management and bit level operations
- 10. Structures, unions, data counter types
- 11. Introduction to documents, text document and binaries, random document access, document rename-deletion
- 12. Pre-processor and libraries, application on time functions, time calculations and modular programming
- 13. Algorithm analysis, complexity, program evaluation, debugging and documentation

#### TEACHING AND LEARNING METHODS-ASSESSMENT

INSTRUCTION	Frontal teaching and laboratory		
USE OF INFORMATION AND	Use of ICT in teaching Learning support through Open eClass platform.		
COMMUNICATION TECHNOLOGY	Laboratory teaching		
TEACHING ORGANIZATION	Activities Semester workload		
	Lectures	39	
	Study	85	
	Laboratory practice 26		
	Total(25 hours of workload per credit150unit)		
STUDENTS ASSESSMENT	<ul> <li>Students are examined in both parts and laboratory.</li> <li>Assessment of the theoretical part cons</li> <li>1. 35% individual assignments-onli choice questions through the cons</li> <li>2. 65% final examination on theoret</li> <li>Assessment of the laboratory part cons</li> <li>1. 30% participation during laborat</li> <li>2. 70% final examination</li> <li>The theoretical part scores 60% and scores 40% of the total grade of the cons</li> </ul>	of the course; theory sists of : ne tests with multiple urse webpage. tical issues .ists of : ory classes I the laboratory part urse.	

#### RECOMMENDED BIBLIOGRAPHY

1.. Οδηγός της C, Schildt Herbert ΕΚΔΟΣΕΙΣ Χ. ΓΚΙΟΥΡΔΑ & ΣΙΑ ΕΕ

2.. Η ΓΛΩΣΣΑ C ΣΕ ΒΑΘΟΣ, ΝΙΚΟΣ Μ. ΧΑΤΖΗΓΙΑΝΝΑΚΗΣ ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

3.. C: Από τη Θεωρία στην Εφαρμογή, Γ. Σ. Τσελίκης, Ν. Δ. Τσελίκας ΕΚΔΟΣΕΙΣ ΝΙΚΟΛΑΟΣ ΤΣΕΛΙΚΑΣ

4.. C Μηχανικούς, Η.Η. Tan T.B. D'Orazio ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

#### LINEAR ALGEBRA

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	nte			
CODE	SEMESTER A				
TITLE	LINEAR ALGEBRA				
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
	Lectures and Practice 4 5				
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS149/				

#### LEARNING OUTCOMES

#### Learning Outcomes

It is the basic introductory course which offers students the primarily prerequisite knowledge in mathematics needed for informatics.

Linear algebra is basic for all curriculums in science and technology. Nowadays linear algebra has an important role since it is the background for discrete mathematics.

Its goal is to introduce students to the basic concepts of linear algebra. Matrices, determinants, vector spaces, space of inner products, systems of linear equations, linear transformations, eigenvalues and eigenvectots, matrix diagonalization.

Apart from theoretical teaching, students are also introduced to MATLAB.

After the successful completion of the course, students will be able to:

- Handle matrices (calculations, inversion, determinants)
- Solve systems of linear equation
- Calculate eigenvalues and eigenvectos
- Apply the above in MATLAB.

#### General Competences

- Search, analysis and synthesis of data and information using the necessary technologies.
- Decision making.
- Promotion of free, creative and deductive thinking.

#### **COURSE CONTENT**

Introduction to matrices of real and complex numbers. Matrix addition, scalar multiplication, multiplication, inverse matrix.

Introduction to systems of linear equations, the case of 2 equations with 2 unknown geometrical solution, linear system representation with matrices. Square matrices, determinants, reversible matrices. Matrices of special type.

Vector spaces, sub-spaces, intersection and sum of sub-spaces, linear independence, base and dimension. The line and column space of a matrix and its rank.

Solution of linear systems, gaussian elimination, LU factorization, finding the inverse.

Linear transformations, matrix representation, kernel and image, inverse transformation.

Characteristic polynomial, eigenvalues, eigenvectors and matrix diagonalization.



#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

- Strang, Gilbert. (2021). Γραμμική Άλγεβρα και εφαρμογές (2η έκδ.). Εκδόσεις ΙΤΕ & Πανεπιστημιακές Εκδόσεις Κρήτης. [Κωδικός Βιβλίου στον Εύδοξο: 102074431]
- Δονάτος, Γεώργιος Σ. & Αδάμ, Μαρία Χ. (2008). Γραμμική Άλγεβρα: Θεωρία και εφαρμογή. Εκδόσεις Gutenberg. [Κωδικός Βιβλίου στον Εύδοξο: 31174]
- 3. Στεφανίδης, Γ. (2014). Γραμμική Άλγεβρα με το MATLAB, Εκδόσεις Μάρκου & ΣΙΑ ΕΕ.
- 4. Παπαγεωργίου, Γ.Σ., Τσίτουρας, Χ.Γ. & Φαμέλης, Ι.Θ. (2004). *Σύγχρονο Μαθηματικό Λογισμικό ΜΑΤLAB-MATHEMATICA*. Εκδόσεις Συμεών.
- 5. Higham, Desmond J. & Higham, Nickolas J. (2016). *Matlab Guide* (3rd ed.). Society for Industrial and Applied Mathematics. Philadelphia, PA, USA.
- 6. Lipson, Marc Lars, Lipschutz, Seymour Γραμμική Άλγεβρα SCHAUM Εκδόσεις Τζιόλα

#### **ELECTROMAGNETISM**

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergraduate				
CODE	SEMESTER A				
TITLE	ELECTROMAGNETISM				
TEACHING ACTI	TIVITIES HOURS PER CREDI WEEK UNIT			CREDIT UNITS	
and application on co	Lectures on specific issues omputing practical problems.		4		5
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBPAGE (URL)	https://eclass.uowm.gr/courses/CS114/				

#### LEARNING OUTCOMES

Learning Outcomes Students are introduced to basic concepts of electromagnetism and specifically to issues concerning modern technologies and belong to the scope of the Department..

After the successful completion of the course students will :

- 1. Know the basic electromagnetic phenomena and recognize them in technological issues related to communication
- 2. Understand the electromagnetic mechanisms and decide on their application in technology
- 3. Compare and evaluate the capacities and techniques to utilize the natural phenomena of electromagnetism
- 4. Explain and determine the natural limits of technological applications

# General Competences

Autonomous work

#### COURSE CONTENT

- Electric load, electric field, magnetic field
- Electromagnetic induction, mutual induction and self-inductance, RLC circuits
- Electromagnetic waves propagation
- Transmission line, coaxial cable, waveguide
- HM radiation
- Traveling waves and Maxwell equations
- Antennas (fundamental antenna parameters. Linear wire antennas, basic dipole,  $\lambda/2$  dipole, propagation above the surface of the earth. Interference of surface waves in signal input. Ionospheric propagation, reflection and refraction of ionospheric waves. Tropospheric propagation, effect of atmosphere and ground, tropospheric absorption and diffusion. Propagation of satellite signals)
- Reflection, refraction, polarization and scattering of light
- Interference and diffraction
- Elements of geometric optics
- Optical fibres

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

Class
Presentations with the use of PowerPoint and exercises
Learning support through Open eClass platform.

TEACHING ORGANIZATION	Activity	Semester workload	
	Lectures	26	
	Exercises	26	
	Case study in groups	26	
	Study	47	
	Total (25 hours of	135	
	workload per credit unit)	123	
STUDENTS ASSESSMENT	Written final exam (100%) including:		
	- multiple choice questions		
	- exercises		

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. «Φυσική για Επιστήμονες και Μηχανικούς: Ηλεκτρισμός και Μαγνητισμός, Φως και Οπτική, Σύγχρονη Φυσική» , Serway, Εκδόσεις Κλειδάριθμος, 2013.
- 2. «ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΣΜΟΣ ΚΑΙ ΕΦΑΡΜΟΓΕΣ», J.Kraus and D. Fleisch, Εκδ. Τζιόλα, Θεσσαλονίκη 2011
- 3. «Φυσική: Μέρος Β», Halliday-Resnick, Εκδόσεις Πνευματικός, 1976.
- 4. «Φυσική των ταλαντώσεων και των κυμάτων», Η.J. Pain, 1990.
- 5. «Κλασσική Ηλεκτροδυναμική», Ι. Βέργαδος, εκδ. ΣΥΜΕΩΝ, 2002.
- 6. «Διάδοση ΗΜ κυμάτων σε γήϊνο περιβάλλον», Κανελλόπουλος, Εκδόσεις Τζιόλα
- 7. «Τα θεμέλια της ΗΜ θεωρίας», Raitz, Milford, Christy, Παν/κές Εκδόσεις Ε.Μ.Π., 2003
- 8. «ΔΙΑΔΟΣΗ ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΚΩΝ ΚΥΜΑΤΩΝ», Ρωμανίδης, Εκδ. ΖΗΤΗ, Θεσσαλονίκη
- 9. «Οπτικές Ίνες», Αλεξανδρής, Εκδ. ΙΩΝ, 2002
- 10. «Οπτικές Ίνες», Goff, Εκδ. Τζιόλας, 1999.
- 11. «Physics for Scientists and Engineers» , Raymond A. Serway, John W. Jewett, Cengage Learning Publications

#### **ELECTRONICS**

#### GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	INFORMATICS		
STUDIES	UNDERGRADUATE		
CODE	SEMESTER A		
TITLE	ELECTRONICS		
TEACHING ACT	IVITIES	HOURS PER WEEK	CREDIT UNITS
	Lectures	2	
	Laboratory 2		
		4	5
ТҮРЕ	COMPULSORY		
PREREQUISITE	NONE		
LANGUAGE OF TEACHING AND	GREEK		
EXAMS			
OFFERED TO ERASMUS STUDENTS	YES (in Greek)		
WEBPAGE (URL)	https://eclass.uowm.gr/courses/CS107/		

#### LEARNING OUTCOMES

#### Learning Outcomes

After the successful completion students will be able to:

- 1. Know the operation and characteristics of the most basic electronic components used in computer technology
- 2. Understand the operation of measuring tools
- 3. Analyze the operation of basic analogical electronic circuits
- 4. Design simple, analogical electronic structures

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

- Introductory terms: matter and its state, atom, energy levels, material categories, intrinsic semiconductors, energy bands, impurity semiconductors: N type, P type.
- Basic semiconductor components (diode, transistor, chip and integrated circuit).
- PN diode (PN junction) : operation ( denuded zone, potential barrier, junction capacity, ideal and non-ideal diode), PN diode polarization ( forward bias, reverse bias), characteristic diode curve (forward bias field, reverse bias field, breakdown region).
- Special diodes (light-emitting diode (LED), Zener diode).
- Diode applications (voltage stabilization with Zener diode, rectification or half-rectification circuit, double or full rectification circuit, clipper circuit).
- Transistor : structure, operation without polarization, with polarization, alpha DC coefficient, beta DC coefficient, relation between alpha and beta DC, load line.
- Basic Transistor connections (common base, common emitter, common collector), common emitter connection (characteristic curve of base voltage, characteristic collector curves, fields of operation, DC load line).
- Transistor amplifier circuit (common emitter connection) : operation, AC beta coefficient, voltage gain.
- Field Effect Transistor (FET): structure, operation (FET polarization, characteristic drain curves, shorted gate condition, voltage compression, gate-source cut-off voltage, conductance

- characteristic).
- Operational amplifiers: structure, operation, compensation, gain.
- Basic connections of operational amplifiers: voltage follower, irreversible amplifier, reversible amplifier, adder, voltage comparator.

TEACHING AND LEARNING METHODS - ASSESSMENT			
INSTRUCTION	Frontal teaching		
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Presentations with the use of PowerPoint, laboratory exercises in a simulation computing environment using the programme Multisim (NI), interactive communication with the students through eClass.		
TEACHING ORGANIZATION	Activities Semester workload		
	Lectures 30		
	Laboratory exercises 30		
	Study and analysis of books22and articles		
	Projects 13		
	Study 30		
	Total (25 hours of workload per credit unit)	125	
STUDENTS ASSESSMENT	. Mid-term exams are compulsory and score 30% of the final grade. Final exams score 40%, laboratory practice scores 20% and the mid-term project scores 10% of the final grade.		

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. Albert P. Malvino 2010, Ηλεκτρονική, ΕΚΔΟΣΗ 7η, Τζιόλας, Θεσσαλονίκη, [ISBN: 9789604182794]
- Ιωάννης Χαριτάντης 2006, Ηλεκτρονικά Ι, Πανεπιστημιακές Εκδόσεις Αράκυνθος, Αθήνα, [ISBN: 9789609103466]
- 3. Jacob Millman 1991, Μικροηλεκτρονική, ΕΚΔΟΣΗ 2η, Τζιόλας, Θεσσαλονίκη, [ISBN: 9607219090]
- 4. Charles A. Schuler 2010, Εφαρμοσμένα Ηλεκτρονικά, ΕΚΔΟΣΗ 5η , Τζιόλας, Θεσσαλονίκη, [ISBN: 9608050413]
- 5. Milton Kaufman, Arthur H. Seidman 1992, Εγχειρίδιο Ηλεκτρονικής, ΕΚΔΟΣΗ 2η , Τζιόλας, Θεσσαλονίκη, [ISBN: 960721921X]
- 6. Περιοδικό EDN ( <u>www.edn.com</u> )
- 7. Περιοδικό EETimes ( <u>www.eetimes.com</u> )

#### **ENGLISH TERMINOLOGY OF INFORMATICS I**

#### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATICS					
STUDIES	UNDERGRADUATE					
CODE		SEMESTER A				
TITLE	ELECTRO	RONICS				
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS		
Lectures and exercises		4		5		
	r					
ТҮРЕ	COMPULSORY					
PREREQUISITE	NONE					
LANGUAGE OF TEACHING AND EXAMS	English					
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBPAGE (URL)	https://eclass.uowm.gr/courses/CS112/					

#### LEARNING OUTCOMES

#### Learning Outcomes

This course is designed to improve the reading, speaking and listening and writing skills of students studying in the Department.

To empower students with the necessary IT skills, it familiarizes them with the language of computers with technical terms and academic articles. These texts introduce computer language structures and terminology such as the description of technical processes and operations and focus on subject areas of particular importance to computer engineering students such as Input/Output Devices, Storage Devices and Basic Software.

The skills acquired in this course will be useful and valuable in any future profession or postgraduate studies that students may wish to pursue.

Upon successful completion of the course, students are expected to:

- 1. Demonstrate a deep understanding of specialized English texts in the Basic Software.
- 2. Fully develop knowledge in finding general and specific information about Input and Output Devices.
- 3. Acquire skills in the translation and composition of texts related to software.
- 4. Recognize the use of the prefixes deci, kilo, mega to create new words and learn the abbreviations related to operating systems.
- 5. Understand in English the technical specifications of different computers
- 6. Identify devices from the descriptions and specifications of specific optical discs.
- 7. Use vocabulary about hard drives in the English language.
- 8. Fully understand the formation and uses of the present, past and future tenses.
- 9. Acquire the ability to write letters

#### General Competences

Students are expected to:

- Develop the techniques in reading English specialized texts to find general and specific information.
- Acquire and expand specialized vocabulary in the IT field.
- Recognize and use appropriately the words that are connected to each other (collocations) on informatics.
- Extract and transfer information from oral language as well as listening and reading texts and articles from the IT field.
- Master their communicative skills
- Use their knowledge of grammatical structures at B2 level.

- Improve the ability to write in an academic style and express key ideas in writing and orally in a more precise manner
- Cooperate in group work and develop critical thinking.

#### COURSE CONTENT

- 1. Words and phrases concerning informatics, such as software, dual code, electron beam, segmentation, etc.
- 2. Expansion of vocabulary: use of collocations, synonyms, antonyms, compounds, etc.
- 3. Academic writing: use of conjunctions to write an academic text, such as a scientific assignment or an essay on informatics, a summary, conclusions, and the differences between formal and informal language
- 4. Communicative functions of language, such as information exchange on software, search of information for operating systems, expressing agreement and disagreement, etc.

TEACHING AND LEARNING METHODS - ASSESSMENT								
INSTRUCTION	Frontal teaching in Class. Student participation is required.							
USE OF INFORMATION AND	Exercises and presentations with the use of PowerPoint.							
COMMUNICATION TECHNOLOGY	Interactive CD ROMs may be used as well.							
	Learning support through Open eClass platform.							
TEACHING ORGANIZATION	Activity	Semester workload						
	Lectures	26						
	Exercises	26						
	Team work on case study	26						
	Study	47						
	Total (25 hours of workload per credit unit)	125						
STUDENTS ASSESSMENT	Project and written examination	on						

#### **RECOMMENDED BIBLIOGRAPHY**

- Kolethra, E. & Balari-Petrianidi, L. (2010).English for Information Technology. Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 5153]
- 2. Esteras, S R. (1999). Infotech English for computer users (2nd ed.). Cambridge University Press, UK

# SEMESTER B

#### OPERATING SYSTEMS

#### GENERAL

-							
SCHOOL	SCIENCE						
DEPARTMENT	INFORMATICS						
STUDIES	Undergraduate						
CODE	SEMESTER B						
TITLE	OPERATING SYSTEMS						
TEACHING ACTIVITIES			HOURS PEF WEEK	2	CREDIT UNITS		
Lectures and exercises			4		5		
	-						
ТҮРЕ	COMPULSORY						
PREREQUISITE:	NONE						
LANGUAGE OF TEACHING AND EXAMS:	Greek						
OFFERED TO ERASMUS STUDENTS	YES (in English)						
WEBPAGE (URL)	https://eclass.uowm.gr/courses/CS118/						

#### LEARNING OUTCOMES

#### Learning Outcomes

The course aims at introducing students to operating systems and presenting the basic principles of operating system design. More specifically, students become familiar with terms such as processes, threads, memory management, document systems, Input/Output and deadlock.

After the successful completion students will be able to:

- Understand the design and operations of operating systems
- Handle process, thread and inter thread communication issues
- Understand memory management in synchronous operating systems
- Understand input/output in computing systems
- Solve deadlock problems
- Program UNIX shell and use system calls

#### General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Individual work
- Group work

#### COURSE CONTENT

- definition and history of operating systems, introduction to hardware, types of operating systems, basic terms, system calls, structure of operating systems
- processes, threads, inter processing communication, time programming, inter processing communication problems
- address space, virtual memory, page replacement algorithms, page systems, segmentation
- files, catalogues, file system implementation, input/output hardware, input/output software, input/output software layers, disks, user interconnections, power management
- sources, introduction to deadlocks, ostrich algorithm, deadlock detection and recovery, deadlock avoidance and prevention
- in the laboratory part of the course students are introduced to the use of the Unix shell, system calls(in C language), programming with inter processing communication with signals and pipes, process synchronization.


1. «Λειτουργικά συστήματα», Silberschatz, Galvin, Gagne, Εκδόσεις ΙΩΝ

2. «Σύγχρονα λειτουργικά συστήματα», Andrew S. Tanenbaum, Τρίτη αμερικάνικη έκδοση, Εκδόσεις Κλειδάριθμος

3. «Λειτουργικά συστήματα», Παπακωνσταντίνου, Μπιλάλης, Τσανάκας, Εκδόσεις Συμμετρία

4. «Λειτουργικά Συστήματα, Αρχές σχεδίασης», W. Stallings, Εκδόσεις Τζιόλα

5. Operating System Concepts", Silberschatz, Galvin, Gagne, Wiley Publications

## DATA STRUCTURES

### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATICS					
STUDIES	Undergraduate					
CODE		SEMESTER	В			
TITLE	DATA STRUCTURES					
TEACHING ACTI	TEACHING ACTIVITIES		CREDIT UNITS			
	Lectures 2					
	Laboratory 2					
		4	5			
ТҮРЕ	COMPULSORY					
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND EXAMS:	Greek / English					
OFFERED TO ERASMUS STUDENTS	NO					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS139/					

## LEARNING OUTCOMES

## Learning Outcomes

After the successful completion of the course students will be able to :

- 1. Describe the Data Structures they use
- 2. Estimate the capacities (advantages-limits) of a specific data structure
- 3. Examine problems according to the available data structures
- 4. Design the appropriate data structure for each case
- 5. Create and apply the chosen data structure in C programming language
- 6. Compare and assess the performance of data structures

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

- 1. Introduction to data structures, necessity usefulness
- 2. The structure of a table. Evaluation of the table structure
- 3. The structure of stacks
- 4. The structure of queues
- 5. The structure of lists and priority queues
- 6. The structure of connected lists
- 7. The structure of trees. Binary trees
- 8. The structure of red-black trees. 2-3-4 tree
- 9. The structure of hash tables
- 10. The structure of graphs
- 11. Sorting algorithms
- 12. Review and comparison of structures



1. Δομές δεδομένων & αλγόριθμοι στη Java, Lafore Robert ΕΚΔΟΣΕΙΣ Χ. ΓΚΙΟΥΡΔΑ & ΣΙΑ ΕΕ

2. Δομές δεδομένων, αλγόριθμοι και εφαρμογές C++, Sahnii Sartaj ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

 ΔΟΜΕΣ ΔΕΔΟΜΕΝΩΝ, ΓΕΩΡΓΑΚΟΠΟΥΛΟΣ Γ.Φ. ΕΚΔΟΣΕΙΣ ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ

4. Δομές Δεδομένων & οργανώσεις αρχείων Χρ. Κοίλιας Εκδόσεις Νέων Τεχνολογιών

5. Δομές δεδομένων, Μποζάνης Παναγιώτης Δ. ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

## MATHEMATICAL ANALYSIS I

#### GENERAL

SCHOOL	SCIENCE	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradua	ate				
CODE			SEMESTER	В		
TITLE	MATHEMAT	ICAL ANALYSIS I				
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS		
	Lectures	4		5		
ТҮРЕ	COMPULSOR	Υ				
PREREQUISITE:	NONE					
LANGUAGE OF TECHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS115/					

#### LEARNING OUTCOMES

The aim of the course is to help the students to acquire basic knowledge of Mathematical Analysis and Calculus I, which are utilized/used in all branches of Informatics. When the students complete successfully the course, they will be able:

- 1. to understand the concepts, maximum/minimum element of a set, and the process of finding it,
- 2. to understand the concept of sequence of real numbers, what is meant by convergence of a sequence and limit of a sequence in a real number, such as what is meant by divergence of a sequence and how to computationally check the convergence of a sequence,
- 3. to understand the concepts of function continuity/discontinuity,
- 4. to understand the concept of the limit and the behavior of the values of the function at the points of continuity and discontinuity,
- 5. to understand the importance of the rate of change, to calculate the derivative function, how the function behaves at the points of extreme values,
- 6. apply introductory/simple computational techniques to calculate the value of the derivative at a point,
- 7. to understand the geometric meaning of the integral, the upper lower sum of the integral, the approximation of the value of the integral through it, to apply techniques for the analytical calculation of the integral,
- 8. to calculate Taylor polynomials for smooth functions, and use this to approximate function values at points in its domain.
- 9. to calculate Fourier series of a periodic function.

**General Competences** 

Search, analysis and synthesis of data and information using the necessary technologies. Decision making, promotion of free, creative and deductive thinking.

### COURSE CONTENT

The objectives of the course are to understand and become familiar with basic concepts (eg, convergence/divergence) of real sequences and series, as well as the Differential and Integral Calculus of real functions of one variable, (derivative function, extrema points, integration). The content of the course is: Sequences and series of real numbers and approximation methods. Real functions of one variable, limit, derivative and applications (infinities, function linearization, error theory, iterative methods, asymptotic expansions and applications to complexity). Integral calculus, indefinite, definite, trigonometric, explicit integrals. Taylor series with applications to approximations. Fourier series of a periodic function as well as their various forms.

	ASSESSMENT				
INSTRUCTION	Class				
USE OF INFORMATION AND	Mathematica software				
COMMUNICATION TECHNOLOGY	Electronic lectures (PowerPoin	it, LATEX)			
	Learning support through Ope	n eClass platform.			
TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	26			
	Projects	26			
	Autonomous study	73			

Total

credit unit)

### RECOMMENDED BIBLIOGRAPHY

STUDENT ASSESSMENT

1. Petrakis L. Andreas, Petrakis A. Dorothea & Petrakis A. Leonidas. (2017) Mathematics I (2nd ed.). THALI Publications. [Eudoxus Book Code: 77107076]

Final written exam 70%.

(25 hours of workload per

Assignments throughout the semester 30%.

125

- 2. Masouros H. & Tsitouras H. (2016). General Mathematics (3rd ed.). Tsotras Publications An. Athanasios, Book Code in Eudoxos: 59392755
- 3. Spivak M. (2020). Differential and Integral Calculus (12th ed.). ITE Publications & University Publications of Crete. [Book Code in Eudoxus: 213]

## **DISCRETE MATHEMATICS**

## GENERAL

SCHOOL	SCIENCE	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradua	ate				
CODE			SEMESTER	В		
TITLE	DISCRETE M	ATHEMATICS				
TEACHING ACTI	TIVITIES		HOURS PER WEEK		CREDIT UNITS	
	Lectures and exercises 4 5			5		
TYPE:	COMPULSORY					
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND EXAMS	Greek / English					
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS116/			

## LEARNING OUTCOMES

Learning Outcomes

It is a course which introduces students to combinatorial mathematics and algebraic and logic structures that focus on the interdependence between informatics and mathematics. There will be taught issues on combinatorics, graph theory and applications on networks optimization problems and algorithms for the solution of these problems.

After the successful completion of the course, students will be able to explain and apply the basic principles of discrete mathematics on informatics and they will acquire the theoretical background in order to attend the following courses of their curriculum.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies.
- Decision making.
- Promotion of free, creative and deductive thinking.

## **COURSE CONTENT**

- Set theory and logic theory.
- Combinatorial analysis.
- Generating functions. Recurrence relations.
- Trees, overlapping trees, trees with root, binary search trees, in width first, in depth first.
- Minimum overlapping trees, Kruskal algorithm, Prim algorithm.
- Shortest paths, Dijkstra algorithm.

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class				
USE OF INFORMATION AND	Electronic notes (LATEX)				
COMMUNICATION TECHNOLOGY	Learning support through Oper	n eClass platform.			
TEACHING ORGANIZATION	Activities Semester workload				
	Lectures	26			
	Exercises 26				
	Projects 26				
	Autonomous study 47				
	Total (25 hours of workload per 125 credit unit)				
STUDENT ASSESSMENT	Final written exam 70%.				
	Assignments throughout the semester 30%.				

- Suggested Bibliography:

- Liu, C.L. (2009). Στοιχεία Διακριτών Μαθηματικών. Εκδόσεις ΙΤΕ & Πανεπιστημιακές Εκδόσεις Κρήτης. [Κωδικός Βιβλίου στον Εύδοξο: 225]
- Αγγελής, Ελευθέριος Σ. & Μπλέρης, Γεώργιος Λ. (2003). Διακριτά Μαθηματικά. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548932]
- Rosen, Kenneth H.(επιμ. Μποζάνης Παναγιώτης). (2018). Διακριτά Μαθηματικά και Εφαρμογές τους (8<sup>°</sup> έκδ.) Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 77106820]
- Βουτσαδάκης, Γιώργος Α., Κυρούσης, Λευτέρης Μ., Μπούρας, Χρήστος Ι. & Σπυράκης, Παύλος Γ. (2008). Διακριτά Μαθηματικά: Τα Μαθηματικά της Επιστήμης των Υπολογιστών. Εκδόσεις Gutenberg. [Κωδικός Βιβλίου στον Εύδοξο: 31192]
- Supplementary Bibliography:
- 1. Marvin, Marcus. (1969). *A survey of finite mathematics*. Dover Publications Inc. New York, NY, USA
- Balakrishnan, V.K. (2012). Introductory Discrete Mathematics. Dover Publications Inc. New York, NY, USA

## COMBINATORIAL DIGITAL ELECTRONICS

### GENERAL

SCHOOL	SCIENCE	SCIENCE				
DEPARTMENT	INFORMATIC	S				
STUDIES	Undergradua	ate				
CODE			SEMESTER	В		
TITLE	COMBINATO	RIAL DIGITAL EI	LECTRONICS			
TEACHING ACTI	CTIVITIES		HOURS PER WEEK		CREDIT UNITS	
Lectures, exer	Lectures, exercises and laboratory practice		4		5	
ТҮРЕ	COMPULSOR	Υ				
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS113/					

## LEARNING OUTCOMES

Learning Outcomes

After the successful completion of the course, students will be able to:

- 1. Understand the nature, structure and extraction of values in arithmetic systems with various radices.
- 2. Convert a radix to another, in well-known and widely used arithmetic systems.
- **3.** Understand the functions and the truth tables of well-known logical gates and basic Boolean functions.
- 4. Analyze and synthesize logical functions using minterms and maxterms of a truth table.
- 5. Analyze, synthesize and implement simple and complex combinatorial digital circuits.
- 6. Improve (simplify) logical functions, as well as the respective logical circuits using the properties and transformations of the Boolean algebra and other methods, such as the Karnaugh maps.
- 7. Analyze and understand the use of popular combinatorial circuits, such as adders, subtracters, parallel multipliers, (de)codifiers, multiplexers/demultiplexers and guides or three-state elements.

## **General Competences**

- Individual work
- Group work
- Project design and management
- Application of existing and new technologies

## **COURSE CONTENT**

- Number and code representation systems: representation of numbers and information in various radices. Number radix conversion. Complements. Decimal, binary, octal and hexadecimal numbers. Arithmetic operations between binary numbers. Binary and decimal codes of numbers and characters. Binary storage and registers. Binary logic and binary codes.
- **Boolean algebra and logical gates:** basic definitions, axioms and theorems of Boolean algebra. Logical functions. Regular and standard forms. Logical operations. Basic digital logical gates. digital integrated circuits.
- Simplification and application of Boolean functions: minterms, maxterms and Karnaugh maps. Simplification of addition products. Application with NO-AND and NOR gates. AND-OR-INVERT application. YES-NO and multiple-level circuits. Multiple-level NOR circuits. Exclusive-OR and equivalence functions. Parity creation and check.
- **Combinatorial logic:** Design mathods and process. Totalizers and subtracters. Code conversion. Analysis process. NO-AND multiple-level circuits. OR multiple-level circuits. Exclusive-OR and

equivalence functions. Parity creation and check.

• **Combinatorial circuits with MSI and LSI:** Combinatorial circuits. Analysis process. Code conversion. Design methods and process. Totalizers and subtracters. Binary Adder. Decimal totalizer. Decodifiers. Codifiers. Demultiplexers-multiplexers. Application of Boolean functions. Three state gates..

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class					
USE OF INFORMATION AND	Special CAD Circuit design software.					
COMMUNICATION TECHNOLOGY	Learning support through Open eClass platform.					
TEACHING ORGANIZATION	Activities Semester workload					
	Lectures	26				
	Laboratory exercises on	26				
	methodology application and					
	case study analysis in smaller					
	groups					
	Group work on case study and					
	circuit designs 21					
	Educational trips / short					
	individual assignments					
	Autonomous study	52				
	Total (25 hours of workload	125				
	per credit unit)					
STUDENT ASSESSMENT	I. Final written exam (100%) including:					
	- multiple choice questions					
	- role and concerned part analysis in case study					
	- theory assessment					
	II. Presentation of laboratory group work (20%)					
	III. Written laboratory exams (30%	)				

## **RECOMMENDED BIBLIOGRAPHY**

- 1. Morris, Mano M. & Ciletti, Michael D. (2018). Digital Design (6η ed.).
- 2. Ρουμελιώτης, Μάνος & Σουραβλάς, Σταύρος. (2017). *Digital Design* (2η ed.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68374428]
- 3. Brown, Stephen & Vranesic, Zvonko (2021). *Digital System Design with VHDL* (3η ed.) Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102070909]
- 4. Πογαρίδης Δημήτριος. (2019). *Digital Design with the languages VHDL and VERILOG*. Εκδόσεις ΔΙΣΙΓΜΑ ΙΚΕ. [Κωδικός Βιβλίου στον Εύδοξο: 86192991]
- 5. Morris, Mano M., Kime, Charles R. & Martin, Tom. (2016). *Design of Logic Circuits and Computers* (5n ed.).
- 6. Παπαοδυσσεύς, Κωνσταντίνος.(2017).*Logic Design of Digital Circuits*. Εκδόσεις Α.Τζιόλα&ΥιοίΑ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68373919]
- Ευσταθίου, Κωνσταντίνος. (2019). Digital Design (2η ed.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 86057354]
- 8. Dally, William J. & Harting, Curtis R. (2015). Digital Design.

Scientific Papers:

1. Dossis, M. F., "Standard Formats for Register Transfer Level VHDL Modelling", The European Simulation Symposium 95, Erlangen-Nuremberg, 26-28 October 1995, pp. 423-427

## ENGLISH TERMINOLOGY OF INFORMATICS II

### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradua	nte				
CODE	П-В-06		SEMESTER	В		
TITLE	ENGLISH TEF	MINOLOGY II				
TEACHING ACTI	VITIES	HOURS PER WEEK		CREDIT UNITS		
	Lectures and exercises 4 5			5		
ТҮРЕ	COMPULSOF	Y				
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS117/					

### LEARNING OUTCOMES

### Learning Outcomes

This course is designed to improve the reading, speaking, listening and writing skills of students studying in the Department.

To empower students with the necessary IT skills, it familiarizes them with the language of computers with technical terms and academic articles. These texts introduce computer language structures and terminology such as describing technical processes and functions, and focus on subject areas of particular importance to computer engineering students such as the World Wide Web, Multimedia, Electronic Communications and Programming Languages.

The skills acquired in this course will be useful and valuable in any future profession or postgraduate studies that students may wish to pursue.

Upon successful completion of the course, students are expected to:

- demonstrate a deep understanding of specialized English texts in language programming.
- fully develop knowledge in finding general and specific information about the internet.
- acquire skills in translating and composing texts related to the World Wide Web.
- realize the importance of abbreviations in IT contexts such as Unified Resource Locator, Hypertext Markup Language, Data Link Protocol, real-time web conferencing service
- recognize the function of different graphical tools and decode icons
- understand basic concepts in English related to programming and acquire relevant vocabulary.
- develop speaking skills for a variety of electronic systems and telecommunications.
- fully understand the formation and uses of the present, past and future tenses in both active and passive voice.
- write in an academic style for multimedia and design their own website.

## **General Competences**

Students are expected to :

- Develop techniques on reading specialized texts to find general and specific information
- Acquire and expand specialized vocabulary on informatics
- Recognize and use collocations on informatics
- Get and transfer information from oral language and reading of texts and articles related to informatics
- Master their communicative skills
- Use their knowledge of grammatical structures at B2 level
- Improve their ability to use academic language and express themselves in written and oral form
- Cooperate in group work and develop critical thinking

## **COURSE CONTENT**

- 1. Words and phrases concerning informatics, such as internet forums, attachment, data receiving from one programme to another, animated icon, error detection and location on the computer, assembly language, messaging systems, etc.
- 2. Expansion of vocabulary: use of collocations, synonyms, antonyms, compounds, etc.
- 3. Academic writing: use of conjunctions to write an academic text, such as a scientific assignment or an essay on informatics, a summary, conclusions, and the differences between formal and informal language
- 4. Communicative functions of language, such as information exchange on software, search of information for operating systems, expressing agreement and disagreement, etc.

TEACHING AND LEARNING METHODS	- ASSESSMENT				
INSTRUCTION	Frontal teaching. Student participation is required.				
USE OF INFORMATION AND	Exercises and presentations	with the use of PowerPoint.			
COMMUNICATION TECHNOLOGY	Interactive CD ROMs may be used as well.				
TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	26			
	Exercises 26				
	Teamwork case study 26				
	Autonomous study 47				
	Total (25 hours of workload per credit unit)125				
STUDENT ASSESSMENT	Assignment and written exam				

- Κουτσογιάννη, Ευαγγελία. (2009). English for Electronics and Telecommunications (2<sup>η</sup>έκδ.). Εκδόσεις Σύγχρονη Εκδοτική ΕΠΕ.[Κωδικός Βιβλίου στον Εύδοξο: 13149]
- Rizopoulou, Noni. (2019). Academic English for Computer Science. Εκδόσεις ΔΙΣΙΓΜΑ ΙΚΕ. [Κωδικός Βιβλίου στον Εύδοξο: 86195605]
- 3. Esteras, S R. (1999). *Infotech English for computer users* (2<sup>nd</sup> ed.). Cambridge University Press, UK

# SEMESTER C

## **OBJECT-ORIENTED COMPUTER PROGRAMMING WITH C++**

## GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradu	ate			
CODE			SEMESTER C		
TITLE	OBJECT-ORIENTED COMPUTER PROGRAMMING WITH C++				
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
	Theory (lectures), Laboratory 4 5				
ТҮРЕ	COMPULSOF	RY			
PREREQUISITE:	NONE (but knowledge offered in Programming I is optative)				
LANGUAGE OF TEACHING AND EXAMS	Greek / English				
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL))	https://eclass.uowm.gr/courses/CS130/				

## LEARNING OUTCOMES

### Learning Outcomes

- After the successful completion of the course students will be able to:
- 1. Understand the basic elements, nature, structure and functions of subject-oriented programming.
- 2. Understand and use the characteristics and methods of classes, inheritance, constructors and destructors.
- 3. Understand the relation between classes, structures and associations.
- 4. Understand and use the nested function and automatic nesting.
- 5. Understand and use the console input/output in C++.
- 6. Understand and use the subject allocation, the object pass in methods, the object return from methods and friend functions.
- 7. Understand and use object arrangements, pointers to objects, reports, report pass to objects and report return.
- 8. Understand and use functions and operators overloading.
- 9. Understand and use the input/output system and I/O advanced operations in C++.
- 10. Understand and use artificial functions.
- 11. Understand and use models and exception control.
- 12. Understand and use definition of type during run time and type conversion operators.

13. Understand and use name spaces and conversion functions.

## **General Competences**

- 1. Understand the nature, structure and operations of subject-oriented programming languages, and especially C++.
- 2. Understand the concepts of encapsulation, polymorphism and inheritance.
- 3. Understand the structure of classes, members and their methods.
- 4. Understand the exception mechanism and be able to compose pieces of code which exploit the specific mechanism.
- 5. Understand model functions and classes, as well as their advantages in various data structures.
- 6. Understand and compose class hierarchy, and take advantage of the major inheritance themes, such as abstract classes and type definition at run time.
- 7. Be aware of, create and use name spaces.

## **COURSE CONTENT**

Study of basic concepts and models related to subject-oriented programming using C++ language.

Subjects including: introduction to C++: classes, subjects, messages, variables, methods, constructors, access control and overloading. Basic classes. Inheritance, polymorphism, abstract classes. OOP design, interfaces, inner classes. Exceptions, exception control. Input/Output. Definition of public, private, protected in inheritance, encapsulation and subject return. Storage control and subject allocation. Method and operator overloading. Class hierarchy, abstract classes and type definition at run time. Model functions and classes. Name spaces.

TEACHING AND LEARNING METHODS -	ASSESSMENT					
INSTRUCTION	Lecture, discussion and student participation. Code examples are presented during the course, and details, comments and alternative applications of the examples are given.					
USE OF INFORMATION AND	Code examples, solved and u	unsolved exercises, additional				
COMMUNICATION TECHNOLOGY	exercises for the students to complete.					
TEACHING ORGANIZATION	Activities	Semester workload				
	Laboratory or exercises 30					
	Lectures 40					
	Autonomous study	55				
	Total (25 hours of workload per credit unit)	120				
STUDENT ASSESSMENT	Written exams including scaled application of a code using sca semester, students are given 5 that include topics to practice	d theory questions, design and led scenarios. Throughout the 0 exercises divided in 10 units and programs to deliver.				

- 1. «Οδηγός της C++», Schildt H. (2000),3η έκδ. Εκδόσεις Γκιούρδας.
- «C++ from the Ground Up / Μάθετε τη C++από το Μηδέν», Schildt H. (2003), 3η έκδ. The McGraw-Hill Companies / Κλειδάριθμος.
- 3. «Πλήρης C++ 4η», Savitch W. (2013) έκδ., Εκδόσεις Τζιόλα.
- 4. «Οδηγός της C++ με παραδείγματα», Stevens A. (2000), 6η έκδ. Εκδόσεις Γκιούρδας.
- 5. Stroustrup B. (2000) The C++ programming language. Special Edition. USA, Addison-Wesley Longman, Inc.
- 6. Meyers S. (2005) Effective C++: 55 specific ways to improve your programs and designs. 3rd ed. USA, Pearson Education, Inc.
- 7. Meyers S. (1996) More effective C++: 35 new ways to improve your programs and designs. USA, Addison-Wesley.
- 8. Alexandrescu A. (2001) Modern C++ design: generic programming and design patterns applied. USA, Addison-Wesley Publishing Company.
- 9. Booch G. 1994. Object-oriented analysis and design with applications. 2nd Edition. The Benjamin/Cummings Publishing Company.
- 10. Bennett S, McRobb S and R Farmer. 2002. Object-oriented systems analysis and design using UML. 2nd Edition. McGraw-Hill Education.
- 11. Λάζος Κ. 2003. C++ Θεωρία και πράξη. ISBN 960-87723-3-8.

## COMPILERS

## GENERAL

SCHOOL	SCIENCE	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradu	ate				
CODE			SEMESTER	С		
TITLE	COMPILERS					
TEACHING ACTI	TIVITIES		HOURS PER WEEK		CREDIT UNITS	
	Lectures and exercises		4		5	
ТҮРЕ	COMPULSOF	Υ				
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EAAIVIS.						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS120/					

## LEARNING OUTCOMES

## Learning Outcomes

After the successful completion students will be able to:

- Understand the verbal, syntactic and semantic analysis of compilers
- Understand the important points, problems and usefulness of the intermediate form and improvement of compilers
- Understand the mechanism of expression and command translation
- Understand and use compiler generators, such as LEX and YACC

## **General Competences**

- Individual work
- Group work
- Project design and management
- Practice of existing and new technologies

## COURSE CONTENT

- Compiler structure, compiling process, compiler development, interpreter, connector, educational language YAPL, lexical analysis, normal expressions, automatically finite (definite & indefinite)
- Syntactic analysis, grammar, BNF symbols, derivative and syntactic trees, stack machine
- Semantic analysis, property grammar, symbol table, semantic analysis of YAPL
- Intermediate representation and improvement, three address code, improving conversions, type and data representation in memory, basic and structured types, expression and command translation, creation of machine code for YAPL

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class					
USE OF INFORMATION AND	Specialized compiler development software					
COMMUNICATION TECHNOLOGY	Lexical analyzer generator Lex.					
	Syntax analyzer generator YACC.					
	Learning support through Open eClass platform.					
<b>TEACHING ORGANIZATION</b>	Activities Semester workload					
	Lectures	26				
	Exercises on methodology 26					
	application and case study					
	analysis in smaller groups					

-			

	Teamwork case study.	21				
	Compiler development.					
	Autonomous study	52				
	Total (25 hours of 125					
	workload per credit unit)					
STUDENT ASSESSMENT	I. Written final exam (70%) including:					
	- multiple choice questions					
	- role and concerned part analysis on short case study					
	- theory assessment					
	II. Teamwork and exercises (30%)					

- 1. Μεταγλωττιστές Γλωσσών Προγραμματισμού : Θεωρία και Πράξη, Λάζος\_Κατσαρός\_Καραϊσκος, Εκδόσεις Λάζος Κων., Θεσσαλονίκη 2004
- 2. Μεταγλωττιστές, Παπασπύρου\_Σκορδαλάκη, Εκδόσεις Συμμετρία, Αθήνα 2002

-Scientific Papers:

• Michael F. Dossis, "Formal Methods in High-Level and System Synthesis". In the Springer Series on Studies in Computational Intelligence, edited volume entitled as "Semantic Hyper/Multi-media Adaptation: Schemes and Applications", Springer-Verlag, Berlin Heidelberg, ISSN: 1860-949X, SCI 418, 2012, pp. 23-81.

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## NUMERICAL ANALYSIS I

#### ΓΕΝΙΚΑ

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	CS			
STUDIES	Undergradua	ate			
CODE	SEMESTER C				
TITLE	NUMERICAL ANALYSIS				
TEACHING ACTI	TVITIES HOURS PER WEEK			2	CREDIT UNITS
		Lectures	4		5
ТҮРЕ	COMPULSOR	RΥ			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS124/				

## LEARNING OUTCOMES

#### Learning Outcomes

Numerical analysis is the area of mathematics and computer science that creates, analyzes, and implements algorithms for solving numerically the problems of continuous mathematics. Such problems originate generally from real-world applications of algebra, geometry and calculus, and they involve variables which vary continuously; these problems occur throughout the natural sciences, social sciences, engineering, medicine, and business

Numerical analysis consists of two parts:

- The construction of arithmetic methods (algorithms) and analysis of their precision and stability
- The application of arithmetic methods using a programming language.

In this course we study problems as root finding, interpolation, differentiation and integration, differential equations, direct and iterative methods in linear algebra. The methods are implemented in MATLAB.

After the successful completion of the course students will have understood the methodology of arithmetic analysis. They will have created their own MATLAB functions to solve basic problems.

They will be able to choose the appropriate method to use for the solution of a problem from MATLAB functions.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

Computer arithmetic and errors.

Solution of non linear equations. Bisection, Regula falsi method. Fixed point iteration method, convergence. Newton-Raphson, secant , Halley's methods. Newton's method for systems of nonlinear equations.

Polynomial interpolation. Lagrange interpolation. Divided and finite differences. Newton interpolation. Hermite interpolation.

Differentiation and integration. Simple and composite rules of rectangle, trapezium, Simpson, 3/8. Adaptive integration. Gauss integration.

Ordinary differential functions. Euler and Heun methods.

Matrices and Linear equations. Gaussian elimination, LU factorization. Iterative methods (Jacobi, Gauss-Seidel)

-	
TEACHING AND LEADNING METHODS - ASSESSMENT	

INSTRUCTION	Class				
USE OF INFORMATION AND	MATLAB software.				
COMMUNICATION TECHNOLOGY	Electronic lectures (LATEX).				
	Learning support through Open e	Class platform.			
TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	30			
	Laboratory practice using 25				
	MATLAB				
	Programming exercises in	25			
	MATLAB				
	Autonomous study	45			
	Total (25 hours of workload per credit unit)	125			
STUDENT ASSESSMENT	Programming exercises in MATLA	3 (25%)			
	Written final exam on theory (75%	6)			

- Παπαγεωργίου, Γ. & Τσίτουρας, Χ. (2015). Αριθμητική Ανάλυση με εφαρμογές σε Mathematica 1. και Matlab. Εκδόσεις Τσότρας Αν. Αθανάσιος. [Κωδικός Βιβλίου στον Εύδοξο: 50658287]
- 2. Αβδελάς, Γ. & Σίμος, Θ. (2015). Αριθμητική Ανάλυση. Εκδόσεις Τσότρας Αν. Αθανάσιος. [Κωδικός **Βιβλίου στον Εύδοξο: 50661363**]
- 3. Moler, Cleve B. (2010). Αριθμητικές Μέθοδοι με το ΜΑΤLAB. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21379]
- 4. Ακρίβης, Γ.Δ. & Δουγαλής, Β.Α. (2015). Εισαγωγή στην Αριθμητική Ανάλυση (4<sup>η</sup> έκδ.). Εκδόσεις ΙΤΕ & Πανεπιστημιακές Εκδόσεις Κρήτης.
- 5. Βραχάτης, Μ.Ν. (2002). *Αριθμητική Ανάλυση* (6<sup>η</sup> έκδ.). Εκδόσεις Κλειδάριθμος.
- 6. Forsythe, George E., Malcolm, Michael A. & Moler, Cleve B. (2006). Αριθμητική Ανάλυση και προγράμματα για μαθηματικούς υπολογισμούς (2<sup>η</sup> έκδ.), Εκδόσεις ΙΤΕ & Πανεπιστημιακές εκδόσεις Κρήτης.
- 7. Higham, Desmond J. & Higham, Nicholas J. (2005). Matlab Guide. SIAM (Society for Industrial and Applied Mathematics). USA.
- 8. Van Loan, Charles F. (1999). Introduction to Scientific Computing: A Matrix-Vector Approach Using MATLAB (2nd ed.). Pearson-Prentice Hall Inc. USA.

## PROBABILITY - STATISTICS

#### GENERAL

SCHOOLSCIENCEDEPARTMENTINFORMATICSSTUDIESUndergraduateCODESEMESTERCCODEPROBABILITY - STATISTICSTEACHING ACTIVITIESHOURS PER WEEKCREDIT UNITSLectures and exercises44TYPECOMPULSORYOMPULSORYSEMESTERCSEMESTERCOFFERED TO ERASMUS STUDENTSYES (in English)WEBSITE (URL)https://eclass.uowm.gr/courses/CS123/						
DEPARTMENTINFORMATICSSTUDIESUndergraduateCODESEMESTERCPROBABILITY - STATISTICSRCREDITTEACHING ACTITIESHOURS PER WEEKCREDIT UNITSLectures and exercises44Lectures and exercises44PREREQUISITE:IONPULSORYISONAnguage of teaching and examplesSeek / EnglishOFFERED TO ERASMUS STUDENTSYES (in English)ISONWEBSITE (URL)Https://eclassu/scores/CS123/	SCHOOL	SCIENCE				
STUDIESUndergraduateCODESEMESTERCTITLEPROBABILITY - STATISTICSCREDIT UNITSLECCURES and exercisesHOURS PER WEEKCREDIT UNITSLectures and exercises44OPPREREQUISITEOMPULSORY1NONEVESVESSecondSecondOFFERED TO ERASMUS STUDENTSYES (in English)YES (in English)SecondSecondMEBSITE (URU)MITDS://eclassicover.gr/course.sc/S5123/MethodSecondSecond	DEPARTMENT	INFORMATIC	S			
CODESEMESTERCTITLEPROBABILITY - STATISTICSHOURS PER WEEKCREDIT UNITSLectures and exercises44Lectures and exercises44COMPULSORY4COMPULSORY1PREREQUISITE:NONEAnguage of teaching and examsGreek / EnglishOFFERED TO ERASMUS STUDENTSYES (in EnglishWEBSITE (URL)https://eclass.uowm.gr/course.s/CS123/	STUDIES	Undergradua	ite			
TITLEPROBABILITY - STATISTICSTEACHING ACTHOURS PER WEEKCREDIT UNITSLectures and exercises44COMPULSORYCOMPULSORYOFFEREQUISITE:NONEANGUAGE OF TEACHING AND EXAMSGreek / EnglishOFFERED TO ERASMUS STUDENTSYES (in English)WEBSITE (URL)https://eclass.uowm.gr/courses/CS123/	CODE	SEMESTER C				
HOURS PER WEEKCREDIT UNITSLectures and exercises444COMPULSORYPREREQUISITE:COMPULSORYNONECOMPULSORYOFFERED TO ERASMUS STUDENTSGreek / EnglishVES (in English)WEBSITE (URL)https://eclass.uowm.gr/cours/CS123/	TITLE	PROBABILITY - STATISTICS				
Lectures and exercises     4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       Colspan="2">4       PREREQUISITE:       NONE       ANGUAGE OF TEACHING AND EXAMS       Greek / English       OFFERED TO ERASMUS STUDENTS       YES (in English)       WEBSITE (URL)       https://eclass.uowm.gr/courses/CS123/	TEACHING ACTI	VITIES	HOURS PER WEEK		CREDIT UNITS	
TYPE   COMPULSORY   PREREQUISITE:   NONE   ANGUAGE OF TEACHING AND EXAMS   Greek / English   OFFERED TO ERASMUS STUDENTS   YES (in English)   WEBSITE (URL)   https://eclass.uowm.gr/courses/CS123/		Lectures	4		4	
TYPE       COMPULSORY         PREREQUISITE:       NONE         ANGUAGE OF TEACHING AND EXAMS       Greek / English         OFFERED TO ERASMUS STUDENTS       YES (in English)         WEBSITE (URL)       https://eclass.uowm.gr/courses/CS123/						
PREREQUISITE:NONEANGUAGE OF TEACHING AND EXAMSGreek / EnglishOFFERED TO ERASMUS STUDENTSYES (in English)WEBSITE (URL)https://eclass.uowm.gr/courses/CS123/	ТҮРЕ	COMPULSOR	Y			
ANGUAGE OF TEACHING AND EXAMS       Greek / English         OFFERED TO ERASMUS STUDENTS       YES (in English)         WEBSITE (URL)       https://eclass.uowm.gr/courses/CS123/	PREREQUISITE:	NONE				
OFFERED TO ERASMUS STUDENTS     YES (in English)       WEBSITE (URL)     https://eclass.uowm.gr/courses/CS123/	LANGUAGE OF TEACHING AND EXAMS	Greek / English				
WEBSITE (URL)         https://eclass.uowm.gr/courses/CS123/	OFFERED TO ERASMUS STUDENTS	YES (in English)				
	WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS123/		

## LEARNING OUTCOMES

## Learning Outcomes

The course is an introduction to Probabilities and Statistics. The field of Statistics deals with the appropriate methods to collect, organize, present and analyze data.

Statistic methods apply to almost all the sectors of human activities, such as business, administration, education, medicine, etc. in general, Statistics deal with data process, which is distinguished into two main phases:

- Data collection, classification, description and presentation,
- Conclusions on the characteristics of a group of data through the study of a (small) sub-group.
- In the next phase, where a generalization of the conclusions takes place, the theory of Probabilities is used.

The course aims at the introduction to the basic principles of the theory of Probabilities and the statistic methods used during the data process.

The goal is to help students understand the basic principles of probabilities and use them in the statistic techniques which are necessary in order to make conclusions during the data analysis.

After the successful completion of the course students will be able to:

- Collect, classify and present a group of data.
- Handle everyday probability problems.
- Recognize the most basic probability distributions.
- Make conclusions on the total of data using a (small) sub-group.
- Predict the values of a variable using regression analysis

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

- 1) Basic concepts of statistics (static population, sample sampling, types of variables).
- 2) Descriptive statistics (description of qualitative data, graphical methods for qualitative data description, description of quantitative data, graphical methods for quantitative data description, measures of central tendency, measures of variation, measures of asymmetry, irregular singularity).
- 3) Issues of probability theory (modeling uncertainty, sample space, events, definition of probability, principles of enumeration, combinatons, sequences, permutation), conditional probability.
- 4) Random variables, distribution function, discrete random variables, continuous random variables, distribution parameters of random variables. Bernoulli distribution, binomial distribution,

- geometrical distribution, Poisson distribution, normal distribution.
- 5) Estimation (confidence interval, confidence interval for the mean value of the population, confidence interval for the dispersion of the population).
- 6) Linear regression (the method of minimum squares, regression line), correlation correlation coefficient.

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class					
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	EXCEL software. Electronic lectures (PowerPoint, LATEX). Learning support through Open eClass platform.					
TEACHING ORGANIZATION	Activities Semester workload					
	Lectures 30					
	Exercises 20					
	Exercises using EXCEL 20					
	Case study	25				
	Autonomous study	30				
	Total (25 hours of workload per credit unit)	125				
STUDENT ASSESSMENT	Written final exam 70%.					
	Case study 30%.					

- Βασιλειάδης Γ., Καλογηράτου Ζ. & Μονοβασίλης Θ. (2019). Εισαγωγή στη Στατιστική με εφαρμογές σε SPSS & Excel (2η έκδ.). Εκδόσεις Ευγενία Αστ.Μπένου. [Κωδικός Βιβλίου στον Εύδοξο: 86198129]
- Καραγεώργος Δ. (2001). Στατιστική: Περιγραφική & Επαγωγική. Εκδόσεις Α. & Σ. Σαββάλας Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 8634]
- Κολυβά-Μαχαίρα, Φ., Μπόρα-Σέντα, Ε. & Μπράτσας, Χ. (2018). Στατιστική:Θεωρία-Εφαρμογές-Παραδείγματα στην R (3η έκδ.). Εκδόσεις Ζήτη Πελαγία & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 77120260]
- 4. Spiegel, Murray R. (1977). Πιθανότητες και Στατιστική (Schaum's outline series). ΕΣΠΙ Εκδοτική ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 2505]

## MATHEMATICAL ANALYSIS II

#### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATIC	S				
STUDIES	Undergradua	ate				
CODE	SEMESTER C					
TITLE	MATHEMATICAL ANALYSIS II					
TEACHING ACTI	TVITIES HOU W			2	CREDIT UNITS	
	Lectures and exercises 4 5			5		
ТҮРЕ	COMPULSOF	Υ				
PREREQUISITE:	Successful at	tendance of Ma	thematical ana	lysis	l is required	
LANGUAGE OF TEACHING AND	Greek / Engli	sh				
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS154/					

#### LEARNING OUTCOMES

#### Learning Outcomes

The objective of the course is the students to acquire the basic knowledge but also to understand basic concepts of the Mathematical Analysis II and Calculus II of the n-dimensional space, which are exploited/used in Informatics and computer science problems, such as for example signal processing, machine learning, telecommunications, optimization, etc.

Upon a successful completion of the course the student will be able:

- to understand basic concepts of vector calculus in n-dimensional space and the description and analysis of functions of several variables,
- to understand the description but also describe multivariable problems himself by introducing/using multivariable tools,
- to use the calculus of changes to solve similar problems such as optimization problems, data analysis,
- to monitor the construction of computational methods and algorithms, e.g. approximation methods, for the discrete solution of optimization problems, data analysis, robotic navigation, etc. with the help of a computer.
- to understand the terms encountered in simple partial differential equations.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

The course material includes, in brief, the following:

- Geometry of Euclidean space, representation of points in 3D space and n-dimensional space, addition of vectors in n-dimensional space, inner and outer product, cylindrical and spherical coordinates
- Vector calculus in n-space, Limits and continuity, differentiation, directional derivatives, extrema of real functions, extrema under conditions and Lagrange multipliers
- Applications to data analysis and optimization in multivariate problems
- Double and triple integrals over general parts, applications of double and triple integrals, the Theorem of change of variables
- Curves and surface integrals, area of a surface, integration of real functions on surfaces,

TEACHING AND LEARINING WETHODS	ASSESSIVIEINI					
INSTRUCTION	Class					
USE OF INFORMATION AND	Mathematica software.					
COMMUNICATION TECHNOLOGY	Electronic lectures (PowerPoint, LATEX)					
	Learning support through Open eClass platform.					
TEACHING ORGANIZATION	Activities	Semester workload				
	Lectures 26					
	Exercises 26					
	Autonomous study	73				
	Total (25 hours of workload per credit unit)	125				
STUDENT ASSESSMENT	Final written exam 70%.					
	Projects throughout the semester 30%.					

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

- Πετράκης Λ. Ανδρέας, Πετράκη Α. Δωροθέα & Πετράκης Α. Λεωνίδας. (2018). Μαθηματικά ΙΙ. Εκδόσεις ΘΑΛΗΣ. [Κωδικός Βιβλίου στον Εύδοξο: 77106980]
- Μασούρος Χ. & Τσίτουρας Χ. (2016). Μαθηματικά ΙΙ (2η έκδ.). Εκδόσεις Τσότρας Αν. Αθανάσιος, Κωδικός Βιβλίου στον Εύδοξο: 41955684]
- Τσίτσας Λ. (2003). Εφαρμοσμένος Διανυσματικός Απειροστικός Λογισμός (2η έκδ.). Εκδόσεις Συμμετρία. [Κωδικός Βιβλίου στον Εύδοξο: 45391]
- Finney R.L., Weir M.D. & Giordano F.R. (2012). Απειροστικός Λογισμός. Πανεπιστημιακές Εκδόσεις Κρήτης. [Κωδικός Βιβλίου στον Εύδοξο: 22689021]
- 5. J. Marsden -A. Tromba, Διανυσματικός Λογισμός, Μεταφραση Α . Γιαννόπουλος, Πανεπ. Εκδόσεις Κρήτης

## SEQUENTIAL DIGITAL ELECTRONICS

## ΓΕΝΙΚΑ

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradua	ate				
CODE			SEMESTER	С		
TITLE	SEQUENTIAL DIGITAL ELECTRONICS					
TEACHING ACTI			HOURS PER WEEK		CREDIT UNITS	
Lectures, exer	cises and labo	4		5		
ТҮРЕ	COMPULSOR	Υ				
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS119/					

## LEARNING OUTCOMES

Learning Outcomes

After the successful completion of the course students will :

- Understand the behavior and function of basic sequential elements, such as flip-flops, clock and immediate inputs, such as preset and reset.
- Understand the use of state diagrams and transition tables (between states) to analyze and design synchronous sequential digital circuits and systems.
- Understand the functions and use of registers, counters and serial adders, and the way they are used to develop more complex digital systems.
- Understand the role, functions and use of Algorithmic State Machines (ASMs και ASMDs) to analyze and design digital systems.
- Program a memory system and Programmable Logic Device (PLD) such as an FPGA, to implement digital systems.

## **General Competences**

- Individual work
- Group work
- Design and management of digital system projects
- Practice of existing and new technologies

## COURSE CONTENT

- Synchronous sequential circuits: Diagrams and state equations, excitation tables, state minimization and codification. Circuit design, such as synchronous counters, sequence detectors, parity generators, etc.
- Registers (burst and synchronous), counters, shifters, ring counters and Johnson counters
- Memories and programmable logic: RAM, ROM and PLA memories
- Algorithmic State Machines: ASM diagrams and timing issues. Data processors (and route). Check with the use of codifiers, multiplexers and PLAs. Design of circuits that perform arithmetic functions.
- Hardware Description Languages (VHDL): Description levels: Description of dataflow, behavior, register transfer and structural level. Signals, variables, processes and control structures. Simulation and examples using VHDL language.
- **Laboratory**: Development in FPGAs using VHDL and schematic circuit processor of synchronous sequential digital circuits.

TEACHING AND LEARINING WETHODS			
INSTRUCTION	Class		
USE OF INFORMATION AND	Special and Standard E-CAD Cir	rcuit design software	
COMMUNICATION TECHNOLOGY	Learning support through Ope	n eClass platform.	
TEACHING ORGANIZATION	Activities Semester workload		
	Lectures	26	
	Laboratory exercises on	26	
	methodology application		
	and case study analysis in		
	smaller groups		
	Teamwork case study. 12		
	Circuit design.		
	Short individual 26		
	assignments		
	Autonomous study	35	
	Total (25 hours of	125	
	workload per credit unit)		
STUDENT ASSESSMENT	I. Written final exam (100%) including:		
	- multiple choice questions		
	<ul> <li>role and interested part analysis on short case study</li> </ul>		
	<ul> <li>comparative assessment of theory elements</li> </ul>		
	II. Presentation of group laboratory project (optional 20%)		
	III. Laboratory exercises (optional 30%)		

## 

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. Morris, Mano M. & Ciletti, Michael D. (2018). Digital Design (6n ed.).
- 2. Ρουμελιώτης, Μάνος & Σουραβλάς, Σταύρος. (2017). Digital Design (2η ed.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68374428]
- 3. Brown, Stephen & Vranesic, Zvonko (2021). Digital System Design with VHDL (3η ed.) Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102070909]
- 4. Πογαρίδης Δημήτριος. (2019). Digital Design with the languages VHDL and VERILOG. Εκδόσεις ΔΙΣΙΓΜΑ ΙΚΕ. [Κωδικός Βιβλίου στον Εύδοξο: 86192991]
- 5. Morris, Mano M., Kime, Charles R. & Martin, Tom. (2016). Design of Logic Circuits and Computers (5η ed.).
- 6. Παπαοδυσσεύς, Κωνσταντίνος.(2017). Logic Design of Digital Circuits. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68373919]
- 7. Ευσταθίου, Κωνσταντίνος. (2019). Digital Design (2η ed.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 86057354]
- 8. Dally, William J. & Harting, Curtis R. (2015). Digital Design.

#### - Scientific Papers:

1. Dossis, M. F. (1995). "Standard Formats for Register Transfer Level VHDL Modelling", The European Simulation Symposium 95, Erlangen-Nuremberg, 26-28 October 1995, pp. 423-427

# SEMESTER D

## COMPUTER NETWORKS

## GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE	SEMESTER D				
TITLE	COMPUTER NETWORKS				
TEACHING ACTI	TIVITIES HOURS PER CREDI			CREDIT UNITS	
	Lectures and exercises 4 6			6	
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS136/				

## LEARNING OUTCOMES

### Learning Outcomes

The course aims at the introduction of students to computer networks. It familiarizes them with the concepts of communication data, networks and communication protocols. More specifically, the course covers issues related to the Internet, Internet Service Providers (ISPs), Web, analysis of Internet protocol stack TCP/IP and determination of the governing principles. Exercises based on the curriculum are conducted in NS2 software simulation programme and Wireshark packet capturing and analysis tool.

After the successful completion of the course students will be able to:

- 1. understand the basic principles and concepts of networks
- 2. recognize the basic communication model
- 3. approach the basic principles based on TCP/IP architecture
- 4. record and analyze internet flow
- 5. design and run network simulation.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

The course covers the following topics:

- Computer networks and internet
- Application layer
- Transfer layer
- Network layer
- Connection layer and local networks
- Networking and multimedia.

-	
TEACHING AND LEARNING METHODS	ASSESSMENT
INSTRUCTION.	Lecture using audiovisual

INSTRUCTION.	Lecture using audiovisual media.			
	Practical exercises.			
USE OF INFORMATION AND	Use of specialized software of network graphic simulation.			
COMMUNICATION TECHNOLOGY	Handling and solving problems of managing real network			
	devices.			
	Learning support through Open eClass platform.			
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Exercises	26		
	Semester assignment	26		
	Autonomous study	72		
	Total (25 hours of 150			
	workload per credit unit)			
STUDENT ASSESSMENT	Written final exam 80% and exercises 20%.			
	<ol> <li>Written final exam including:         <ul> <li>multiple choice questions</li> <li>problem solution on acquired knowledge</li> <li>theory assessment.</li> </ul> </li> </ol>			
	2. The examination on exercises includes a) the assessment of students' written laboratory reports b) the assessment of laboratory skills obtained through examination with the use of laboratory equipment.			

- Kurose, James F. & Ross, Keith W. (2021). Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω (8<sup>η</sup> έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070624]
- Peterson, Larry L. & Davie, Bruce S. (2009). Δίκτυα Υπολογιστών: Μία προσέγγιση από τη σκοπιά των συστημάτων (4<sup>η</sup> έκδ.), Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13954]
- Tanenbaum, Andrew S., Feamster Nick & Wetherall David. (2021). Δίκτυα Υπολογιστών (6<sup>η</sup> αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070446]
- 4. Comer, Douglas E. (2003). Διαδίκτυα με TCP/IP: Αρχές, Πρωτόκολλα και Αρχιτεκτονικές (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13637]

Recommended Bibliography in English:

- 1. Kurose F. James and Ross W. Keith, (2021), Computer Networking: A Top Down approach", Pearson Publications
- 2. Peterson L. L. and Davie B. S., (2009), "Computer Networks: A Systems Approach", Elsevier Publications

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## DATABASES

### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE			SEMESTER	D	
TITLE	DATABASES				
TEACHING ACTI	TIVITIES		HOURS PER WEEK		CREDIT UNITS
Lectures, exer	cises and labo	ratory practice	4		6
ТҮРЕ	COMPULSOF	Y			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS133/				

## LEARNING OUTCOMES

Learning Outcomes The course introduces students to relational databases, with emphasis on their design and the application of databases using SQL relational language. After the successful completion of the course, students will:

- 1. Know the basic concepts on Database Management Systems, the relational data model and their design by applying the principles of the Entity-Relationship model
- 2. Understand the capabilities and advantages of relational databases
- 3. Know and apply relational algebra, relational calculus, functional dependencies and normalization
- 4. Know and apply Structured Query Language (SQL)
- 5. Design effective and efficient database systems
- 6. Implement database applications using SQL.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

- Introduction to the basic concepts of data storage and management using DBMS (Data Base Management Systems).
- Comparison between the Relational Model of Data Storage and the traditional file organization.
- Database models.
- Introduction to database relational systems.
- Design of relational databases with the application of entity relationship model
- SQL language
- Relational algebra, relational calculus
- Functional dependencies, normalization.

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION.	Lecture, discussion and student participation. PowerPoint	
	presentations. Laboratory exercises	
USE OF INFORMATION AND	Theory presentation with PowerPoint.	
COMMUNICATION TECHNOLOGY	Electronic self-assessment projects/exercises.	
	Learning support through Open eClass platform.	

TEACHING ORGANIZATION	Activities	Semester workload	
	Lectures	26	
	Exercises	26	
	Semester	26	
	assignment/project		
	Autonomous study	72	
	Total (25 hours of workload per credit unit)	150	
STUDENT ASSESSMENT	Written final exam 70% and projects/exercises examination 30%		
	<ol> <li>The final written exam includes:         <ul> <li>multiple choice questions</li> <li>problem solution on acquired knowledge</li> </ul> </li> </ol>		

_	theory	assessment
	theory	assessment

2. The examination on projects/exercises includes
a) the assessment of students' reports
b) the assessment of skills obtained through examination
with the use of laboratory equipment.

- Hoffer, J.A., Ramesh, V. & Topi, H. (επιμ. Βαΐτης Μιχαήλ & Καβακλή Ευαγγελία). (2017). Βάσεις Δεδομένων: Σύγχρονη Διαχείριση (11η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50656016]
- Garcia-Molina, Hector, Ullman, Jeffrey D. & Widom, Jennifer. (2012). Συστήματα Βάσεων Δεδομένων (σε έναν τόμο). Εκδόσεις ΙΤΕ & Πανεπιστημιακές Εκδόσεις Κρήτης. [Κωδικός Βιβλίου στον Εύδοξο: 22690971]
- Παπαδόπουλος Απόστολος Ν., Τζουραμάνης Θεόδωρος, Γούναρης Αναστάσιος & Μανωλόπουλος Ιωάννης (2020). Συστήματα Βάσεων Δεδομένων (2η έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94702113]
- 4. Silberschatz, Abraham, Korth, Henry F. & Sudarshan, S. (2021). Συστήματα Βάσεων Δεδομένων (7η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070677]
- Elmasri, Ramez & Navathe, Shamkant B. (επιμ. Χατζόπουλος M.). (2016). Θεμελιώδεις Αρχές Συστημάτων Βάσεων Δεδομένων (7η έκδ.). Εκδόσεις Δίαυλος Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50662846]

## MICROPROCESSORS – MICROCONTROLLERS I

#### GENERAL

30000	SCIEINCE	SCIENCE			
DEPARTMENT	INFORMATIC	S			
STUDIES	Undergradua	ate			
CODE			SEMESTER	D	
TITLE	MICROPROC	ESSORS - MICR	OCONTROLLER	S I	
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
	Lectures 2				
	Labo	ratory practice	2		
	4 6			6	
ТҮРЕ	COMPULSORY				
PREREQUISITE:	COMBINATORIAL DIGITAL ELECTRONICS				
LANGUAGE OF TEACHING AND EXAMS:	Greek				
OFFERED TO ERASMUS STUDENTS	YES (IN GREEK)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS110/				

## LEARNING OUTCOMES

### Learning Outcomes

The course aims at familiarizing students with basic principles of microcomputing systems and introducing them to the logic programming of INTEL's MCS51 family microcontrollers.

After the successful completion of the course students will:

- 1. Know the basic principles of microcomputing systems.
- 2. Understand the differences between microprocessors and microcontrollers.
- 3. Know the architecture of INTEL's MCS-51 family microcontrollers.
- 4. Know symbolic programming language and run basic application programmes of MCS-51 family microcontrollers in order to control simple peripheral devices.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Promotion of free, creative and deductive thinking

#### **COURSE CONTENT**

- Introduction to Microcontrollers: terminology, Central Processing Unit (CPU), RAM and ROM memory, buses, input/output devices, programmes, differences and similarities between microprocessors and microcontrollers.
- Description of Hardware: review of MCS-51 family, microcontroller 8051 Pinout, timing and machine cycle, memory organization, special function registers, external memory, reset function.
- 8051 instruction sets: address buses, instruction types, instruction description, pseudoinstructions.
- Interrupts: interrupt sources, handling interrupts, service line, priority, interrupt signal, interrupt exit, analysis of various types of interrupts, registers during interrupts, size of interrupt service subprogrammes.
- Programmes: description of MCS-51 family microcontrollers function software, run and analysis of programmes.
- System application with 8051: development of programmes in symbolic language, development of systems with the use of 8051 microcontroller.

TEACHING AND LEARNING METHODS	- ASSESSMENT
INSTRUCTION	Frontal teaching
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Presentations using PowerPoint, microcontroller programme analysis using simulation software, laboratory exercises with the use of computer and MCS-51 Microcomputer Trainer hardware, interactive communication with the students with

	the use of computer and MCS-51 Microcomputer Trainer hardware, interactive communication with the students with the use of eClass.			
TEACHING ORGANIZATION	Activities Semester workload			
	Lectures	52		
	Exercises	52		
	Study and analysis of books and articles.	20		
	Autonomous study 26			
	Total (25 hours of workload per credit unit)	150		
STUDENT ASSESSMENT	There is a mid-term exam scoring 30% of the final grade.			
	The final exam scores 40% of the final grade.			
	Concerning the laboratory pa use of hardware available Microcomputer Trainer) scorin	rt, there is an exam with the in the laboratory (MCS-51 g 30% of the final grade.		

- Suggested Bibliography:

- Πογαρίδης, Δημήτριος. (2020). Ενσωματωμένα Συστήματα: Οι Μικροελεγκτές AVR και ARDUINO (3η έκδ.). Εκδόσεις ΔΙΣΙΓΙΜΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94689582]
- Καλοφωλιάς, Δημήτριος. (2017). Προγραμματισμός του Μικροελεγκτή AVR ATMega328. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68369856]
- Καλοβρέκτης, Κωνσταντίνος. (2018). Βασικές Δομές Ενσωματωμένων Συστημάτων. Εκδόσεις Μαρκέλλα Ι. Βαρβαρήγου. [Κωδικός Βιβλίου στον Εύδοξο: 77119177]
- 4. Παπάζογλου, Παναγιώτης & Λιωνής, Σπύρος-Πολυχρόνης. (2021). *Ανάπτυξη Εφαρμογών με το Arduino* (3η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102071811]
- Μπούρας, Αριστείδης Σ. & Κάππος, Ιωάννης Θ.,. (2021). ARDUINO: Αλγοριθμική, Προγραμματισμός και Εφαρμογές. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070452]

- Supplementary Bibliography:

- 1. Φωτιάδης, Δημήτριος. (2010). *Μικροεπεξεργαστές–Μικροελεγκτές: Ο Μικροελεγκτής 8051.* Αυτοέκδοση. Θεσσαλονίκη. [ISBN: 9789609317900
- Καραϊσκος, Χρήστος. (2010). Ο Μικροελεγκτής 8051. Σύγχρονη Εκδοτική. Αθήνα. [ISBN: 9789606674518]
- Αλατσαθιανός, Σταμάτης. (2008). Ανάπτυξη Συστημάτων με Μικροελεγκτές 8051. Αυτοέκδοση. Αθήνα. [ISBN: 9789609259613]
- Κόγιας, Γεώργιος. (2005). Αρχιτεκτονική οργάνωση και προγραμματισμός μικροϋπολογιστών.
   Σύγχρονη Εκδοτική. Αθήνα. [ISBN: 9608165873]
- 5. Αλατσαθιανός, Σταμάτης. (2006). Ανάπτυξη συστημάτων με μικροελεγκτές. Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. Αθήνα. [ISBN: 9603872148]
- 6. Myke, Predko. (2000). *Προγραμματίζοντας τον μικροελεγκτή 8051*, Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. Θεσσαλονίκη. [ISBN: 9608050340]

- Scientific Magazine: RTC (<u>www.rtcmagazine.com</u>)

## COMPUTER ARCHITECTURE

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER D				
TITLE	COMPUTER ARCHITECTURE				
TEACHING ACTIVITIES		HOURS PEF WEEK	2	CREDIT UNITS	
	Lectures and exercises				
		2			
	-	4		6	
ТҮРЕ	COMPULSORY				
PREREQUISITE:	Sequential Digital Electronics				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS143/				

## LEARNING OUTCOMES

### Learning Outcomes

After the successful completion of the course students will :

- Understand the nature, structure, functions, hierarchy and programming of synchronous computer architecture
- Use MSI and VLSI circuits in order to develop a computing machine
- Understand the functions, structure, symbolic language and programming of an educational computer (TRN)
- Understand the Instruction Set Architecture (ISA) of synchronous computers
- Analyze, synthesize and programme data routes and processing units
- Analyze, synthesize and programme microprogrammable and wired control units of Central Processing Unit (CPU)
- Analyze and design main and peripheral (assistive) memory systems

## **General Competences**

- Individual work
- Group work
- Project design and management
- Practice of existing and new technologies

#### **COURSE CONTENT**

- **Computer layers:** Digital logic and information representation. Computer hardware layers, instruction and machine cycles, and data route in registers. Register transfer with multiplexing and three state bus. Relationship among machine language, symbolic language and high level languages.
- **CPU internal structure:** Registers, shifters, arithmetic and logic unit, multiplexing, buses and control signals. Data processing with microfunctions. CPU instruction architecture. Application of control unit using microprogramming or wiring. Microinstructions, microcodes and microprogramme sequencing.
- Memory organization: Memory hierarchy, main memory, secondary (peripheral) memory, memory extension, memory address map. Speed characteristics of main memory and acceleration methods. Associative and cache memory. Virtual memory, address space / memory space, paging and segmentation.
- Input/Output organization: Review of peripheral devices, connection, communication and synchronization. Synchronous and asynchronous buses. Communication with handshake, sampling, interrupts and Direct Memory Access. independent I/O and memory mapped I/O.



## **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

- Παπακωνσταντίνου, Γ. Κ., Τσανάκας, Π. Δ. & Φραγκάκης, Γ. Π. (1999). Αρχιτεκτονική Υπολογιστών. Εκδόσεις Συμμετρία. [Κωδικός Βιβλίου στον Εύδοξο: 45342]
- Tanenbaum, Andrew S. (2000). Η Αρχιτεκτονική των Υπολογιστών: Μια δομημένη προσέγγιση (4η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13759]
- Stallings, William. (2020). Οργάνωση και Αρχιτεκτονική Υπολογιστών (11η έκδ.). Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94692327]
- Νικολός, Δημήτριος Β. (2017). Αρχιτεκτονική Υπολογιστών. Εκδόσεις Παν. Παπακωνσταντίνου. [Κωδικός Βιβλίου στον Εύδοξο: 68370526]
- Harris, Sarah L. & Harris, Money David. (2019). Ψηφιακή Σχεδίαση και Αρχιτεκτονική Υπολογιστών (Έκδοση ARM<sup>®</sup>). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 86055864]

## - Scientific Paper:

Δόσης, Μ.Φ. (2007). "Σημειώσεις στην αρχιτεκτονική της ΚΜΕ και ασκήσεις με παραδείγματα διαδρομής δεδομένων (μονάδων επεξεργασίας)". ΤΕΙ Δυτικής Μακεδονίας.

## **OBJECT-ORIENTED APPLICATION DEVELOPMENT WITH JAVA**

## ΓΕΝΙΚΑ

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER D				
TITLE	OBJECT-ORIENTED APPLICATION DEVELOPMENT WITH JAVA			r with Java	
TEACHING ACTIVITIES		HOURS PER WEEK	2	CREDIT UNITS	
Theory (lec	Theory (lectures), Exercises (laboratory)		4		6
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE, but the knowledge offered in Introduction to computer programming and Object-oriented programming with C++ is optative				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS132/				

## LEARNING OUTCOMES

## Learning Outcomes

After the successful completion of the course students will be able to:

- 1. Understand the basics of JAVA programming language.
- 2. Understand the concpets of interface and implementation.
- 3. Understand and familiarize with the concepts of inheritance, polymorphism, interface and type determination during run time.
- 4. Understand the usage of Swing library.
- 5. Create Applets and Java applications.
- 6. Create applications of parallel code execution with threads.
- 7. Understand synchronization issues of parallel/multithreaded code.

#### **General Competences**

- Understanding of the nature, structure and functionalities of object-oriented programming languages and especially Java.
- Understanding of the concepts of encapsulation, polymorphism and inheritance.
- Understanding of class structure, members and methods.
- Understanding of abstract classes and their use in Application Programming Interface (API).
- Understanding of template class design issues and their use in data structures, with emphasis on encapsulation and information hiding.
- Understanding of exception mechanism and synthesis of pieces of code that utilize the specific mechanism.
- Understanding of parallel code through threads, advanced issues of multitasking and hierarchy class synthesis through which parallel in nature problems can be solved.
- Knowledge, analysis, design and implementation of programmes in window (JavaFX) and internet environment.

## COURSE CONTENT

Study of basic concepts and models related to object-oriented programming using JAVA language.

The course covers the following topics: differences between Java and C++, advantages of Java. Introduction to Java: classes, objects, messages, variables, methods, constructors, access control and overloading. Basic classes and packages. Inheritance, polymorphism, abstract classes, type determination during run time. OOP design, interfaces, inner classes, packages. Exceptions, exception handling. Threads and thread synchronization. Input/Output operations. Applet programming. Abstract window toolkit (AWT), components, containers, graphics, fonts, colors, layouts, event handling, images, animation. JavaFX. Object-oriented data structures with template classes.

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lecture, discussion and student participation. PowerPoint presentations, which include analytical notes to help students understand the course. PowerPoint presentations, solved and unsolved exercises, extra exercises/projects for the students to solve. Learning process support through Open eClass platform.				
TEACHING ORGANIZATION	Activities Semester workload				
	Lectures 26				
	Laboratory or Exercises	26			
	Semester 26				
	assignment/projectAutonomous study72				
	Total (25 hours of workload per credit unit)150				
STUDENT ASSESSMENT	Written final exam 70% and projects/exercises examination 30%				
	1. The final written exam includes:				
	<ul> <li>multiple choice questions</li> <li>problem solution on acquired knowledge</li> <li>theory assessment</li> </ul>				
	2. The examination on projects	s/exercises includes			
	<ul><li>a) the assessment of students' reports</li><li>b) the assessment of skills obtained through examination with the use of laboratory equipment</li></ul>				

- Suggested Bibliography:
- Barnes, David J. & Kolling, Michael. (2018). Αντικειμενοστρεφής Προγραμματισμός σε Java: Μια πρακτική εισαγωγή με χρήση του BlueJ (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο:77108692]
- 2. Elliotte, Rusty Harold. (2016). *Προγραμματισμός Δικτυακών Εφαρμογών με Java* (4η αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 59373748]
- Horstmann, Cay. (2021). Η γλώσσα προγραμματισμού JAVA: Αναλυτική Προσέγγιση. Εκδόσεις Broken Hill Publishers LTD. [Κωδικός Βιβλίου στον Εύδοξο: 94643857]
- 4. Deitel, Paul J. & Deitel, Harvey J. (2015). *Java: Προγραμματισμός* (10η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50659320]
- 5. Deitel, Paul J. & Deitel, Harvey J. (2011). *Προγραμματισμός Internet & World Wide Web* (4η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12543770]
- Supplementary Bibliography:
- Savitch, Walter. (2016). Απόλυτη Java (περιέχει CD). Εκδόσεις ΙΩΝ. [Κωδικός Βιβλίου στον Εύδοξο: 59380297]
- Savitch, Walter (2015). Java: Μία εισαγωγή στην επίλυση προβλημάτων και στον προγραμματισμό (7η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655978]
- Liang, D.Y. (2015). *Java: Εισαγωγή στον προγραμματισμό* (10η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655980]
- 4. Cadenhead, Rogers. (2013). *Πλήρες Εγχειρίδιο της Java 7* (6η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 33094851]
- 5. Cadenhead, Rogers.(2012).*Sams Teach Yourself Java in 21 Days (Covering Java 7 & Android)* (6th ed.) Pearson.

# SEMESTER E

## DISTRIBUTED SYSTEMS

## GENERAL

SCHOOL	SCIENCE			
DEPARTMENT	INFORMATICS			
STUDIES	Undergraduate			
CODE	SEMESTER E			
TITLE	DISTRIBUTED SYSTEMS			
TEACHING ACTIVITIES		HOURS PEF WEEK	R CREDIT UNITS	
Lectures and exercises		4	5	
	1			
ТҮРЕ	COMPULSORY			
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND	Greek / English			
EXAMS:				
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS127/			

## LEARNING OUTCOMES

### Learning Outcomes

The goal of the course is to familiarize students with the basic concepts of sitributed operation in a computer network. More specifically, topics such as structure, characteristics, communication and safety of distributed systems are presented.

After the successful completion of the course students will :

- Understand the design and operations of distributed systems
- Handle communication issues in distributed systems
- Understand transparency issues in distributed systems
- Understand synchronization issues in distributed systems
- Handle security issues
- Use ordinary UNIX distributed tools and programme with usual distributed methods

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Individual work
- Group work

## **COURSE CONTENT**

- Distributed system characteristics, impact factors, client-server model, communication between processes, sockets, Remote Procedure Call (RPC)-synchronous and asynchronous, Remote Method Invocation (RMI), message-oriented communication
- Distributed system synchronization, security policies and mechanisms, distributed objects, distributed file systems. More specifically, there is reference to distributed system discrepancy and its development, extension methods and techniques, and the problems that occur.
- The concept of process and its major role in a distributed system. Distinction between client and server process, client and server creation, client and server component and their combination. Communication and how it is achieved through sockets and procedure or method calls
- Extensive reference to distributed system security
- Globus system Policy and security mechanisms, security architecture (protocols). NFS, AFS distributed file systems



- Tanenbaum, Andrew S. & Van Steen, Maarten. (2006). Κατανεμημένα Συστήματα: Αρχές και Υποδείγματα. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13777]
- Coulouri,s George, Dollimore, Jean & Kindberg, Tim & Blair, Gordon. (2020). Κατανεμημένα Συστήματα Αρχές και Σχεδίαση (2η έκδ.). Εκδόσεις DA VINCI Μ.Ε.Π.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94642613]
- Ben-Ari, M. (2015). Αρχές Προγραμματισμού με Ταυτοχρονισμό και Κατανομή Λογισμικού (2η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655947]
- 4. Κάβουρας, Ι.Κ., Μήλης Ι.Ζ., Ρουκουνάκη Α.Α. & Ξυλωμένος Γ.Β. (2011). Κατανεμημένα Συστήματα με Java: Συστήματα Υπολογιστών (Τόμος ΙΙΙ) (3<sup>n</sup> έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12533080]
- Μάργαρης, Αθανάσιος Ι. (2008). ΜΡΙ: Θεωρία & Εφαρμογές. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548957]

## WEB PROGRAMMING

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER E				
TITLE	WEB PROGRAMMING				
TEACHING ACTIVITIES		HOURS PER WEEK	CR U	EDIT NITS	
Lectures and exercises		4		5	
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS128/				

## LEARNING OUTCOMES

Learning Outcomes Introduction to the basic concepts of network (topologies, architectures, protocols). Introduction to the programming languages used for development of internet applications (HTML, CSS, JavaScript, PHP)

Design and development of simple webpages and internet applications using template technologies.

After the successful completion of the course students will:

- 1. Have basic knowledge of internet protocols (HTTP(S)/TCP/IP)
- 2. Have basic knowledge of basic markup (HMLT, CSS) and programming (Javascript/PHP) languages used to develop internet applications.
- 3. Have knowledge of three-tier model of application development and its application in web based applications.
- 4. Know the implementation, functionality and structural pieces of web servers.
- 5. Know how web based programmes run.

#### General Competences

Search, analysis and synthesis of data and information using the necessary technologies.

## COURSE CONTENT

- Internet protocols (HTTP(S)/TCP/IP)
- Markup (HMLT, CSS) and programming (JavaScript/PHP) languages used for internet application development.
- Three-tier model of application development and its application in web based applications.
- Implementation, functionality and structural pieces of web servers.
- How web based programmes run.

## **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class			
USE OF INFORMATION AND	Learning support through Open eClass platform.			
COMMUNICATION TECHNOLOGY	Laboratory			
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	39		
	Exercises 26			
	Autonomous study 26			
	Teamwork case study 59			
	Total (25 hours of workload per credit unit)	150		


1. The final written exam includes:
- multiple choice questions
<ul> <li>problem solving</li> </ul>
<ul> <li>comparative assessment of theory elements</li> </ul>
<ul> <li>programme code writing</li> </ul>
2. The examination on exercises includes:
a) the assessment of students' written laboratory reports
b) the assessment of laboratory skills obtained through
examination with the use of laboratory equipment

#### **RECOMMENDED BIBLIOGRAPHY**

- Deitel, Paul J. & Deitel, Harvey J. (2011). Προγραμματισμός Internet & World Wide Web (4η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12543770]
- Δουληγέρης, Χρήστος, Μαυροπόδη, Ρόζα, Κοπανάκη, Εύη & Καραλής, Απόστολος. (2021). Τεχνολογίες και Προγραμματισμός στον Παγκόσμιο Ιστό (2η έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68407011]
- 3. Rafe, Colburn, Kyrnin, Jennifer & Lemay, Laura. (2016). Πλήρες Εγχειρίδιο HTML 5, CSS και JavaScript (7η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 59357307]

#### SOFTWARE TECHNOLOGY

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE			SEMESTER	E	
ΤΙΤΛΟΣ ΜΑΘΗΜΑΤΟΣ	SOFTWARE 1	<b>TECHNOLOGY</b>			
TEACHING ACTI	CTIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
		Laboratory	2		
		Theory	2		
			4		5
ТҮРЕ	COMPULSOF	RΥ			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / Engli	ish			
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in Englis	YES (in English)			
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	<u>ses/CS129/</u>		

#### LEARNING OUTCOMES

#### Learning Outcomes

Necessity to use modeling tools. Why do we model? Description of the problems that occur from complex application development and deal with analysis, design, implementation, testing and maintenance of these applications. How modeling tools help us solve problems related to the development of Large Scale Applications. Definition of the Model concept. Modeling principles. Object Oriented Modelling. Introduction to UML. Historical review. Structural elements of UML (Things, Relationships, Diagrams). Description of separate diagrams (Class Diagram, Object Diagram, Component diagram, Use case diagram, Sequence diagram, State diagram, Activity diagram, Deployment diagram). Modeling of a problem using UML.

After the successful completion of the course students will :

- 1. Understand the importance of modeling
- 2. Describe the problems that arise from complex application development and deal with analysis, design, implementation, testing and maintenance of these applications.
- 3. Understand how modeling tools help us solve problems related to the development of large scale applications.
- 4. Use modeling tools in order to model the statistic and dynamic characteristics of a complex system.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Project design and management
- Individual work

#### COURSE CONTENT

- Introduction to UML.
- Necessity to use modeling tools. Why do we model?
- Modeling principles. Object Oriented Modelling.
- Structural elements of UML (Things, Relationships, Diagrams).
- Description of separate diagrams (Class Diagram, Object Diagram, Component diagram, Use case diagram, Sequence diagram, State diagram, Activity diagram, Deployment diagram).
- Problem modelling with the use of UML.



#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. Pressman, Roger S. & Maxim, Bruce R. (επιμ. Πρέντζα Αδριάνα & Σαΐδης Κωνσταντίνος). (2018). Τεχνολογία Λογισμικού (8η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68374068]
- 2. Lethbridge, T.C. & Laganiere, R. (2016). Μηχανική Αντικειμενοστραφούς Λογισμικού. Εκδόσεις.Α.Τζιόλα & Υιοί Α.Ε [Κωδικός Βιβλίου στον Εύδοξο: 59384106]
- 3. Sommerville, Ian. (2009). *Βασικές Αρχές Τεχνολογίας Λογισμικού* (8η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13625]
- 4. Dennis, Alan, Wixom, Haley Barbara & Tegarden, David. (2010). Ανάλυση και Σχεδιασμός Συστημάτων με τη UML 2.0: Μία Αντικειμενοστρεφής Προσέγγιση (3η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21781]
- 5. Γερογιάννης, Β., Κακαρόντζας, Γ., Καμέας, Α., Σταμέλος, Ι. & Φιτσιλής, Π. (2006). Αντικειμενοστρεφής Ανάπτυξη Λογισμικού με τη UML. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13597]
- 6. Χατζηγεωργίου, Αλέξανδρος Ν. (2005). Αντικειμενοστρεφής Σχεδίαση: UML, Αρχές, Πρότυπα και Ευρετικοι Κανόνες. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13600]
- 7. Pfleeger, Lawrence Snari. (2011). Τεχνολογία Λογισμικού: Θεωρία και Πρακτική (2η αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13009253]:

#### COMPUTER NETWORK DESIGN

#### GENERAL

SCHOOL	SCIENCE	SCIENCE			
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE			SEMESTER	E	
TITLE	COMPUTER	NETWORK DESI	GN		
TEACHING ACTI	rivities		HOURS PER WEEK		CREDIT UNITS
	Lectures	and exercises	4		5
ТҮРЕ	COMPULSOR	Υ			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / Engli	sh			
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in Englis	YES (in English)			
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS150/		

#### LEARNING OUTCOMES

Learning Outcomes

The course aims at introducing students to design and implementation of networks. More specifically, the topics presented are related to network topology, wiring and structured wiring, current network and internet device technologies. Exercises are conducted using CCNA Packet Tracer.

After the successful completion of the course students will :

- 1. Understand the basic principles and concepts of networks.
- 2. Understand the basic principles of structured wiring
- 3. Compare the current network technologies
- 4. Analyze needs and design basic networks
- 5. Configure, operate and handle errors in medium seize networks

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

This course is the continuity of Computer Networks and is based on the knowledge obtained in that. More specifically, the following topics are covered:

- Basic concepts of network and metric performance
- Network topologies
- Network interface
- Local networks
- Structured wiring
- Network device control: routers and switches, console connection
- Introduction to IOS operating system, basic configuration, remote connection
- Introduction to package routing and promotion
- Subnetting, supernetting, Variable Length Subnet Masking (VLSM).
- Static and dynamic routing
- RIPv1, RIPv2, EIGRP, OSPF routing protocols



#### **RECOMMENDED BIBLIOGRAPHY**

- McQuerry, Stephen. (2006). CCNA Αυτοδιδασκαλία: Διασύνδεση Συσκευών Δικτύου Cisco (ICND) (2<sup>η</sup> έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13529]
- Αρσένης, Σπύρος Δ. (2009). Σχεδιασμός και Υλοποίηση Δικτύων (2<sup>η</sup> έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13900]
- Peterson, Larry L. & Davie, Bruce S. (2009). Δίκτυα Υπολογιστών: Μία προσέγγιση από τη σκοπιά των συστημάτων (4<sup>n</sup> έκδ.), Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13954]
- 4. Comer, Douglas E. (2003). Διαδίκτυα με TCP/IP: Αρχές, Πρωτόκολλα και Αρχιτεκτονικές (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13637]
- Kurose, James F. & Ross, Keith W. (2021). Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω (8<sup>n</sup> έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070624]

## SPECIAL PROGRAMMING TOPICS

#### GENERAL

SCHOOL	SCIENCE	SCIENCE			
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE			SEMESTER	E	
TITLE	SPECIAL PROGRAMMING TOPICS				
TEACHING ACTI	TIVITIES		HOURS PER WEEK	2	CREDIT UNITS
Theory (lectures), Exercis		es (Laboratory)	4		5
ТҮРЕ	COMPULSOF	Υ			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	<u>ses/E61/</u>		

## LEARNING OUTCOMES

#### **Learning Outcomes**

The goal of the course is to familiarize students with advanced programming concepts, which combine different fields and are extensively applied.

After the successful completion of the course students will:

- Understand the concepts of recursion and the mechanism behind its operation (activation records).
- Understand the concepts of dynamic polymorphism and virtual method tables (vtable).
- Familiarize with the capacities of synchronous programming languages and the direct support they provide to advanced architectures.
- Understand the whole support framework of parallel programming and the respective control structures, especially the support provided from the combination of hardware and operating system.
- Familiarize with performance measurement techniques of code pieces, code improvement and the various restrictions referred to the underlying architectures.
- Understand the various forms of file organization, their advantages and disadvantages.
- Familiarize with the creation and use of dynamic libraries as extras in applications.

Familiarize with application interface with local or remote database servers.

## General Competences

- Group work
- Project design and management
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### **COURSE CONTENT**

- Unit 1: The concept of recursion and activation records mechanism to support recursive function calls. The relationship of programme stack to function call and the structure of activation records compared to non-recursive functions. Seize modification of programme stacks.
- Unit 2: Dynamic interface and method calls. The class instance record concept. Pointer tables to virtual function code (vtables). The key-words virtual and override. Binary compatibility issues in large scale software development.
- Unit 3: The capacities offered by synchronous computing languages for advanced architecture support. Support of vector processing and data structure alignment in memory. GPU process

and OpenCL and C++ AMP templates. Combination of C++ class implementation with assembly programming language.

- Unit 4: The support framework of parallel programming and the respective control structures, such as semaphores, monitors, spinlocks, etc. Race conditions, deadlocks and starvation problem solving. Correlation of control structures with respective low level commands of processors and functions of the operating system. Multi-core programming, threads and affinity masks.
- Unit 5: Code execution timing with various low and high accuracy approaches. Code improvement in various levels, keeping in mind factors such as branch prediction, branch elimination, inline functions, calls and return from functions without stack (declspec naked), code alignment, reduction of loop repetition, elimination of code dependence, read-after-write, write-after-read, SoA and AoS, improvement of data array and locality, stack improvement, best use of cache.
- Unit 6: Text and binary files. Serial and random access files. Basic actions of addition, modification and deletion of data in serial and random access files, and indexed files. External classification of binary files. Files that combine classified and non-classified parts, and file headings, combined with the above actions.
- Unit 7: Creation and use of Dynamic Load Libraries (DLLs) in programmes. Combination of managed and unmanaged code.
- Unit 8: Techniques of application connection with servers in local or remote network for database support.

	ASSESSIVIEIVI					
INSTRUCTION	Lecture, discussion and stu	udent participation. Use of				
	examples and PowerPoint	presentations, which include				
	analytical notes to help studen	ts understand the course.				
USE OF INFORMATION AND	PowerPoint presentations, so	lved and unsolved exercises,				
COMMUNICATION TECHNOLOGY	extra exercises for the students to solve.					
<b>TEACHING ORGANIZATION</b>	Activities	Semester workload				
	Lectures	26				
	Laboratory or Exercises 26					
	Autonomous study 73					
	Total (25 hours of workload per credit unit)	125				
STUDENT ASSESSMENT	Written exams which includ questions that cover the c students are given individual project that covers various top	e open and multiple choice urriculum. During the exam or group assignments and a ics simultaneously.				

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

- Suggested Bibliography:

- Savitch, Walter (2015). Java: Μια εισαγωγή στην επίλυση προβλημάτων και στον προγραμματισμό (7η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655978]
- Deitel, Paul J. & Deitel, Harvey J. (2015). *Java: Προγραμματισμός* (10η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50659320]
- Liang, D.Y. (2015). Java: Εισαγωγή στον προγραμματισμό (10η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655980]
- Barnes, David J. & Kolling, Michael. (2018). Αντικειμενοστρεφής Προγραμματισμός σε Java: Μια πρακτική εισαγωγή με χρήση του BlueJ (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο:77108692]
- 5. Cadenhead, Rogers. (2013). Πλήρες Εγχειρίδιο της Java 7 (6η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 33094851]

## - Supplementary Bibliography:

- 1. Akhter, S. and Roberts, J. (2006) Multi-core programming: increasing performance through software multi-threading. USA, Intel Press. 336 pp. ISBN 978-81-8333-392-4.
- 2. Banger, R. and Bhattacharyya, K. (2013) OpenCL programming by example. UK, Packt Publishing Ltd. 287 pp. ISBN 978-1-84969-234-2.
- 3. Barlas, G. (2015) Multicore and GPU programming: An integrated approach. USA, Morgan Kaufmann. 677 pp. ISBN 978-0-12-417137-4.
- Ben-Ari, M. (2016) Αρχές προγραμματισμού με ταυτοχρονισμό και κατανομή λογισμικού. 2η Έκδοση. Εκδόσεις Τζιόλα. 398 σελ. ISBN 978-960-418-591-7.
- 5. Bik, A.J.C. (2004) The software vectorization handbook: applying multimedia extensions for maximum performance. USA, Intel Press. 236 pp. ISBN 9743649-2-4.
- 6. Bryant, R.E. and O'Hallaron, D. (2015) Computer systems: a programmer's perspective. 3rd ed. USA, Pearson Education. 1120 pp. ISBN 978-129-210-176-7.
- 7. Chandra, R., Dagum, L., Kohr, D., Maydan, D., McDonald, J. and Menon, R. (2001) Parallel programming in OpenMP. USA, Academic Press. 230 pp. ISBN 1-55860-671-8.
- 8. Goetz, B., Peierls, T., Bloch, J., Bowbeer, J., Holmes, D. and Lea, D. (2006) Java: concurrency in practice. USA, Pearson Education, Inc. 403 pp. ISBN 978-0-321-34960-6.
- 9. Gregory, K. and Miller, A. (2012) C++ AMP: Accelerated massive parallelism with Microsoft Visual C++. USA, Microsoft Press. 326 pp. ISBN 978-0-7356-6473-9.
- 10. Herlihy, M. and Shavit, N. (2012) The art of multiprocessor programming. Revised first edition. USA, Morgan-Kaufmann Publishers. 508 pp. ISBN 978-0-12-397337-5.
- Kaeli, D., Mistry , P., Schaa, D. and Zhang, D.P. (2015) Heterogeneous computing with OpenCL 2.0.
   3rd ed. USA, Morgan-Kaufmann Publishers. 307 pp. ISBN 978-0-12-801414-1.
- 12. Kusswurm, D. (2014) Modern x86 assembly language programming: 32-bit, 64-bit, SSE, and AVX. USA, APress. 667 pp. ISBN 978-1-4842-0065-0.
- 13. McCool, M., Robison, A.D., and Reinders J. (2012) Structured parallel programming. USA, Morgan-Kaufmann Publishers. 406 pp. ISBN 978-0-12-415993-8.
- 14. Reddy, M. (2011) API design for C++. USA, Morgan Kaufmann Publishers. 441 pp. ISBN 978-0-12-385003-4.
- 15. Reinders, J. and Jeffers, J. (2015) High performance parallelism pearls: Multicore and many-core programming approaches Volume One. USA, Morgan-Kaufmann Publishers. 502 pp. ISBN 978-0-12-802118-7.
- 16. Reinders, J. and Jeffers, J. (2015) High performance parallelism pearls: Multicore and many-core programming approaches Volume Two. USA, Morgan-Kaufmann Publishers. 523 pp. ISBN 978-0-12-803819-2.
- 17. Sebesta, R.W. (2016) Concepts of programming languages. 11th edition. England, Pearson Education Limited. 785 pp. ISBN 978-1-292-10055-5.
- 18. Sebesta, R.W. (2017) Αρχές γλωσσών προγραμματισμού. 11η έκδοση. Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. 792 σελ. ISBN 978-960-512-698-8.
- 19. Williams, A. (2012) C++ concurrency in action: Practical multithreading. USA, Manning Publications Co 506 pp. ISBN 978-1-933988-77-1.

### APPLIED MATHEMATICS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	CS			
STUDIES	Undergradua	ate			
CODE			SEMESTER	E	
TITLE	APPLIED MATHEMATICS				
TEACHING ACTIV	ITIES		HOURS PER WEEK	CREDIT UNITS	
	Lectures an	d exercises	4	5	
ТҮРЕ	COMPULSOR	RY			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in Englis	YES (in English)			
WEBSITE (URL)	https://eclas	s.uowm.gr/co	ourses/CS152/		

#### LEARNING OUTCOMES

In the course there is a detailed description of ordinary differential equations, ODE, and their applications to specific problems. After successfully attending the course the student will be able to:

- understand and classify an ODEs into the appropriate group, e.g. of separable variables, firstorder linear, etc.
- to be able to know the most general methodology for the analytical solution of a ODE, and especially for 2nd order linear, (e.g. method of changing the parameters, method of determinable coefficients),
- understand the description of an initial value problem,
- apply the Laplace transform to solve initial value problems,
- recognize understand and formulate initial value problems as mathematical models to describe computer related problems, e.g. problems in electrical circuits, problems of transmission-diffusion of signals and information in networks, problems related to rates of change,
- to apply different computational methods for the discrete solution of simple PDEs on the computer.
- to use Fourier analysis techniques to solve simple SDRs.

#### General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

- 1) Basic concepts, definitions, classification of first-order differential equations.
- 2) Differential equations of separable variables, homogeneous, complete, Integration factors, linear differential equations of the first order, Bernoulli, Riccati differential equations.
- 3) General observations, theory of solutions, applications of first-order differential equations.
- 4) Linear differential equations of second order with constant coefficients, linear differential equations of order n with constant coefficients. Systems of differential equations.
- 5) Qualitative theory. Applications in mathematical modeling.
- 6) Simple techniques of integral transformation (Laplace/Fourier) with applications to differential equations.
- 7) Simple discretization techniques and computing an approximate solution with the help of a computer.
- 8) Discrete/Continuous Fourier & Laplace Transforms.
- 9) Convolution, Autocorrelation and Heterocorrelation.



#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

Suggested Bibliography:

- 1. Alikakos, N.D. & Kalogeropoulos, G.H. (2021). Ordinary Differential Equations (2nd ed.). Contemporary Publishing Ltd. Publications. [Eudoxus Book Code: 102124405]
- 2. Trahanas, Stefanos. (2008). Ordinary differential equations. ITE Publications & University Publications of Crete. [Book Code in Eudoxus: 222]
- 3. Boyce, W.E. & Di Prima, R.C. (2015). Elementary Differential Equations and Boundary Value Problems (2nd ed.). NTUA Publications. [Book code in Eudoxus: 55591102]

#### - Supplementary Bibliography:

- 1. Bronson, Richard. (1978). Introduction to Differential Equations (Schaum's Outline Series). ESPI Publishing.
- 2. Braun, Martin. (1983). Differential Equations and their Applications (eBook). Springer-Verlag, New York, USA.
- 3. Famelis, Ioannis (2021). Computational Mathematics, Numerical Optimization Methods with implementation in MATLAB (OCTAVE) Python

## SEMESTER F

#### INTERNET APPLICATIONS

#### ΓΕΝΙΚΑ

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE			SEMESTER	F	
TITLE	INTERNET A	PPLICATIONS			
TEACHING ACTI	TIVITIES		HOURS PER WEEK		CREDIT UNITS
Lect	tures and labo	ratory practice	4		6
ТҮРЕ	COMPULSOR	RY			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / Engli	ish			
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in Englis	sh)			
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS134/		

#### LEARNING OUTCOMES

#### Learning Outcomes

The goal of the course is to teach students how to design and implement Internet applications through JAVA programming language.

After the successful completion of the course students will:

- 1. Understand the characteristics of web applications .
- 2. Create web applications.
- 3. Create client-server applications using Sockets.
- 4. Create Web applications using Frameworks, servlets ή JSPs.
- 5. Create Web Services with XML-RPC and SOAP-RPC

#### General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

The topics covered include:

- 1. Revision of basic Java knowledge (basic classes and packages, Exceptions, error handling, threads, Input/Output).
- 2. Programming with TCP/UDP Sockets, Server Client applications.
- 3. HTTP protocols (HyperText Transfer Protocol), SMTP (Simple Mail Transport Protocol).
- 4. Programming in URL level. Applets, Servlets. Use of Cookies Sessions.
- 5. Synchronous techniques of application development for version control, dependency management, testing, etc.
- 6. Introduction to application development with web frameworks.
- 7. Definition and use of XML/JSON. XML-RPC and SOAP-RPC examples.
- 8. Applications using IDEs are developed in the laboratory part.

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Lecture, discussion and student participation.
	PowerPoint presentations.
	Laboratory exercises.

USE OF INFORMATION AND	PowerPoint presentations of t	heory.					
COMMUNICATION TECHNOLOGY	Electronic exercises of self-assessment.						
	Learning support through Open eClass platform.						
TEACHING ORGANIZATION	Activities Semester workload						
	Lectures 26						
	Exercises 26						
	Teamwork on internet	26					
	application development						
	Autonomous study	72					
	Total (25 hours of						
	workload per credit unit)	150					
STUDENT ASSESSMENT	Final written exam (50%) and e	exam on exercises (50%).					
	<ol> <li>The final written exam includes:         <ul> <li>multiple choice questions</li> <li>problem solving</li> <li>comparative assessment of theory elements</li> </ul> </li> </ol>						
	<ul> <li>programming code writi</li> </ul>	ing					
	<ul> <li>2. The examination on exercises includes:</li> <li>a) the assessment of students' written lab reports</li> <li>b) the assessment of laboratory skills obtained throug examination with the use of laboratory equipment.</li> </ul>						

#### RECOMMENDED BIBLIOGRAPHY

Suggested Bibliography:

- Deitel, Paul J. & Deitel, Harvey J. (2015). *Java: Προγραμματισμός* (10η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50659320]
- Deitel, Paul J. & Deitel, Harvey J. (2011). Προγραμματισμός Internet & World Wide Web (4η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12543770]
- 3. Savitch, Walter (2015). Java: Μια εισαγωγή στην επίλυση προβλημάτων και στον προγραμματισμό (7η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655978]
- 4. Barnes, David J. & Kolling, Michael. (2018). Αντικειμενοστρεφής Προγραμματισμός σε Java: Μια πρακτική εισαγωγή με χρήση του BlueJ (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο:77108692]
- 5. Elliotte, Rusty Harold. (2016). *Προγραμματισμός Δικτυακών Εφαρμογών με Java* (4η αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 59373748]
- 6. Horstmann, Cay. (2021). Η γλώσσα προγραμματισμού JAVA: Αναλυτική Προσέγγιση. Εκδόσεις Broken Hill Publishers LTD. [Κωδικός Βιβλίου στον Εύδοξο: 94643857]
- Cadenhead, Rogers. (2013). Πλήρες Εγχειρίδιο της Java 7 (6η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 33094851]

Supplementary Bibliography:

- Sams Teach Yourself Java in 21 Days (Covering Java 7 and Android) (6th edition), Pearson, USA, 2012
- 2. Μιχάλας, Άγγελος. (2013). Εισαγωγή στην γλώσσα προγραμματισμού Java. Σημειώσεις Διδάσκοντα

### MULTIMEDIA TECHNOLOGY

#### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATIC	INFORMATICS				
STUDIES	Undergradua	ite				
CODE			SEMESTER	F		
TITLE	MULTIMEDI	A TECHNOLOGY				
TEACHING ACT	VITIES		HOURS PER	2		
TEACHING ACT	VIIIES		WEEK		CREDIT UNITS	
Lect	ures and labo	ratory practice	4		6	
ТҮРЕ	COMPULSOR	Y				
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclas	https://eclass.uowm.gr/courses/CS155/				

#### LEARNING OUTCOMES

#### Learning Outcomes

The course aims at familiarizing students with the basic concepts of multimedia technology, and techniques and tools used to create, develop and complete synchronous multimedia applications and digital games (video games).

After the successful completion of the course students will:

- Understand the basic concepts of Multimedia Technologies.
- Understand the special characteristics, templates and technologies related to the various media of information representation (text, image, sound, animation, video) and familiarize with the basic codification techniques in multimedia applications.
- Familiarize with the tools and special software to create multimedia applications.
- Familiarize with management and development methodologies of multimedia project development and how they are used to secure the successful integration of multimedia applications.
- Detect the basic roles in a real project or a case study of a multimedia application and estimate the role of the interested parts in the realization of the project.
- Detect the special problems that occur during the development of multimedia applications and study possible solutions.
- Understand the network requirements of multimedia systems, as well as the transfer and reproduction of multimedia applications on the internet with guaranteed service quality.
- Cooperate with other students in order to create and present a case study of interactive multimedia application.

#### **General Competences**

- Group work
- Project design and management
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

The course introduces methods, tools and techniques to create and handle multimedia content (text, hypertext, voice, sound, graphics, image and video), for content retrieval and multimedia communication. It includes issues of algorithms, templates and protocols upon which techniques of handling multimedia signals, information and communication are based.

There is focus on the presentation of concepts and characteristics of multimedia systems, description of the media that consist multimedia applications, analysis of theories and techniques for media transformation into a digital form suitable for process, and exposition of requirements and techniques for the transfer of multimedia applications on the internet.

Furthermore, students are taught design, development and implementation methodologies of multimedia applications, including digital games.

Theory concepts are practiced through laboratory exercises, exercises and group work.

More specifically, the following topics are covered:

- Introduction. What are multimedia? Structure, general characteristics and properties of multimedia systems. Categorization of multimedia systems and applications. Interaction and interactive multimedia. Hypermedia. Structure and characteristics of adaptive hypermedia systems, hypermedia in education.
- Digital representation of information. Digitalization techniques.
- Basic methods of signal compression / codification. Codification principles and data compression techniques. Compression algorithms with and without loss. Entropy and source codification. Categories of compression methods. Techniques of text, image, sound, animation and video (JPEG, MPEG) compression.
- Digital text. Text representation, introduction, processing and printing. Signal languages. Text and multimedia applications.
- Digital image. Color representation and models. Basic principles of digital image. File types of bitmap images and vector graphics. Image capture and digitalization. Image compression techniques. Digital image and vector graphics processing.
- Digital sound. Sound characteristics. Sound capture and digitalization. File types of digital sound. Codification methods and sound compression techniques. Sound and multimedia applications. MIDI. Digital sound processing. Digital sound sharing.
- Digital video. Basic video and video transmission characteristics. Video capture and digitalization. Video sampling and quantization. File types of digital video. Compression techniques of video files (MPEG). Video codification templates (H.264, H.265). Video retrieval and reproduction. Digital video processing. Digital video sharing.
- 2D and 3D animation. Animation principles, 2D animation. 3D animation. 3D animation applications. Virtual Reality. Augmented Reality.
- Multimedia application development. Work phases (analysis, design, production, check/assessment, distribution). Production team. Methodology and tools of multimedia application development. Source management in multimedia systems.
- Multimedia and internet. Distributed multimedia systems. Multi-transmission and multimedia flow technology. Internet sharing of multimedia content. Network services and protocols of multimedia communication. Teleconference. Best effort service and guaranteed quality service. Transmission of multimedia content through mobile network 4G/5G.

INSTRUCTION	Lecture using audiovisual media.				
	Laboratory exercises - Practice.				
USE OF INFORMATION AND	Use of specialized process and multin	nedia application writing			
COMMUNICATION TECHNOLOGY	software. Learning support through Op	en eClass platform.			
	In the context of communication wit	h students Open eClass			
	and e-mail are used.				
TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	39			
	Exercises	13			
	Short individual assignments	26			
	Teamwork case study	26			
	Autonomous study 46				
	Total (25 hours of workload per				
	credit unit)				
STUDENT ASSESSMENT	The evaluation criteria are determined at the beginning of the				
	semester and are accessible by students on the course page in				
	the Open eClass platform and include:				
	1) Written final exam with a weight of 60% of the total grade:				
	- multiple choice questions				
	- short Answer Questions,				
	- problem solving				
	<ul> <li>comparative assessment of theory elements</li> </ul>				
	2) Assessment of practical/laboratory p	part with a weight of 40%			
	on the total grade, which includes:				
	<ul> <li>a) assessment of students' written</li> </ul>	lab reports or			
	b) assessment of the digital game of	development group work			
	and the 20-minute public preser	itation.			

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

- Suggested Bibliography:

- 1. Wong, Yue-Ling. (2018). Χρήση και Προγραμματισμός Πολυμέσων (3η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 77107230]
- Στυλιαράς Γ., Δήμου Β. & Ζευγώλης Δ. (2019). Τεχνολογία Πολυμέσων: Σύγχρονα Πολυμεσικά Εργαλεία. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 86053439]
- 3. Vaughan, Tay. (2012). *Πολυμέσα Αναλυτικός Οδηγός* (8η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 22728229]
- 4. Havaldar, Parag & Medioni, Gerard. (2012). *Συστήματα Πολυμέσων: Αλγόριθμοι, Πρότυπα & Εφαρμογές*. Εκδόσεις Broken Hill Publishers LTD. [Κωδικός Βιβλίου στον Εύδοξο: 13256967]
- 5. Δημητριάδης Σ.Ν.,Πομπόρτσης Α.Σ. & Τριανταφύλλου Ε.Γ. (2004). *Τεχνολογία Πολυμέσων: Θεωρία & Πράξη*. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549030]
- 6. Ξυλωμένος Γ.Β. & Πολύζος Γ.Κ. (2009). *Τεχνολογία Πολυμέσων και Πολυμεσικές Επικοινωνίες*. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13914]

- Supplementary Bibliography:

- 1. Maverick, Durano, Vincent S. (2019). *Understanding Game Application Development* [ebook]. Apress. USA. [Κωδικός στον Εύδοξο: 91696187]
- 2. Sloan, Kelly. (2019). *Python, PyGame, and Raspberry Pi Game Development* (2nd ed.) [ebook], Apress. USA. [Κωδικός στον Εύδοξο: 91693658]
- 3. Nicoll, Benjamin & Keogh, Brendan. (2019). *The Unity Game Engine and the Circuits of Cultural Software* [ebook]. Springer International Publishing Inc. USA. [Κωδικός στον Εύδοξο: 91695820]
- 4. Halpern, Jared. (2019). Developing 2D Games with Unity [ebook]. Apress. [Κωδικός στον Εύδοξο: 91689012]
- 5. Sung, Kelvin & Smith, Gregory. (2019). *Basic Math for Game Development with Unity 3D* [ebook]. Apress. USA. [Κωδικός στον Εύδοξο: 91687538]

# TELECOMMUNICATIONS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE			SEMESTER	F	
TITLE	TELECOMMU	JNICATIONS			
TEACHING ACTI	rivities		HOURS PER WEEK	R CREDIT UNITS	
Lect	ures and labo	ratory practice	4	6	
ТҮРЕ	COMPULSOR	RΥ			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / Engli	ish			
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclas	<u>s.uowm.gr/cour</u>	<u>ses/CS141/</u>		

#### LEARNING OUTCOMES

Learning Outcomes

After the successful completion of the course students will :

- 1. Understand the basic signal and system properties
- 2. Understand and apply Fourier transform properties
- 3. Understand the basic principles and concepts of analogue and digital telecommunication systems
- 4. Analyze and design basic telecommunication systems
- 5. Estimate the performance of telecommunication systems in relation with complexity, modulation type and power and bandwidth requirements
- 6. Process a signal using Matlab
- 7. Model and simulate a linear system with the use of Simulink package of Matlab

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Individual work
- Promotion of free, creative and deductive thinking

#### **COURSE CONTENT**

- 1) Basic signal and system concepts.
- 2) Spectral description of signals, Fourier analysis, basic filters.
- 3) Data transmission (analogue, digital).
- 4) Analogue signal transmission with amplitude modulation (AM), frequency modulation (FM), phase modulation (PM). Pulse code modulation systems, PCM, DPCM, DM.
- 5) Analogue carrier modulation techniques with digital signal.
- 6) Digital signal transmission with ASK, PSK, FSK modulation.

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Lecture, discussion and student participation. PowerPoint presentations. Laboratory exercises.
USE OF INFORMATION AND	Theory presentation with PowerPoint.
COMMUNICATION TECHNOLOGY	Electronic self-assessment exercises.
	Learning support through Open eClass platform.

TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Laboratory practice	26		
	Short individual assignments	26		
	Autonomous study	48		
	Total (25 hours of workload per credit unit)	150		
STUDENT ASSESSMENT	Final written exam (50%), presentation of the project (10%) and exam on laboratory exercises (40%).			
	<ol> <li>Final written exam includes:         <ul> <li>multiple choice questions</li> <li>problem solving</li> <li>comparative assessment of theory elements</li> </ul> </li> </ol>			
	<ul><li>2) Examination on exercises includes:</li><li>a) assessment of students' written laboratory reports</li></ul>			

#### RECOMMENDED BIBLIOGRAPHY

- Haykin, Simon & Moher, Michael. (2010). Συστήματα Επικοινωνίας (5η έκδ.).
   Εκδόσεις Α. Παπασωτηρίου & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 9778]
- Δουληγέρης, Χρ. & Τσιχριντζής, Γ.Α. (2014). Αρχές και Εφαρμογές Σημάτων και Συστημάτων (4η έκδ.). Εκδόσεις Μαρκέλλα Ι. Βαρβαρήγου. [Κωδικός Βιβλίου στον Εύδοξο: 89783]

b) assessment of laboratory skills obtained through examination with the use of laboratory equipment.

- Taub, Herbert & Schilling, Donald L. (2006). Αρχές Τηλεπικοινωνιακών Συστημάτων (3η έκδ.). Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548860]
- Καραγιαννίδης, Γεώργιος & Παππή, Κοραλία. (2017). Τηλεπικοινωνιακά Συστήματα (4η έκδ.).
   Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68369851]
- 5. Κωττής, Π.Γ. (2011). *Εισαγωγή στις Τηλεπικοινωνίες*. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549058]
- 6. Αλεξόπουλος, Αριστείδης & Λαγογιάννης, Γεώργιος. (2016). Τηλεπικοινωνίες και Δίκτυα Υπολογιστών (10<sup>η</sup> έκδ.). Εκδόσεις Α. Παπασωτηρίου & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 59374915]
- Lathi, P. B. & Ding, Zhi (επιμ. Παναγόπουλος Αθ.). (2018). Σύγχρονες Αναλογικές και Ψηφιακές Επικοινωνίες (4η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 59421499]

### DESIGN OF DIGITAL SYSTEMS WITH VHDL

#### GENERAL

SCHOOL	SCIENCE			
DEPARTMENT	INFORMATIC	S		
STUDIES	Undergradua	ate		
CODE			SEMESTER	F
TITLE	DESIGN OF D	DIGITAL SYSTEM	S WITH VHDL	
TEACHING ACTI	HOURS PER         CREDIT           TIVITIES         WEEK         UNITS		CREDIT UNITS	
	Lectures and exercises 2			
	Labo	ratory practice	2	
	4 6			6
ТҮРЕ	ELECTIVE COMPULSORY			
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND EXAMS:	Greek			
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS131/			

#### LEARNING OUTCOMES

#### Learning Outcomes

After the successful completion of the course students will understand:

- Advanced capacities of VHDL
- Codification and testbench of digital systems
- Structure and operation of FSMs and datapaths
- Interconnection systems of digital system subunits
- Process of simulation, composition and implementation in software of VHDL designs

### General Competences

- Individual work
- Group work
- Project design and management
- Practice of existing and new technologies

#### COURSE CONTENT

- 1) Parts, components and operation of integrated digital systems
- 2) Components and operation of FSMs, datapaths, ALUs, adders, multipliers, interface circuits
- 3) Advanced characteristics of VHDL
- 4) Methods of codification and control with simulation of digital systems
- 5) Methods of HDL composition and implementation in digital system hardware

#### TEACHING AND LEARNING METHODS - ASSESSMENT

INSTRUCTION	Class			
USE OF INFORMATION AND	Specialized E-CAD XILINX Vivad	0		
COMMUNICATION TECHNOLOGY	Learning support through Oper	eClass platform.		
TEACHING ORGANIZATION	Activities Semester workload			
	Lectures	26		
	Laboratory exercises on methodology application and case study analysis in smaller groups	39		
	Teamwork case study. Presentation.	33		
	Autonomous study	52		

	Total (25 hours of workload per credit unit)	150
STUDENT ASSESSMENT	<ul> <li>I. Final written exam (50%) incl</li> <li>multiple choice question</li> <li>role and interested part a</li> <li>comparative assessment</li> </ul>	uding: s analysis on short case study of theory elements

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. "Design of Integrated Circuits CMOS VLSI", N.H.Weste, K.Eshraghian, 4th ed., 2011
- 2. "Digital Integrated Circuits. A Design Approach", Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd American Ed., 2006, ISBN: 960-209-982-8

III. Laboratory exams (30%)

II. Presentation of group assignment (20%)

- 3. "Digital Design Embedded Systems with VHDL", Peter J. Ashenden,
- 4. "Digital Systems : Modeling and simulation with VHDL", Σταύρος Ι. Σουραβλάς, και Εμμανουήλ Ρουμελιώτης, Θεσσαλονίκη : Εκδόσεις Τζιόλα, 2008,
- 5. "Digital Circuit Design with VHDL", Ε. Ζυγούρης, (Τόμος Α, Τόμος Β), Πάτρα, 2002.
- 6. "Digital System Design with VHDL", Stephen Brown, Zvonko Vranesic, 3rd ed., 2012
- 7. "Circuit Design with VHDL", Volnei A. Pedroni, 2007

#### - Scientific Papers:

Dossis, M. F. (1995). "*Standard Formats for Register Transfer Level VHDL Modelling*", The European Simulation Symposium 95, Erlangen-Nuremberg, 26-28 October 1995, pp. 423-427

#### WIRELESS MOBILE COMMUNICATIONS

#### GENERAL

SCHOOL	SCIENCE			
DEPARTMENT	INFORMATIC	CS		
STUDIES	Undergradua	ate		
CODE	SEMESTER F			
TITLE	WIRELESS MOBILE COMMUNICATIONS			
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS
Lectures, exer	cises and labo	ratory practice	4	6
ТҮРЕ	ELECTIVE COMPULSORY			
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND	Greek / English			
EXAMS:				
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS142/			

#### LEARNING OUTCOMES

#### Learning Outcomes

In this course the basic concepts related to a wireless communication network are presented.

Students are expected to obtain knowledge on the principles of wireless system design and understand the latest developments in this field. Exercises are conducted using NS2 and NS3 simulation tools.

After the successful completion of the course students will :

- Understand the basic principles of cellular systems and mobile communications
- Detect types of interference in the wireless environment of mobile communications
- Know techniques of wireless multiple access, as well as techniques and types of transmission
- Know the principles of mobility management and Mobile IP protocol
- Know mobile communication systems 2.5G, 3G, and 4G.
- Understand the basic principles of Ad-Hoc networks and sensor networks
- Modulate, operate and manage errors and failures of wireless local networks

#### **General Competences**

•

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

### COURSE CONTENT

- The following topics are covered:
- Wireless environment in mobile communications
- Basic principles of cellular systems
- Interference in the wireless environment of mobile communications
- Distribution and allocation of wireless sources multiple access
- Cellular system architecture
- Mobility management
- Review of mobile communication systems
- Ad-Hoc and sensor networks

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Lecture using audiovisual media.
	Practical exercises.
USE OF INFORMATION AND	Use of specialized software of network graphic simulation.
COMMUNICATION TECHNOLOGY	Handling and solving problems of managing real network
	devices. Learning support through Open eClass platform.

TEACHING ORGANIZATION	Activities	Semester workl
	Lectures	26
	Practical Exercises /	26
	Laboratory exercises	
	Semester assignment	52
	Autonomous study	46
	Total (25 hours of workload per credit unit)	150
STUDENT ASSESSMENT	F: 1 (202()	

	workload per creatt unit)
STUDENT ASSESSMENT	Final written exam (80%) and exam on practical exercises (20%).
	<ol> <li>Final written exam includes:</li> <li>multiple choice questions</li> <li>problem solving</li> <li>comparative assessment of theory elements</li> </ol>
	<ul> <li>2) Examination on exercises includes:</li> <li>a) assessment of students' written laboratory reports</li> <li>b) assessment of laboratory skills obtained through examination with the use of laboratory equipment.</li> </ul>

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. Tse, David & Viswanath, Pramod. (2009). Βασικές Αρχές Ασύρματης Επικοινωνίας. Εκδόσεις Κλειδάριθμος ΕΠΕ [Κωδικός Βιβλίου στον Εύδοξο: 13617]
- 2. Θεολόγου, Μ. (2021). Δίκτυα Κινητών και Προσωπικών Επικοινωνιών (2η βελτιωμένη έκδ.). Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102071057]
- 3. Black, Bruce A., DiPiazza, Philip S., Ferguson, Bruce A., Voltmer, David R. & Berry, Frederick C. (2010). Εισαγωγή στα Ασύρματα Συστήματα. Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12421]
- 4. Κανάτας, Αθ., Κωνσταντίνου, Φ. & Πάντος, Γ. (2013). Συστήματα Κινητών Επικοινωνιών (2<sup>η</sup> έκδ.). Εκδόσεις Α.Παπασωτηρίου & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 33154041]
- 5. Κωτσόπουλος, Στ. (2016). Αρχές και Μοντελοποίηση Ασύρματης Διάδοσης. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε., [Κωδικός Βιβλίου στον Εύδοξο: 59413241]
- 6. Stallings, William & Beard, Cory. (2016). Ασύρματες Επικοινωνίες, Δίκτυα και Συστήματα. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655989]

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#### COMPUTER GRAPHICS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE	SEMESTER F				
TITLE	COMPUTER GRAPHICS				
TEACHING ACTI	TIVITIES HOURS PER CREDI WEEK UNIT			R CREDIT UNITS	
Lect	tures and labo	ratory practice	4	6	
ТҮРЕ	ELECTIVE CO	MPULSORY			
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS152/				

#### LEARNING OUTCOMES

#### Learning Outcomes

The course aims at familiarizing students with the basic principles of computer graphics, two- and three-dimensional object modeling, geometric algorithm/computation geometry application, linear algebra and graphic techniques, development of simple applications that use basic algorithms and use of graphical programming interfaces to access hardware.

After the successful completion of the course students will:

- Understand the basic principles related to computer graphics.
- Understand the basic principles and operations of vectors, tables, points and their interrelationships.
- Familiarize with coordinate systems and their use in graphics, line and ellipsoid algorithms, and frame and depth memory.
- Understand the basic elements of colour models and their variations, as well as the consequences of various choices among them.
- Familiarize with the basic geometric transformations in 2 and 3 dimensions.
- Understand and apply 2D and 3D object modeling techniques.
- Familiarize with the practical use of the concepts of inner and outer products, vertical vectors, vector normalization, visible surface localization, and surface inclination in relation to light sources.
- Understand the rectangular, oblique-parallel and perspective projections of objects.
- Familiarize with basic lighting models, camera parameters and photorealistic techniques based on observational methods for rays and emitted radiation.
- Cooperate, where needed, with other students to create and present simple applications showing the concepts of each unit.

#### **General Competences**

- Individual work
- Group work
- Project design and management
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

Fundamental concepts of graphics for 2 and 3 dimensions are presented in this course. It covers basic concepts of linear algebra and computation geometry for modeling objects in 2D or 3D space.

Techniques of applying basic transformations and estimating the basic elements for lighting and determination of object visibility are described. Lighting models connected with visible surfaces are covered.

Various projections used in practice are analyzed.

Students are introduced to photorealistic representation techniques used in cinema graphics and now in real time; so, the concept of energy transfer in space is covered.

More specifically, the course covers the following:

- Unit 1: The concept of vector and point. Operations between vector and between vectors and points. Inner and outer product calculations. Vector normalization. Vector projection. Inner product and angle normalization relationship. Outer product and left- and right-hand systems relationship. Coordinate reference systems. 3x3 and 4x4 tables. Operations between tables and tables and points.
- Unit 2: Basic colour models and actions that reduce colour depth. The consequences of various choices in models and colour depths.
- Unit 3: Frame and depth memories. Description of linear parts and ellipsoids. Visible and active frame memories relationship. Use of depth memory to estimate visible elements of representations.
- Unit 4: Modeling objects in 2 and 3 dimensions. Descriptions of network model and parametric. Description of models based on points/faces and points/edges/faces. Vertical vectors of vertices and faces, and use of outer products and Gouraud method.
- Unit 5: Basic geometric transformations in 2 and 3 dimensions, such as escalation, displacement, rotation, inclination. Table joining and complex geometric transformations. Rectangular, oblique-parallel and perspective projections of objects.
- Unit 6: Cut of geometric descriptions out of truncated cone and non-visible faces.
- Unit 7: Lighting models, such as environment lighting, diffused lighting, reflected lighting, Phong model, intensity attenuation, floodlights. Refraction and transparent or semi-transparent materials. Surface inclination and lighting.
- Unit 8: Photorealistic graphics with techniques based on light addition and observation, and emitted radiation.

LACING AND LLANNING MILTIODS				
INSTRUCTION	Lecture using audiovisual media.			
	Laboratory exercises - practice.			
USE OF INFORMATION AND	Use of specialized software of	computer graphic process and		
COMMUNICATION TECHNOLOGY	writing.			
	Learning support through Oper	n eClass platform.		
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Laboratory exercises	26		
	Short individual	26		
	assignments			
	Teamwork case study 26			
	Autonomous study 46			
	Total (25 hours of	150		
	workload per credit unit)	150		
STUDENT ASSESSMENT	Final written exam (100%) in g	reek which includes:		
	- Short answer questions			
	- Problem solving			
	- Optional individual or group exercises and assignments			
	- Comparative assessment of theory elements			
	During the semester students are given group exercises or			
	individual assignments and assignments, and an optional			
	group project which covers various topics simultaneously.			

### **TEACHING AND LEARNING METHODS - ASSESSMENT**

#### **RECOMMENDED BIBLIOGRAPHY**

Suggested Bibliography:

- Hearn, D., Baker, M.P. & Carithers, W.R. (2021). Γραφικά Υπολογιστών με Open GL (4η έκδ.). Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94701919]
- Μπαρδής, Γεώργιος. (2020). Γραφικά Υπολογιστών & Προγραμματισμός WebGL. Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94700225]
- Hughes, J.F., Van Dam, A., McGuire, M., Sklar, D.F., Foley, J.D., Feiner, S.K. & Akeley, K. (2020). Γραφικά και Εικονική Πραγματικότητα (3η έκδ.). Εκδόσεις Γρηγόριος Χρ.Φούντας. [Κωδικός Βιβλίου στον Εύδοξο:94643361]
- Θεοχάρης Θ., Παπαϊωάννου Γ., Πλατής Ν. & Πατρικαλάκης Ν.Μ. (2019). Γραφικά και
   Οπτικοποίηση: Αρχές και Αλγόριθμοι. Εκδόσεις ΕΚΠΑ. [Κωδικός Βιβλίου στον Εύδοξο: 86195186]

Supplementary Bibliography:

- 1. Akenine-Möller T., Haines E. & Hoffman N. (2018). *Real-Time Rendering* (4th ed.). A K Peters/CRC Press. USA.
- 2. Lengyel E. (2011). *Mathematics for 3D Game Programming and Computer Graphics* (3rd ed.). Cengage Learning PTR. USA.
- 3. Dunn F. & Parberry I. (2011). *3D Math for Game Development* (2nd ed.). A K Peters/CRC Press. USA.
- 4. Kessenich J, Sellers G. & Shreiner D. (2016). *OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 4.5 with SPIR-V.* Addison-Wesley. USA.
- 5. Luna F.D. (2016). 3D Game Programming with DirectX 12. Mercury Learning & Information. USA.
- 6. Haines E. & Akenine-Möller T. (2019). *Ray Tracing Gems: High-Quality and Real-Time Rendering with DXR and Other APIs*. APress. USA, 2019
- 7. Pharr M., Humphreys G. & Jakob W. (2016). *Physically Based Rendering: From Theory to Implementation* (3rd ed.). Morgan Kaufmann Publishers Inc. USA.
- 8. Nystrom R. (2014). *Game programming patterns*. Genever Benning. UK.

#### VISUAL PROGRAMMING

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE		SEMESTER F			
TITLE	VISUAL PROGRAMMING				
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
	Theory 2				
	Laboratory 2				
	4 6				
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS135/				

#### LEARNING OUTCOMES

#### Learning Outcomes

This course introduces students to Optical Programming. Most programming courses use console applications as the main type of communication between user and programme.

This is the first attempt to introduce students to a new programming approach; Event-Based Programming. VB.NET programming language, which is a totally object-oriented language, will be used. Basic structural elements will be covered and there will be focus on structural window applications.

After the successful completion of the course students will :

- Show their knowledge on programming using VB.NET.
- Show their knowledge on window application creation using integration environment of application development (IDE – Integrated Development Environment) which is widely used in software production industry, and more specifically Microsoft Visual Studio 2010.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Project design and management
- Individual work

#### COURSE CONTENT

- Introduction to optical programming and its advantages versus non optical programming
- Short history and review of .NET Framework
- Analytical description of IDE Integrated Development Environment Microsoft Visual Studio 2010, with all the necessary tools (Graphical User Interface (GUI)), forms and their properties, Toolbox, solution explorer, property window, debugging, application execution.
- Basic programming principles in VB.NET (Modules, Procedures, Collections, Basic programming structures).
- Detailed approach to classes and objects (class field, structors (preselected and non configured), partial classes, composition, use of Me to access the current object, garbage collection, basic and bound classes, polymorphism examples, relationships between bound and basic classes, polymorphism examples, show of polymorphic behaviour, abstract classes and methods.
- Events and their role in optical programming (What is an event, event based programming, how we use events of specific controls. What is the role of events. What kind of energy can be

associated to an event. Event types. Delegates and event handling mechanism.

- Design of a programme user interface. Management of forms and controls located in forms in Run Time
- Creation of Graphical User Interface (GUI) using WPF (Windows Presentation Foundation), basic concepts and use of XML, declarative programming GUI using XAML, creation of a WPF application using VB/NET. General principles of array, array examples, event management

TEACHING AND LEARNING METHODS - ASSESSMENT					
INSTRUCTION	Class	Class			
USE OF INFORMATION AND	Learning support through Ope	n eClass platform.			
COMMUNICATION TECHNOLOGY	Laboratory.				
TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	26			
	Exercises / Laboratory 26				
	exercises				
	Teamwork case study 26				
	Autonomous study 72				
	Total (25 hours of				
	workload per credit unit) 150				
STUDENT ASSESSMENT	In order to complete the course, students must achieve pass				
	marks both in theoretical and laboratory part.				
	1. the theoretical part scores 100% of the final exam				
	2. the laboratory part scores 1	00% of the final exam.			

#### **RECOMMENDED BIBLIOGRAPHY**

- Γκούμας, Στέφανος & Συμεωνίδης, Συμεών. (2013). Οπτικός Προγραμματισμός σε Visual Basic. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 33153301]
- Halvorson, Michael. (2012). Microsoft Visual Basic 2010 Βήμα-Βήμα. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12866918]
- Deitel, Paul J., Deitel, Harvey J. & Deitel, Abbey J. (2014). *Android Προγραμματισμός* (2η έκδ.). Εκδόσεις Χ.Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 41960295]
- Έλληνας Ιωάννης & Έλληνας Νικόλαος. (2014). Εισαγωγή στον Προγραμματισμό Android. Εκδόσεις
   Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 41954973]

#### SPECIAL NETWORK TOPICS I

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	te			
CODE			SEMESTER	F	
TITLE	SPECIAL NETWORK TOPICS I				
TEACHING ACTI	TIVITIES HOURS PER WEEK CREDIT UN			CREDIT UNITS	
Lectures, exer	ercises and laboratory practice 4 6			6	
ТҮРЕ	ELECTIVE CO	MPULSORY			
PREREQUISITE:	NONE				
	Computer Network Design course (5 <sup>th</sup> semester) is recommended			is recommended	
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS156/				

#### LEARNING OUTCOMES

#### Learning Outcomes

After the completion of the course (theoretical and laboratory part) students will have understood the technical details of design, installation and operation of small to medium-size computer networks.

Students will know in detail the structure of these networks and widely used switching and routing protocols. They'll have the opportunity to gain great experience on the use and management of network devices, implement complex network topologies and face problems they meet under realistic conditions.

More specifically, students are expected to familiarize with architecture, elements and operations of routers and switches in small networks.

Students will be able to configure routers and switches for basic operations in a small network, set, face and solve common problems on routing packets in IPv4 and IPv6 networks, design virtual local networks (VLANs) and switching between VLANs, configure DHCP and NAT protocols, secure local networks through Access Control Lists (ACLs) in IPv4 and IPv6 networks, and in general detect, manage and maintain network devices.

Upon successful completion of the course students will be able to:

- Understand and explain the importance of protocol models and their layers.
- Know and apply layer 3 addressing as well as subnetting in both IPv4 and IPv6 networks
- Understand the message structure and operation of the TCP and UDP protocols.
- Understand and apply virtual local area network (VLAN) switching.
- Understand the operation of static and dynamic routing protocols and be able to implement them.
- Implement the basic configuration in the IOS operating system commands on network devices (routers and switches) both at the operational level and at the security level.
- Identify problems and troubleshoot issues concerning the functionality of small and medium-size networks.

#### General Competences

- Application of theoretical knowledge in practice. This is achieved through hands-on practice in the hands-on / lab exercises and the various implementation scenarios.
- Search, analysis and synthesis of data and information using the necessary technologies
- Independent work when solving laboratory exercises.
- Cooperation during the preparation of the weekly exercises.

- Search for data and information on the internet.
- Adaptation to new conditions since they are asked to adapt their knowledge and skills to new scenarios to be implemented.
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

The course is a continuation of the **Computer Network Design** course taught in 5th semester and is based on the knowledge provided in that course.

Teaching methods combine the electronic access to the teaching material through Open eClass platform with lectures in the classroom and carrying out the practical exercises in a specially equipped laboratory of the Department.

Through Practical Exercises and laboratory exercises, the concepts of theory are put into practice using a number of exercises that cover the material extensively. More specifically, the content of the course covers the following topics:

More specifically, the course covers the following topics:

- 1. Analysis of layers, protocol stack (TCP/IP), Structure and function of TCP, UDP
- 2. Configuration for the operation and security of routers and switches
- 3. Structure of IPv4 and IPv6 packets. IPv4 and IPv6 addressing subnetting
- 4. Planning and design of Local Area Networks (LANs) and Switching.
- 5. Designing Virtual Local Area Networks (VLANs) and Switching between VLANs
- 6. Static vs Dynamic Routing.
- 7. Dynamic routing protocols (RIPv2, OSPF) and router configuration.
- 8. IPv4 and IPv6 Dynamic Host Configuration Protocol (DHCP).
- 9. IPv4 address translation mechanism (Network Address Translation NAT).

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

	ASSESSMENT			
INSTRUCTION	Lecture using audiovisual media.			
	Practical exercises in laboratory.			
USE OF INFORMATION AND	Use of specialized software of netw	vork graphic simulation.		
COMMUNICATION TECHNOLOGY	Handling and solving problems of r	eal network devices.		
	Learning support through Open eC	lass platform.		
	In the context of communication w	vith students, the electronic		
	class platform and e-mail are used			
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Exercises and lab practice	13		
	Short individual exercises	46		
	Autonomous study	70		
	Total (25 hours of workload per credit unit)150			
STUDENT ASSESSMENT	The assessment criteria are determined at the beginning of the semester and are accessible by students on the course page in the Open eClass and include:			
	<ol> <li>Written mid-course exam in Greek/English with a weight factor of 20% of the total grade, which includes:         <ul> <li>Multiple choice questions</li> <li>Matching Exercises</li> </ul> </li> <li>Evaluation of the practical/laboratory part with a weight factor of 40% on the total grade, which includes:         <ul> <li>a) Assessment of student's written reports</li> <li>b) Assessment of the practical skills acquired via online lab exercises.</li> </ul> </li> </ol>			

<ul> <li>Written final exam in Greek/English with a weight factor of 40% of the total grade, which includes:</li> <li>Multiple choice questions</li> </ul>
- Matching Exercises
- Short answer questions
- Problem solving
<ul> <li>Comparative assessment of theory elements</li> </ul>

#### **RECOMMENDED BIBLIOGRAPHY**

- Suggested Bibliography:

- McQuerry, Stephen. (2006). CCNA Αυτοδιδασκαλία: Διασύνδεση Συσκευών Δικτύου Cisco (ICND) (2<sup>η</sup> έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13529]
- Odom, Wendell (2006). Δίκτυα υπολογιστών: Το πρώτο βήμα. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13653]
- Kurose, James F. & Ross, Keith W. (2021). Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω (8<sup>η</sup> έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070624]
- 4. Aboela, Emad. (2011). *Ασκήσεις Προσομοίωσης Δικτύων*. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21498]
- Τσαουσίδης Β., Μαματάς Ε., Ψαρράς Ι., Κοσμίδης Ε., Δημητρίου Σ. (2010). Εργαστηριακά Μαθήματα στα Δίκτυα και Διαδίκτυα Υπολογιστών. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21492]
- Doherty, Jim, Anderson, Neil & Della, Maggiora Paul. (2010). Ο οδηγός της Cisco για τη δικτύωση (2η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 140863]

#### - Supplementary Bibliography:

- 1. Odom, Wendell & Wilkins, Sean. (2017). CCNA Routing and Switching 200-125 Official Cert Guide and Network Simulator Library. Cisco Press. [ISBN: 1-58720-610-2]
- Odom, Wendell & Wilkins, Sean. (2017). CCENT/CCNA ICDN1 100-105 Official Cert Guide and Network Simulator Library. Cisco Press. [ISBN: 1-58720-609-9]
- 3. Johnson, Allan. (2017). 31 Days Before Your CCNA Routing & Switching Exam: A Day-By-Day Review Guide for the ICND1 (100-105), ICND2 (200-105), CCNA (200-125) Certification Exams. Cisco Press.[ISBN: 1-58720-590-4]
- 4. Nastase, Ramon. (2018). *Cisco CCNA Command Guide*. CreateSpace Independent Publishing. [ISBN: 1-72191-324-6]

### NUMERICAL ANALYSIS TOPICS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	Undergraduate			
CODE			SEMESTER	F	
TITLE	NUMERICAL ANALYSIS TOPICS				
TEACHING ACTI	TIVITIES HOURS PER CREDIT WEEK UNITS			CREDIT UNITS	
	Lectures 2				
	Laboratory (MATLAB) 2				
	4 6			6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclas	<u>s.uowm.gr/cour</u>	<u>ses/CS144/</u>		

#### LEARNING OUTCOMES

## Learning Outcomes

The course is the continuity of Numerical Analysis of the 3<sup>rd</sup> semester and is divided in two parts:

- Numerical linear algebra.
- Numerical solving of differentiated equations.

Arithmetic methods are implemented in MATLAB where students learn to use MATLAB functions. They write their functions to implement the methods developed in the theoretical part. They are also taught Mathematica.

Finally, they get involved in various problems modeled by differential equations, such as oscillations, Kepler's two-body problem, pendulum. Solving Schrodinger's one-dimensional equation.

Mathematical biology and Lotka – Voltera models.

After the successful completion of the course students will have good knowledge of arithmetic methods to solve problems that appear in sciences, such as celestial mechanics, quantum mechanics, mathematical biology, etc.

#### General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

- Numerical linear algebra.
- Linear systems solving.
- Direct methods. LU factorization method. Special LDM, LDLT factorization. Factorization band of diagonal tables.
- Repetition methods. Jacobi, Gauss, SOR methods.
- Finding eigenvalue tables.
- Representation and management of sparse tables in MATLAB, special functions.
- Algebraic eigenvalue problem.
- Sparse table management.

#### Numerical solution of differential equations.

- Simple step methods. Runge-Kutta methods, theory and creation of methods, application using Mathematica. Class conditions and trees.
- Multistep methods. Adams-Bashforth, Adams-Moulton, prediction-correction methods. Second class equations and Numerov method.
- Arithmetic solution of differential equations with some derivatives.

• Case study. Two-body problem. Pendulum. Solving Schrodinger's one-dimensional equation. Mathematical biology and Lotka – Voltera models.

#### TEACHING AND LEARNING METHODS - ASSESSMENT

INSTRUCTION	Class		
USE OF INFORMATION AND	MATLAB and Mathematica software.		
COMMUNICATION TECHNOLOGY	Electronic lectures (LATEX).		
	Learning support through Ope	n eClass platform.	
TEACHING ORGANIZATION	Activities	Semester workload	
	Lectures	26	
	Laboratory practice using	26	
	MATLAB		
	Projects	52	
	Autonomous study	46	
	Total (25 hours of	150	
	workload per credit unit)		
STUDENT ASSESSMENT	Projects on MATLAB programm	ning 50%	
	Final written exam on theory 5	50%	

#### **RECOMMENDED BIBLIOGRAPHY**

- Suggested Bibliography:

- Φαμέλης, Ιωάννης Θ. (2021). Υπολογιστικά μαθηματικά. Εκδόσεις ΚΡΙΤΙΚΗ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102071614]
- Σιφαλέρας, Άγγελος & Στεφανίδης, Γεώργιος. (2021). Γραμμική Άλγεβρα με MATLAB και SageMath (2η έκδ.) Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102070944]
- 3. Golub, Gene H. & Van Loan, Charles F. (επιμ. Εμίρης Γ.). (2015). *Θεωρία και Υπολογισμοί Μητρώων*. Εκδόσεις ΠΕΔΙΟ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50657620]
- 4. Moler, Cleve B. (2010). *Αριθμητικές Μέθοδοι με το ΜΑΤLAB*. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21379]
- 5. Βραχάτης, Μιχαήλ Ν. (2012). *Αριθμητική Ανάλυση: Συνήθεις Διαφορικές Εξισώσεις*. Εκδόσεις Κλειδάριθμος. [Κωδικός Βιβλίου στον Εύδοξο: 12867996]
- Supplementary Bibliography:
- Παπαγεωργίου, Γ.Σ., Τσίτουρας, Χ.Γ., Φαμέλης, Ι.Θ. (2008). Σύγχρονο Μαθηματικό Λογισμικό Matlab & Mathematica. Εκδόσεις Συμεών.
- 2. Higham, Desmond J. & Higham, Nickolas J. (2016). *Matlab Guide* (3rd ed.). Society for Industrial and Applied Mathematics. Philadelphia, PA, USA
- Shampine L.F., Gladwell I. & Thompson S. (2003). Solving ODEs with MATLAB. Cambridge University Press, UK
- 4. Dormand J.R.(1996). *Numerical methods for Differential Equations: A computational Approach*. CRC Press LLC.
- 5. Buthcer J. (2008). Numerical Methods for Ordinary Differential Equations. Wiley & Sons Publications, USA.
- 6. Golub, G.H. & Van Loan, C.F. (2013). Matrix Computations. The John Hopkins University Press, USA

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# SEMESTER G

### **RESEARCH METHODOLOGY AND ETHICS**

#### GENERAL

SCHOOL	SCIENCE	SCIENCE			
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE			SEMESTER	G	
TITLE	RESEARCH METHODOLOGY AND ETHICS				
TEACHING ACTI	VITIES		HOURS PER WEEK	2	CREDIT UNITS
	Lectures	and exercises	4		6
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND EXAMS:	Greek / English				
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/		

## LEARNING OUTCOMES

#### Learning Outcomes

The course is an introductory course in scientific research and writing a scientific paper and aims to train students in research methodology and ethics and encourage their participation in research projects.

Teaching in the Department is directly and reciprocally connected with the research carried out in it and both are fed back, as a part of the research work included in a wider field can additionally be processed / analyzed / presented in specialized elective courses in subjects related to Informatics, creating a general set that allows multiple options and exits for students.

After the successful completion of the course students will :

- Distinguish the types of scientific research and methodology and recognize its value.
- Acquire a competence of writing a scientific article, preparing a thesis, etc.
- Understand how to conduct extensive bibliographic research with modern techniques and methods.
- Understand how to collect secondary data, analyze it and develop proposals.
- Understand how internet research is conducted and what limitations exist in that search process.
- Define the methodology and tools for conducting the research and prepares an appropriate questionnaire.
- Check for possible measurement errors, validity and reliability of the survey.
- Understand how to choose sample size (sampling) and quantitative/qualitative research methods and basic statistical methods for analyzing research data.
- Understand how to combine research results with analytical and critical thinking in order to produce new knowledge and develop scientific discourse.
- Understand how to write a properly structured text of a scientific paper and to be able to summarize the important and original conclusions of the scientific paper.
- Understand how to prepare the presentation of scientific research and how to present it orally to both specialized and non-specialized audiences.

Based on the above, students gain direct research experience on the subjects treated in the Department and are encouraged to participate in the Department's research activities. Their

participation can be done in the context of a research project, through the preparation of a student paper, or even through a thesis. Also, Department students are encouraged to participate in competitions (national and international), individually or in groups, with or without the participation of Department teachers. In this way, the active inclusion of students in the research process is expected, while they are given the opportunity to expand their academic and professional horizons.

#### **General Competences**

- Search, analysis and synthesis of data, using the necessary technologies
- Adaptation to new conditions
- Promotion of free, creative and deductive thinking
- Decision making and application of scientific knowledge
- Critical review and self-reflection
- Individual work and Group work
- Project design and management

#### COURSE CONTENT

The theoretical part of the course includes the teaching of the method of highlighting and structuring the scientific object of the Research. It contributes to the foundation of scientific work in the field of research in the field of Information Science.

The active exploratory approach, documentation, synthetic processing and presentation of a topic (individual or group) that belongs to the wider thematics of the Department's curriculum is used, through the application of a research scenario, so that the students become familiar on the one hand with a series of basic techniques and methodologies that are used in research in individual areas of IT science and on the other hand with the interpretation/evaluation of their experimental results.

At the same time, it is sought that the students acquire skills in experimental design as well as formulation and control of scientific hypotheses.

In the empirical part, apart from the group work, there is also practice in utilizing modern tools for searching bibliographic sources as well as in the management of databases of scientific publications, a fact that contributes drastically to the understanding and application of the scientific work.

It is also worth noting that special emphasis is given by all lecturers/supervisors of research and degree theses in education, which is also combined with practical application, on individual issues of research methodology (related to the research topics of each work) and ethics (e.g. issues plagiarism, correct citation of bibliographic sources and results of other works, etc.

By using the appropriate software provided through the available electronic platform (Turnitin) it is possible to check all students' written work for issues of copying/plagiarism. This process ultimately works positively in the development of the scientific ethics of the students throughout their studies.

Students are trained in Research Methodology and Ethics in the following topics:

- Introduction to Research Methodology Basic concepts.
- Types of Research Research methods Primary Research Types of Field Research Bibliographic research.
- Scientific Research Design Methodology.
- Primary Research Types of Field Research.
- Secondary Research.
- Sampling.
- Construction of a questionnaire.
- Errors of measurement Validity Reliability.
- Statistical Methods of Data Analysis.
- Qualitative Research Methods and Qualitative Data Analysis.
- Organizing and Writing Papers.
- Oral Presentation of Work.

TEACHING AND LEARNING METHODS -	ASSESSMENT
INSTRUCTION	Lecture using audiovisual media.
	Practical exercises.
USE OF INFORMATION AND	- Learning process support throu
COMMUNICATION TECHNOLOGY	communication with students e
	- Use of ICT and available electro

hrough Open eClass platform and nts electronically through e-mail. ectronic services to the students of the University of Western Macedonia - Use of specialized software. **TEACHING ORGANIZATION** Activities Semester workload Lectures 39 **Exercises/** Activities 13 focusing on the analysis and presentation of case studies Individual or group work on 52 case studies **Guided Study** 20 Autonomous study 26 150 Total (25 hours of workload per credit unit) STUDENT ASSESSMENT The evaluation criteria are determined at the beginning of the semester and are accessible by students on the course page in the Open eClass and include: I. Attending lectures, participating in pilot research work & presentation of results. II. Preparation & presentation of a small dissertation work based on predefined specifications. The purpose of this work is to check the skills developed by the students in research methodology tools and techniques and their ability to design and implement a project in a group or independently.

#### **RECOMMENDED BIBLIOGRAPHY**

- Λιαργκόβας Παναγιώτης, Δερμάτης Ζαχαρίας, Κομνηνός Δημήτρης, 2022, Μεθοδολογία της Έρευνας και Συγγραφή Επιστημονικών Εργασιών, 2η Έκδοση, ISBN: 978-960-418-912-0, Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε.
- Gray David, Πρόδρομος Χατζόγλου, Δελιάς Παύλος (επιμέλεια), 2018, Η Ερευνητική Μεθοδολογία στον Πραγματικό Κόσμο, 4η Έκδοση, ISBN: 978-960-418-787-4, Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε.
- Μαντζάρης Ιωάννης, 2017, ΕΠΙΣΤΗΜΟΝΙΚΗ ΈΡΕΥΝΑ: Συγγραφή-Διαμόρφωση-Παρουσίαση Επιστημονικών Εργασιών, 2η Έκδοση, ISBN: 978-618-833-942-2, Εκδόσεις ΛΟΓΙΣΜΟΣ -ΚΑΠΟΥΡΤΖΟΥΔΗ ΜΑΡΙΑ
- 4. Χαλικιάς Μιλτιάδης, Σαμαντά Ειρήνη, 2016, Εισαγωγή στη Μεθοδολογία Έρευνας Εκπόνησης Επιστημονικών Εργασιών, ISBN: 978-960-595-012-5, Εκδόσεις Σύγχρονη Εκδοτική Ε.Π.Ε.
- 5. Λατινόπουλος Περικλής, 2010, Τα πρώτα βήματα στην έρευνα, ISBN:978-960-218-667-1,Εκδόσεις Κριτική ΑΕ

#### COMPUTER SYSTEMS SECURITY

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ite			
CODE	SEMESTER G				
TITLE	COMPUTER SYSTEMS SECURITY				
TEACHING ACTI	VITIES	HOURS PER WEEK	2	CREDIT UNITS	
Lecture	s, exercises an	d project work	4		6
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS158/		

#### LEARNING OUTCOMES

#### Learning Outcomes

The main target of the course is to help students to understand the fundamental principles of Computer System Security and security mechanisms of computer systems, the most common security problems of modern computer systems, as well as how their multi-level protection mechanisms work.

Emphasis is placed on familiarizing students with basic software or hardware-based security mechanisms and protocols that support access control, confidentiality, integrity, and availability, as well as the techniques by which their use is extended to a high system level and applications.

Through hands-on practice and laboratory exercises, students become familiar with implementing cryptographic algorithms, detecting vulnerabilities and intrusions, preventing intrusions, implementing safeguards, and developing security policies.

After the successful completion of the course students will :

- Understand and explain the fundamental concepts and principles of computer system security.
- Compare security and data protection protocols and techniques at the device, network, application and information system level.
- Understand and analyze the main cryptographic algorithms (symmetric, public key) and digital certificates/signatures, as well as their use for the implementation of complex systems (Embedded Security, Cybersecurity).
- Understand and apply security mechanisms and corresponding protocols at all levels of the TCP/IP networking model and network perimeter defense mechanisms.
- Compare and evaluate fundamental access control models and policies and be able to develop an appropriate security policy and the necessary security mechanisms to support it.
- Distinguish and analyze the main security characteristics of networks and their applications, detecting possible vulnerabilities and intrusions in devices, systems and data networks, identify possible threat models, as well as design risk prevention mechanisms.

#### General Competences

- Search, analysis and synthesis of data, using the necessary technologies
- Adaptation to new conditions
- Decision making and application of scientific knowledge
- Promotion of free, creative and deductive thinking
- Exercise criticism and self-criticism
- Individual work and Group work

#### -

#### COURSE CONTENT

#### INTRODUCTION

Basic concepts and fundamental principles of Computer Systems Security

FIRST PART – CRYPTOGRAPHY AND CRYPTOGRAPHIC ALGORITHMS

- Cryptographic tools
- Symmetric cryptography and message confidentiality
- Public key cryptography and message identification certificate

SECOND PART - TECHNOLOGY AND PRINCIPLES OF COMPUTER SYSTEM SECURITY

- User identity certificate
- Access control
- Database and cloud computing security
- Malicious software
- Denial of service attacks
- Intrusion detection
- Firewalls and intrusion prevention systems

THIRD PART – SOFTWARE SECURITY AND TRUSTED SYSTEMS

- Temporary storage area overflow
- Software security
- Operating system security
- Trusted computing and multilevel security
- Assessment criteria if security in information technology

FOURTH PART – SECURITY MANAGEMENT ISSUES

- IT security managements and danger estimation
- Control mechanisms, designs and procedures of IT security
- Physical security and infrastructure security
- Human resource security
- Security management monitoring
- Legal and ethical aspects

In the practical part of the course, students have the opportunity to apply the concepts of theory using a number of exercises that extensively cover the material, and to gain experience in the use of encryption, authentication and access control mechanisms, computer system security control applications, using specific tools and software libraries (vulnerability detectors, penetration testing tools and exploitation of computer system vulnerabilities, intruder detection and prevention systems).

	IODS ASSESSMENT			
INSTRUCTION.	Lecture using audiovisual media.			
	Laboratory exercises - practice.			
USE OF INFORMATION AND	Use of ICT for teaching and specialized software for Practical			
COMMUNICATION TECHNOLOGY	Exercises - Laboratory exercises.			
	Learning process support through the asynchronous distance			
	learning electronic platform (Open eClass).			
	In the context of communication with students, Open eClass			
	and e-mail are used.			
TEACHING ORGANIZATION	Activities Semester workload			
	Lectures	39		
	Laboratory exercises	13		
	Short individual assignments 52			
	Autonomous study	46		
	Total (25 hours of workload per credit unit)	150		

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**
STUDENT ASSESSMENT	The assessment criteria are determined at the beginning of the semester and are accessible on the course page in the Open eClass, and include:
	<ol> <li>Written mid-course exam in Greek/English with a weight factor of 20% of the total grade, which includes:         <ul> <li>Multiple choice questions</li> <li>Matching Exercises</li> </ul> </li> </ol>
	<ul> <li>2) Evaluation of the practical part with a weight factor of 20% of the total grade, which includes:</li> <li>a) Assessment of student's written reports</li> <li>b) Assessment of the practical skills acquired via online lab exercises.</li> </ul>
	<ul> <li>3) Written final exam in Greek/English with a weight factor of 60% of the total grade, which includes:</li> <li>Multiple choice questions</li> <li>Matching Exercises</li> <li>Short answer questions</li> <li>Problem solving</li> </ul>
	<ul> <li>Comparative assessment of theory elements</li> </ul>

- Suggested Bibliography:

- Pfleeger, Charles P., Pfleeger, Shari Lawrence & Margulies, Jonathan. (2017). Ασφάλεια Πληροφοριακών Συστημάτων (5η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 59415278]
- Stallings, William & Brown, Lawrie. (2016). Ασφάλεια Υπολογιστών: Αρχές και Πρακτικές (3η αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50656354]
- Stallings, William. (2011). Κρυπτογραφία για Ασφάλεια Δικτύων: Αρχές και Εφαρμογές. Εκδόσεις ΙΩΝ. [Κωδικός Βιβλίου στον Εύδοξο: 12777632]
- Κάτσικας, Σωκράτης, Γκρίτζαλης, Στέφανος, Λαμπρινουδάκης, Κωνσταντίνος. (2020). Ασφάλεια Πληροφοριών & Συστημάτων στον Κυβερνοχώρο. Εκδόσεις Νέων Τεχνολογιών ΙΚΕ. [Κωδικός Βιβλίου στον Εύδοξο: 94701556]
- Πολέμη Ν., Δημητριάδης Χ., Καλιοντζόγλου Αλ., Καραντζιάς Αθ. & Παπαστεργίου Σπ. (2007). Εργαστηριακές Ασκήσεις Ασφάλειας Πληροφοριακών Συστημάτων. Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 3340]

- Supplementary Bibliography:

- Μαυρίδης, Ιωάννης. (2016). Ασφάλεια Πληροφοριών στο Διαδίκτυο [ebook]. ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN: 978-960-603-193-9. [Κωδικός Βιβλίου στον Εύδοξο: 320065]
- Μαυρίδης, Ιωάννης. (2016). Εργαστήριο Ασφάλειας Πληροφοριών και Συστημάτων [ebook]. ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN: 978-960-603-192-2. [Κωδικός Βιβλίου στον Εύδοξο: 320025]
- Ζάχος, Ευστάθιος, Παγουρτζής, Αριστείδης & Γροντάς, Παναγιώτης (2016). Υπολογιστική Κρυπτογραφία [ebook] ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN 978-960-603-276-9. [Κωδικός Βιβλίου στον Εύδοξο: 59303550]
- 4. Sanjib, Sinha. (2018). *Beginning Ethical Hacking with Kali Linux* [ebook]. HEAL-Link Springer ebooks. ISBN: 978-148-423-891-2. [Κωδικός Βιβλίου στον Εύδοξο: 91677533]
- 5. Sanjib, Sinha. (2017). *Beginning Ethical Hacking with Python* [ebook]. HEAL-Link Springer ebooks. Apress. ISBN: 978-148-422-541-7. [Κωδικός Βιβλίου στον Εύδοξο: 75482250]
- 6. Grimes, Roger A. (2017). *Hacking the Hacker: Learn from the Experts Who Take Down Hackers*] [ebook]. HEAL-Link Wiley ebooks. ISBN: 978-111-939-626-0. [Κωδικός Βιβλίου στον Εύδοξο: 91696983]

# ADVANCED DATABASE TOPICS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	Undergraduate			
CODE		SEMESTER G			
TITLE	ADVANCED I	ADVANCED DATABASE TOPICS			
TEACHING ACTI	TEACHING ACTIVITIES		HOURS PEF WEEK	ł	CREDIT UNITS
	Lectures		2		
	Exercises 2				
	4 6			6	
ТҮРЕ	COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND EXAMS:	Greek / English				
OFFERED TO ERASMUS STUDENTS	NO				
WEBSITE (URL)	https://eclas	https://eclass.uowm.gr/courses/CS106/			

#### LEARNING OUTCOMES

#### Learning Outcomes

- 1. Recognize and describe parallel, distributed and object-oriented satabases.
- 2. Estimate the capacities of decision making and concluding from data extraction.
- 3. Design effective procedures of data search, process and storage.
- 4. Recognize security and exchange problems and choose the appropriate forms of handling.
- 5. Create-implement various simple database applications.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

- 1. Database applications
- 2. Applications on the internet
- 3. Data storage and search
- 4. Tree and fragmented indexes
- 5. Question process and improvement
- 6. Exchange management and concurrency control
- 7. Failure recovery
- 8. Physical design and database adjustment
- 9. User management and security
- 10. Parallel and distributed databases
- 11. Object-oriented databases
- 12. Decision making systems
- 13. Data extraction

INSTRUCTION	Frontal teaching
USE OF INFORMATION AND	Use of ICT in teaching.
COMMUNICATION TECHNOLOGY	Learning support through Open eClass platform.
	Exercises - practice

TEACHING ORGANIZATION	Activities	Semester workload	
	Lectures	52	
	Study	30	
	Exercises / Practical application	68	
	Total (25 hours of workload per	152	
STUDENT ASSESSMENT	The final mark comes from the following percentages:		
	<ol> <li>20% from 5 online tests with 10 questions</li> <li>30% from 2 individual assignments</li> </ol>		
	3. 50% from final written exam		

- 1. Silberschatz, Abraham & Korth, Henry F. & Sudarshan S. (2021). *Συστήματα Βάσεων Δεδομένων* (7η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070677]
- Hoffer J.A., Ramesh V. & Topi H. (επιμ. Βαΐτης Μιχαήλ & Καβακλή Ευαγγελία). (2017). Βάσεις Δεδομένων: Σύγχρονη Διαχείριση (11η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50656016]
- Κεχρής, Ευάγγελος. (2021). Σχεσιακές Βάσεις Δεδομένων (3η έκδ.). Εκδόσεις ΚΡΙΤΙΚΗ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102071604]
- 4. Ramakrishnan, Raghu & Gehrke, Joahannes. (2012). Συστήματα Διαχείρισης Βάσεων Δεδομένων (3η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 22694245]
- Elmasri, Ramez & Navathe, Shamkant B. (επιμ. Χατζόπουλος M.). (2016). Θεμελιώδεις Αρχές Συστημάτων Βάσεων Δεδομένων (7η έκδ.). Εκδόσεις Δίαυλος Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50662846]

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## **HIGH SPEED NETWORKS**

#### GENERAL

SCHOOL	SCIENCE	SCIENCE		
DEPARTMENT	INFORMATICS			
STUDIES	Undergradua	Undergraduate		
CODE	SEMESTER G			
TITLE	HIGH SPEED NETWORKS			
TEACHING ACTIVITIES		HOURS PEF WEEK	2	CREDIT UNITS
Lectures and exercises		4		6
ТҮРЕ	ELECTIVE COMPULSORY			
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND	NGUAGE OF TEACHING AND Greek / English			
EXAMS:				
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS153/			

## LEARNING OUTCOMES

Learning Outcomes

In this course, the basic concepts related to a synchronous high speed network are presented. The course aims at offering students the necessary knowledge on synchronous networks.

Exercises are conducted in NS2 and NS3 simulation tools.

After the successful completion of the course students will :

- Understand the basic principles and concepts of high speed networks.
- Distinguish high speed networks from other networks.
- Spot their basic characteristics.
- Design a high speed network consisting of sub-networks.
- Control addressing
- Execute simulation
- Manage network errors and failures.
- General Competences
- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

### COURSE CONTENT

The following topics are covered:

- 1) Introduction to high speed networks
- 2) Frame Relay technology, ATM, SONET/SDH
- 3) Gigabit Ethernet technologies, Xwdm
- 4) 4G mobile networks
- 5) WiFi
- 6) WiMAX
- 7) LTE
- 8) Satellite communications.

The practical exercises on the teaching material are carried out using network simulation tools (NS2, NS3, NetSim, OMNeT++, OPNET, Cisco Packet Tracer, etc.)

-		
TEACHING AND LEARNING METHODS -	ASSESSMENT	
INSTRUCTION	N Lecture using audiovisual media.	
	Practical exercises.	
USE OF INFORMATION AND	D Use of specialized software of netwo	
COMMUNICATION TECHNOLOGY	Y Handling and solving problems of ma	
devices.		
Learning support through Open ed		
TEACHING ORGANIZATION Activities		S
	Lectures	

rk graphic simulation. naging real network s platform. emester workload 26 39 Exercises Laboratory exercises Semester assignment 57 Autonomous study 78 Total (25 hours of 200 workload per credit unit) STUDENT ASSESSMENT Final written exam (80%) and exam on practical exercises (20%). 1. Final written exam includes: multiple choice questions problem solving comparative assessment of theory elements 2. Examination on exercises includes a) the assessment of students' written laboratory reports b) the assessment of laboratory skills obtained through examination with the use of laboratory equipment.

## **RECOMMENDED BIBLIOGRAPHY**

### Suggested Bibliography:

- Δουληγέρης, Χρήστος. (2021). Σύγχρονα Τηλεπικοινωνιακά και Δικτυακά Πρωτόκολλα (3<sup>η</sup> έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 33287934]
- Βασιλόπουλος Χ., Κωτούλας Δ., Ξενικός Δ., Βούδας Π., Χελιώτης Γ., Αγαπίου Γ. & Δούκογλου Τ. (2010). Δίκτυα Πρόσβασης Νέας Γενιάς. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21391]
- Πομπόρτσης, Ανδρέας Σ. (2009). Εισαγωγή στις Σύγχρονες Τεχνολογίες Επικοινωνιών. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549087]
- 4. Βενιέρης, Ιάκωβος Σ. (2012). Δίκτυα Ευρείας Ζώνης (3η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 22694268]
- Τσαουσίδης Β., Μαματάς Ε., Ψαρράς Ι., Κοσμίδης Ε., Δημητρίου Σ. (2010). Εργαστηριακά Μαθήματα στα Δίκτυα και Διαδίκτυα Υπολογιστών. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21492]

Supplementary Bibliography:

- Tanenbaum, Andrew S., Feamster Nick & Wetherall David. (2021). Δίκτυα Υπολογιστών (6<sup>η</sup> αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070446]
- Kurose, James F. & Ross, Keith W. (2021). Δικτύωση Υπολογιστών: Προσέγγιση από Πάνω προς τα Κάτω (8<sup>η</sup> έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070624]
- Stallings, William. (επιμ. Κατσαβούνης Στέφανος). (2018). Επικοινωνίες Υπολογιστών και Δεδομένων (10η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 77107676]
- 4. Peterson, Larry L. & Davie, Bruce S. (2009). Δίκτυα Υπολογιστών: Μία προσέγγιση από τη σκοπιά των συστημάτων (4<sup>n</sup> έκδ.), Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13954]
- 5. Aboela, Emad. (2011). *Ασκήσεις Προσομοίωσης Δικτύων*. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21498]

## DESIGN OF EMBEDDED SYSTEMS WITH VLSI

### GENERAL

SCHOOL	SCIENCE	SCIENCE		
DEPARTMENT	INFORMATICS			
STUDIES	Undergradua	ate		
CODE			SEMESTER	G
TITLE	DESIGN OF EMBEDDED SYSTEMS WITH VLSI			1
TEACHING ACTI	TIVITIES		HOURS PEF WEEK	CREDIT UNITS
	Lectures and exercises		4	6
ТҮРЕ	ELECTIVE CO	MPULSORY		
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND	Greek / English			
EXAMS:				
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclas	s.uowm.gr/cour	ses/CS122/	

## LEARNING OUTCOMES

Learning Outcomes After the successful completion of the course students will :

- Understand the basic characteristics and operation of VLSI circuits
- Understand the implementation of basic structures of VLSI digital circuits
- Understand the structure and operation of embedded integrated circuits
- Understand tools and methodologies to design VLSI systems (for example VHDL/Verilog HDL and High Level Synthesis)
- Understand the basic properties and operations of SoCs and embedded cores

## **General Competences**

- Individual work
- Group work
- Analysis, design and programming of integrated SoC VLSI
- Practice of existing and new technologies

## COURSE CONTENT

- Sections, part and operation of integrated digital systems
- Technologies to implement integrated circuits, such as CMOS
- Embedded digital system design
- Methods and problems of design, verification and implementation of complex integrated VLSI systems (for example VHDL/Verilog HDL and High Level Synthesis)
- Methods to synthesize and implement an integrated System On a Chip (SoC)

INSTRUCTION	Class		
USE OF INFORMATION AND	Specialized E-CAD XILINX Vivado		
COMMUNICATION TECHNOLOGY	Learning support through Oper	n eClass platform.	
TEACHING ORGANIZATION	Activities Semester workload		
	Lectures	52	
	Laboratory exercises on		
	methodology application		
	and case study analysis in		
	smaller groups		
	Short individual 52		
	assignments / Teamwork		

- 1. "Design of Integrated Circuits CMOS VLSI", N.H. Weste, K.Eshraghian, 4th ed., 2011
- 2. "Digital Integrated Circuits. A Design Approach", Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd American Ed., 2006, ISBN: 960-209-982-8

-Suggested bibliography of scientific papers:

- 1. Michael F. Dossis, and Dimitrios E. Amanatidis, "Synthesizing Neural Nets into Image Processing Hardware", Journal of Pattern Recognition and Intelligent Systems (PRIS), vol. 1, iss (no.) 1, May 2013, pp. 10-17.
- 2. Michael Dossis, "Rapid Modelling and Verification in the Intelligent CCC Synthesis Flow", International Journal of Information Science and Intelligent System (IJISIS), vol. 2, no.1, June 2013, pp. 7-25.

## INTERNET TECHNOLOGIES AND MOBILE COMPUTING

#### GENERAL

SCHOOL	SCIENCE	SCIENCE		
DEPARTMENT	INFORMATICS			
STUDIES	Undergraduate			
CODE		SEME	STER G	
TITLE	INTERNET TECHNOLO	GIES		
TEACHING ACTIVIT	TIES HOURS PER WEEK		CREDIT UNITS	
L	ectures and exercises	4	6	
ТҮРЕ	ELECTIVE COMPULSORY			
PREREQUISITE:	NONE			
LANGUAGE OF TEACHING AND	Greek / English			
EXAMS:				
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.	gr/courses/DIE141/		

### LEARNING OUTCOMES

**Learning Outcomes** 

The course aims at introducing students to the basic technologies used for application implementation on the Internet. Structural elements of internet applications are presented: application architecture (client - server, n-tier), middleware architecture protocols, methodologies and existing packages for the development of integrated applications on the internet.

After the successful completion of the course students will :

- Understand the basic internet technologies
- Implement internet applications
- Search for information and use the latest internet technologies

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Individual work
- Group work

### COURSE CONTENT

- 1) Open distributed middleware and RPC systems, TCP/IP model, example of client/server for the internet.
- basic world web technologies : HTTP , HTML, XHTML, CSS , JavaScript and JQuery, AJAX, DHTML, scriplets. XMLXML DOM,XML Schema technology.
- 3) SOAP, WSDL, UDDI internet services, RDF, RDF Schema semantic web technologies, and CGI, Perl, Tel/SafeTel interface and technology.
- 4) Search services, DNS server hierarchy, X.500, DAP, LDAP protocols.
- 5) Information retrieval : Electronics mail, MIME , S/MIME, SMTP, POP, PPP, FTP, Mobile Code:Java, Active X, Javascript.
- 6) Security issues and the role of TTPs. Distributed technologies: OMG/CORBA, MS/DCOM, Sun/JavaBeans, Mobile Software agents.
- 7) Java programming language. Applet programmes. Java and CORBA applications. Applet security issues on the internet.

INSTRUCTION.	Lecture, discussion and student participation. PowerPoint		
	presentations. Laboratory practice and exercises.		
USE OF INFORMATION AND	Theory presentation with PowerPoint.		
COMMUNICATION TECHNOLOGY	Electronic self-assessment exercises.		
	Learning support through Open eClass platform.		

	l e	In the context of communication with students, the Open eClass and e-mail are used.		
TEACHING ORGANIZATION		Activities	Semester workload	
		Lectures	26	
		Exercises / Laboratory	26	
		exercises		
		Semester assignment	30	
		Autonomous study	68	
		Total (25 hours of	150	
		workload per credit unit)		
STUDENT ASSESSMENT	1) Written final exam. The grade in the theoretical par		rade in the theoretical part is	
	the result of 100% performance in the final exam		nance in the final exam	
	2) Optionally and alternatively, it is possible to undertake		ly, it is possible to undertake a	
	six-month assignment which is evaluated in terms of it		ich is evaluated in terms of its	
		content and its presentation	on.	

- Suggested Bibliography:

- Δουληγέρης, Χρήστος, Μαυροπόδη, Ρόζα, Κοπανάκη, Εύη & Καραλής, Απόστολος. (2021). Τεχνολογίες και Προγραμματισμός στον Παγκόσμιο Ιστό (2η έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68407011]
- Deitel, Paul J. & Deitel, Harvey J. (2011). Προγραμματισμός Internet & World Wide Web (4η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 12543770]

- Supplementary Bibliography:

- Deitel, Paul J. & Deitel, Harvey J. (2015). *Java: Προγραμματισμός* (10η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50659320]
- Cadenhead, Rogers. (2013). Πλήρες Εγχειρίδιο της Java 7 (6η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 33094851]
- Rafe Colburn, Kyrnin Jennifer & Lemay Laura. (2016). Πλήρες Εγχειρίδιο HTML 5, CSS και JavaScript (7η έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 59357307]

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## CLOUD COMPUTING

#### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATICS					
STUDIES	Undergradua	Undergraduate				
CODE	SEMESTER G					
TITLE	CLOUD COMPUTING					
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS		
	Lectures	and exercises	4		6	
ТҮРЕ	ELECTIVE COMPULSORY					
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS160/					

#### LEARNING OUTCOMES

# Learning Outcomes

The course aims at familiarizing students with the basic concepts of cloud computing and topics on their installation and management. Moreover, they learn to develop applications in cloud computing environments and measure their performance.

After the successful completion of the course students will :

- Understand the basic principles and concepts of cloud computing.
- Install and manage cloud computing services.
- Develop applications in cloud computing environments.
- Estimate and assess the performance of programmes in cloud computing environments.

## General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Individual work
- Critical review and self-reflection

#### COURSE CONTENT

- 1. Historical review, basic principles, system categories, capacities and cloud computing architecture.
- 2. Parallel process, parallel computer architecture, synchronization and memory effect.
- 3. Traditional techniques of distributed computer systems, TCP/UDP Sockets, RPC, JavaRMI, DCOM, Corba, SOAP, DSDL, Web Services. Cloud computing architecture.
- 4. Distributed databases and data management in cloud computing.
- 5. Security, supervision of available resources, contract for provision of works, managements of works in cloud computing.
- 6. Introduction and familiarization with the environment of Oceanos (of the Greek Research and Technology Network), execution of simple and parallel MPI works, measurement of programme performance.

INSTRUCTION.	Lecture, discussion and student participation. PowerPoint
	presentations. Laboratory exercises.
USE OF INFORMATION AND	Theory presentation with PowerPoint.
COMMUNICATION TECHNOLOGY	Electronic self-assessment exercises.
	Learning support through Open eClass platform.



Suggested Bibliography:

- Puttini, Ricardo & Thomas, Erl & Zaigham, Mahmood. (2015). *Cloud Computing: Αρχές, Τεχνολογία και Αρχιτεκτονική*. Εκδόσεις Χ. ΓΚΙΟΥΡΔΑ & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 50658783]
- Παπακωνσταντίνου Γ. Κ., Τσανάκας Π. Δ. & Θεοχάρης Θ. (1994). Συστήματα Παράλληλης Επεξεργασίας. Εκδόσεις Συμμετρία. [Κωδικός Βιβλίου στον Εύδοξο: 45339]
- Curbera, F., Ferguson, D.F., Leymann, F., Storey, T. & Weerawarana, S. (2008). Αρχιτεκτονική Πλατφόρμας Υπηρεσιών Ιστού: SOAP, WSDL, WS-Policy, WS-Addressing, WS-BPEL, WS-Reliable Messaging και άλλα. Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13613]
- Μάργαρης, Αθανάσιος Ι. (2008). *MPI: Θεωρία & Εφαρμογές*. Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548957]
- Γαβαλάς, Δαμιανός & Κασαπάκης, Βλάσης & Χατζηδημήτρης, Θωμάς. (2015). Κινητές
   Τεχνολογίες: Κινητός Ιστός Κινητές Εφαρμογές στην Πλατφόρμα Android Επαυξημένη
   Πραγματικότητα. Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50657185]

### Supplementary Bibliography:

- 1. Reese, G. (2009). *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice).* O'Reilly Publications.
- 2. Schulz, G. (2011 *Cloud and Virtual Data Storage Networking: Your Journey to Efficient and Effective Information Services.* CRC Press.
- 3. Linthicum, D. S. (2009). *Cloud computing and SOA convergence in your enterprise: a step-by-step guide*. Pearson Education Publications.
- 4. Sosinsky, B. (2010). *Cloud computing bible (Vol. 762).* Wiley & Sons Publications.
- 5. Berners-Lee, T., Hall, W., Hendler, J.A., O' Hara, K., Shadbolt, N. & Weitzner, D.J. (2007). *A Framework for Web Science*. Now Publishers Inc. Publications.

## COMPUTABILITY AND COMPLEXITY

#### GENERAL

SCHOOL	SCIENCE					
DEPARTMENT	INFORMATICS					
STUDIES	Undergradua	Undergraduate				
CODE	SEMESTER G					
TITLE	COMPUTABILITY AND COMPLEXITY					
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS		
Lectures and exercises		and exercises	4		6	
ТҮРЕ	ELECTIVE COMPULSORY					
PREREQUISITE:	NONE					
LANGUAGE OF TEACHING AND	Greek / English					
EXAMS:						
OFFERED TO ERASMUS STUDENTS	YES (in English)					
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS121/					

## LEARNING OUTCOMES

**Learning Outcomes** 

The course aims at familiarizing students with the techniques used to create, analyze and measure the performance of algorithms in problem solving. Furthermore, students become aware of the basic complexity classes.

After the successful completion of the course students will :

- Understand basic principles and methods of algorithm design.
- Know the most effective problem solving methods.
- Know the most basic principles of analysis and measurement of algorithm performance.
- Know the most basic complexity classes.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Individual work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

#### COURSE CONTENT

- 1) The concept of algorithm and complexity.
- 2) Recursive algorithms and recursive equations.
- 3) Search techniques.
- 4) Graph traversal algorithms, graph theory, minimum spanning trees, and shortest path algorithms.
- 5) Algorithm design techniques Divide and conquer algorithms, greedy algorithms, dynamic programming, tree algorithms.
- 6) Decision problems, P and NP classes, NP-complete and NP-hard problems.

INSTRUCTION	Lecture, discussion and student participation.
	PowerPoint presentations.
	Laboratory exercises.
USE OF INFORMATION AND	Use of computer systems
COMMUNICATION TECHNOLOGY	Learning support through Open eClass platform.

TEACHING ORGANIZATION	Activities	Semester workload			
	Lectures	26			
	Exercises	26			
	Semester assignment	30			
	Autonomous study	68			
	Total (25 hours of	150			
	workload per credit unit)				
STUDENT ASSESSMENT	I. Final written exam (80%) including:				
	- multiple choice questions				
	- short answer questions				
	- problem solving				
	- comparative assessment of theory elements				
	II. Exercises and project (20%)				

- 1. Μποζάνης, Παναγιώτης. (2017). Αλγόριθμοι (2η έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- [Κωδικός Βιβλίου στον Εύδοξο: 68369726]
- Παπαρρίζος, Κωνσταντίνος. (2010). Ανάλυση & Σχεδίαση Αλγορίθμων. Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548861]
- 4. Levitin, Anavy. (επιμ. Ρουμελιώτης Μ.). (2018). Ανάλυση και Σχεδίαση Αλγορίθμων (3η έκδ.).
- 5. Εκδόσεις Α.ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68370088]
- 6. Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. & Stein Clifford. (2016). Εισαγωγή στους Αλγόριθμους (3η αμερικανική έκδ.). Εκδόσεις ΙΤΕ & Πανεπιστημιακές Εκδόσεις Κρήτης.
- 7. [Κωδικός Βιβλίου στον Εύδοξο: 59359780]
- 8. Kleinberg, J. & Tardos, E. (2009). Σχεδιασμός Αλγορίθμων. Εκδόσεις Κλειδάριθμος ΕΠΕ.
- 9. [Κωδικός Βιβλίου στον Εύδοξο: 13898]
- 10. Dasgupta, S., Papadimitriou, C., & Vazirani, U. (2009). Αλγόριθμοι. Εκδόσεις Κλειδάριθμος ΕΠΕ.
- 11. [Κωδικός Βιβλίου στον Εύδοξο: 13583]
- 12. Goodrich, Michael T. & Tamassia, Roberto. (2016). Αλγόριθμοι Σχεδίαση και Εφαρμογές. Εκδόσεις Χ.ΓΚΙΟΥΡΔΑ & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 59359833]
- Knuth, Donald E. (2009). Η Τέχνη του Προγραμματισμού: Θεμελιώδεις Αλγόριθμοι (τόμος Α΄) (3η έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549081]
- Knuth, Donald E. (2009). Η Τέχνη του Προγραμματισμού: Ημι-αριθμητικοί Αλγόριθμοι (τόμος Β΄) (3η έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548866]
- Knuth, Donald E. (2009). Η Τέχνη του Προγραμματισμού: Ταξινόμηση και Αναζήτηση (τόμος Γ΄) (3η έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548987]

## ADVANCED ARCHITECTURES

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER G				
TITLE	ADVANCED ARCHITECTURES				
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS	
Lectures and exercises		and exercises	4		6
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS161/				

## LEARNING OUTCOMES

Learning Outcomes

After the successful completion of the course students will :

- Understand nature, structures, operations, hierarchy and programming of advanced computer architecture
- Understand properties of SISD, SIMD, MISD, and MIMD machines
- Understand multiprocessing machines
- Understand CPU and memory interconnection systems
- Know cache memory coherence protocols
- Analyze and understand SIMD, MIMD, NC/CC-NUMA machine examples, Connection Machine, Transputer, Cray, DASH, CM, NUMA-Q, MPP, data-flow machines, Manchester machine and pipelining

#### **General Competences**

- Individual work
- Group work
- Project design and management
- Practice of existing and new technologies

### COURSE CONTENT

- 1) Categories of advanced/parallel architectures
- 2) CPU and memory interconnection systems
- 3) Cache memory coherence protocols
- 4) SIMD, MIMD, NC/CC-NUMA machine examples
- 5) Connection Machine and Transputer, Cray, DASH, CM, NUMA-Q, MPP,
- 6) Data-flow machines, Manchester machine and pipelining

INSTRUCTION	Class		
USE OF INFORMATION AND	Transputers & MPI simulation		
COMMUNICATION TECHNOLOGY	Learning support through Open eClass platform.		
TEACHING ORGANIZATION	Activities	Semester workload	
TEACHING ORGANIZATION	Activities Lectures	Semester workload 26	

	methodology application and case study analysis in smaller groups Short individual assignments / Teamwork case study. Circuit designs. Autonomous study <b>Total (25 hours of</b> workload per credit unit)	52 46 <b>150</b>	
STUDENT ASSESSMENT	I. Final written exam (100%) including:		
	- multiple choice questions		
	- role and interested part analysis on short case study		
	- comparative assessment o	f theory elements	

- Παπακωνσταντίνου Γ. Κ., Τσανάκας Π. Δ. & Φραγκάκης Γ. Π. (1999). Αρχιτεκτονική Υπολογιστών. Εκδόσεις Συμμετρία. [Κωδικός Βιβλίου στον Εύδοξο: 45342]
- Tanenbaum, Andrew S. (2000). Computer Architecture: A Structural Approach (4<sup>th</sup> ed.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13759]

-Suggested bibliography of scientific papers:

1. Dossis, M.F. and Kontaris, D. "Student Notes on Advanced Architectures", TEI of Western Macedonia, 2007

## SPECIAL NETEORK TOPICS II

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduc	ite			
CODE	SEMESTER G				
TITLE	SPECIAL NETWORK TOPICS II				
TEACHING ACTI	rivities		HOURS PER WEEK		CREDIT UNITS
Lectures, exer	ercises and laboratory practice 4		6		
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
	Special Network Topics I course (6 <sup>th</sup> semester) is recommended				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS157/				

#### LEARNING OUTCOMES

#### **Learning Outcomes**

The main target of the course is to provide students with advanced knowledge and skills for the design and implementation of complex and demanding medium-scale networks.

Students will understand in detail the operation of complex networking protocols and technologies, but at the same time they will have the opportunity to gain extensive experience in using and managing network devices (routers and switches), implement complex networking scenarios and deal with all the problems they will encounter in real-world corporate network conditions.

More specifically, students are expected to familiarize themselves with the architecture, elements and functions of routers and switches in a large and complex network. Students will be able to configure routers and switches in a small network for advanced functionality, configure and troubleshoot common problems involving dynamic packet routing in IPv4 and IPv6 networks, and design complex virtual local area networks (VLANs) and the protocols for switching of frames between VLANs (VTP, DTP) and spanning tree (STP) and in general to identify, manage and maintain the network devices.

Also, students will develop the knowledge and skills required to implement DHCP, NAT and DNS functions, as well as security mechanisms (ACLs) at the network and transport level. Upon completion of the course (theoretical part and practical exercises), students will be able to:

- Understand the operation of the VTP and DTP virtual LAN connection protocols.
- Understand the operation and need to use the STP spanning tree protocol.
- Analyze and categorize dynamic routing protocols.
- Understand and apply OSPF, EIGRP and eBGP protocols.
- Understand the technologies of wide area networks.
- Understand and implement advanced layer 3 (Network) and layer 4 (Transport) security settings.
- Analyze and evaluate the operation and utility of Cloud Computing
- Understand and apply Virtual Private Networks (VPN) technologies.

Identify and resolve issues and problems (troubleshooting) concerning the functionality of complex and demanding medium-scale corporate networks.

#### **General Competences**

• Application of theoretical knowledge in practice. This is achieved through hands-on practice in the

- hands-on / lab exercises and the various implementation scenarios.
- Search, analysis and synthesis of data and information using the necessary technologies
- Independent work when solving laboratory exercises.
- Cooperation during the preparation of the weekly exercises.
- Search for data and information on the internet.
- Adaptation to new conditions since they are asked to adapt their knowledge and skills to new scenarios to be implemented.
- Decision making
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

This course is the continuity of the **Special Network Topics I** course taught in 6th semester and is based on the knowledge provided in that course.

Teaching combines the electronic access to the teaching material through the Open eClass platform, with lectures in the classroom and carrying out the practical exercises in a specially equipped laboratory of the Department.

Through Practical Exercises and laboratory exercises, the concepts of theory are put into practice using a number of exercises that cover the material extensively.

More specifically, the course covers the following topics:

- 1. Dynamic routing protocols (link state distance vector) OSPF, EIGRP and router configuration.
- 2. Design of complex virtual local area networks (VLANs).
- 3. VLAN Trunking Protocol, Dynamic Trunking Protocol (DTP)
- 4. Spanning-Tree Protocol (STP)
- 5. Wide Area Network (WAN) Technologies and Security
- 6. Access Control Lists (ACLs)
- 7. IPv4 and IPv6 Dynamic Host Configuration Protocol (DHCP).
- 8. IPv4 address translation mechanism (Network Address Translation NAT).
- 9. Hierarchical naming system for computer networks (Domain Name System DNS).
- 10. Design of Virtual Private Networks (Virtual Private Networks VPN).
- 11. Network Virtualization & Cloud Computing Technologies.
- 12. Software Defined Networking (SDN).
- 13. Network Automation (Network Automation) and Network Programming.

INSTRUCTION	Lecture using audiovisual media.			
	Practical exercises in laboratory.			
USE OF INFORMATION AND	Use of specialized software of ne	etwork simulation.		
COMMUNICATION TECHNOLOGY	Handling and solving problems of	of managing real network		
	devices.			
	Learning support through Open	eClass platform.		
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	39		
	Exercises and laboratory 13			
	practice			
	Short individual exercises 52			
	Autonomous study 46			
	Total (25 hours of workload			
	per credit unit)			
STUDENT ASSESSMENT	The assessment criteria are determined at the beginning of			
	the assessment entend are determined at the beginning of			
	the semester and are accessible by students on the course			
	page in the Open eClass and include:			

<ol> <li>Written mid-course exam in Greek/English with a weight factor of 20% of the total grade, which includes:         <ul> <li>Multiple choice questions</li> <li>Matching Exercises</li> </ul> </li> </ol>
<ul> <li>2) Evaluation of the practical part with a weight factor of 20% of the total grade, which includes:</li> <li>a) Assessment of student's written reports</li> <li>b) Assessment of the practical skills acquired via online lab exercises.</li> </ul>
<ul> <li>3) Written final exam in Greek/English with a weight factor of 60% of the total grade, which includes:</li> <li>Multiple choice questions</li> <li>Matching Exercises</li> <li>Short answer questions</li> <li>Problem solving</li> </ul>
<ul> <li>Comparative assessment of theory elements</li> </ul>

Suggested Bibliography:

- Δουληγέρης, Χρήστος. (2021). Σύγχρονα Τηλεπικοινωνιακά και Δικτυακά Πρωτόκολλα (3<sup>n</sup> έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 33287934]
- Αλεξόπουλος, Αριστείδης & Λαγογιάννης, Γεώργιος. (2016). Τηλεπικοινωνίες και Δίκτυα Υπολογιστών (10<sup>η</sup> έκδ.). Εκδόσεις Α. Παπασωτηρίου & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 59374915]
- Stallings, William. (επιμ. Κατσαβούνης Στέφανος). (2018). Επικοινωνίες Υπολογιστών και Δεδομένων (10η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 77107676]
- 4. Stallings, William & Beard, Cory. (2016). *Ασύρματες Επικοινωνίες, Δίκτυα και Συστήματα*. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655989]
- Βογιατζής, Ιωάννης & Αντωνοπούλου, Ήρα. (2021). Υλικό, Λογισμικό και Επικοινωνίες Υπολογιστών (4η έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102075306]
- 6. Comer, Douglas E. (2003). Διαδίκτυα με TCP/IP: Αρχές, Πρωτόκολλα και Αρχιτεκτονικές (6η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13637]

Supplementary Bibliography:

- Doherty Jim, Anderson Neil & Della Maggiora Paul. (2010). Ο οδηγός της Cisco για τη δικτύωση (2η έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 140863]
- Τσαουσίδης Β., Μαματάς Ε., Ψαρράς Ι., Κοσμίδης Ε., Δημητρίου Σ. (2010). Εργαστηριακά Μαθήματα στα Δίκτυα και Διαδίκτυα Υπολογιστών. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 21492]
- 3. Odom, Wendell & Wilkins, Sean. (2017). CCNA Routing and Switching 200-125 Official Cert Guide and Network Simulator Library. Cisco Press. [ISBN: 1-58720-610-2]
- 4. Odom, Wendell & Wilkins, Sean. (2017). CCENT/CCNA ICDN1 100-105 Official Cert Guide and Network Simulator Library. Cisco Press. [ISBN: 1-58720-609-9]
- Johnson, Allan. (2017). 31 Days Before Your CCNA Routing & Switching Exam: A Day-By-Day Review Guide for the ICND1 (100-105), ICND2 (200-105), CCNA (200-125) Certification Exams. Cisco Press. [ISBN: 1-58720-590-4]
- 6. Nastase, Ramon. (2018). *Cisco CCNA Command Guide*. CreateSpace Independent Publishing. [ISBN: 1-72191-324-6]

# SEMESTER H

## DIGITAL SIGNAL PROCESSING

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER H				
TITLE	DIGITAL SIGNAL PROCESSING				
TEACHING ACTI	<b>TIVITIES</b>		HOURS PER WEEK	ł	CREDIT UNITS
		2			
	Laboratory 2				
	4 6			6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND EXAMS:	Greek / English				
OFFERED TO ERASMUS STUDENTS	NO				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS104/				

## LEARNING OUTCOMES

#### **Learning Outcomes**

- Recognize and describe digital signals and systems
- Estimate the advantages of digital systems against analogue
- Design signal analysis and process steps
- Recognize transforms and apply them
- Create applications of proper signal management in Matlab

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Critical review and self-reflection
- Promotion of free, creative and deductive thinking

## COURSE CONTENT

- 1) Introduction to signals
- 2) Digital signal process tools
- 3) Fourier series and transforms
- 4) Discrete time systems
- 5) System response-coevolution
- 6) Continuous time signal sampling
- 7) Shannon-Nyquist sampling theorem
- 8) Fourier discrete transform
- 9) Fast Fourier transform
- 10) Laplace transform
- 11) Z transform
- 12) Analogue filters
- 13) Digital filters

In the laboratory part, the following exercises are conducted using Matlab :

- Signal creation
- Signal peak analysis
- Signal comparison
- Pulse analysis
- Discrete Fourier transform
- Power measurement of periodic signal
- Cut-off filters

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Class and laboratory			
USE OF INFORMATION AND	Use of ICT in teaching.			
COMMUNICATION TECHNOLOGY	Learning support through Open eC	lass platform.		
	Laboratory training.			
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	52		
	Laboratory practice	52		
	Autonomous study	46		
	Total (25 hours of workload	150		
	per credit unit)	150		
STUDENT ASSESSMENT	Students take exams both in the theoretical and the			
	laboratory part of the course	in order to compete it		
	successfully.			
	A) Assessment in the theoretical part is:			
	- 25% individual assignments-online tests with multiple			
	- 55% individual assignments-online tests with multiple			
	choice questions through the page of the course			
	- 65% final exams on compa	irative analysis of theory		
	elements			
	B) Assessment in the laboratory pa	art is:		
	- 30% participation and practice during laboratory classes			
	- 70% final exam			
	The total grade is calculated as the weighted average scoring			
	60% of the theoretical and 40% of the laboratory part			
		the laboratory part.		

## **RECOMMENDED BIBLIOGRAPHY**

- Suggested Bibliography:
- Proakis, J., Manolakis D. (2010). Ψηφιακή Ανάλυση Σήματος (4<sup>n</sup> έκδ.). Εκδόσεις Ίων. [Κωδικός Βιβλίου στον Εύδοξο: 14869]
- Antoniou, A. (2009). Ψηφιακή Επεξεργασία Σήματος. ΕΚΔΟΣΕΙΣ Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549117]
- Hayes, Monson H. (2000). Ψηφιακή Επεξεργασία Σήματος. ΕΚΔΟΣΕΙΣ Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18549049]
- 4. Μάργαρης, Αθανάσιος Ι. (2011). Σήματα και Συστήματα Συνεχούς & Διακριτού Χρόνου. ΕΚΔΟΣΕΙΣ
   Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 18548733]
- Supplementary Bibliography:
- Θεοδωρίδης Σ., Μπερμπερίδης Κ.(2003). Εισαγωγή στη Θεωρία Σημάτων & Συστημάτων. Εκδόσεις Τυπωθήτω.
- 2. Κόγιας, Γ. (2010). Εισαγωγή στην ψηφιακή επεξεργασία σήματος. Σύγχρονη Εκδοτική
- Φωτόπουλος, Σπύρος.(2010). Ψηφιακή επεξεργασία σήματος: Βασικές έννοιες και εφαρμογές. Inspiration S.A.
- 4. Κωττής, Π. (2008). Διαμόρφωση και Μετάδοση Σημάτων, ΕΚΔΟΣΕΙΣ Α. Τζιόλα & Υιοί Α.Ε.

## **ARTIFICIAL INTELLIGENCE – LOGIC PROGRAMMING**

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	Undergraduate			
CODE	SEMESTER H			Н	
TITLE	ARTIFICIAL INTELLIGENCE – LOGIC PROGRAMMING				
TEACHING ACTI	VITIES		HOURS PER WEEK	CREDIT UNITS	
	Lectures and exercises				
	Laboratory practice				
			4	6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND EXAMS:	Greek / English				
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS105/				

#### LEARNING OUTCOMES

## Learning Outcomes

After the successful completion of the course students must understand:

- Search, exploration and solution of problems with predicates
- Knowledge logic and representation
- Prolog programme structure and operation
- Expert systems, action planning and knowledge technologies in semantic web
- Functional programming, neural networks and machine learning

## **General Competences**

- Individual work
- Group work
- Project design and management
- Practice of existing and new technologies

### **COURSE CONTENT**

- 1) Introduction to problem solving, search, exploration and games
- 2) Knowledge representation and logic with predicates and Prolog
- 3) Lists, recursion, events-data and global variables in Prolog
- 4) Introduction to expert systems, action planning and knowledge technologies in semantic web
- 5) Introduction to functional programming, neural networks and machine learning

INSTRUCTION	Class			
USE OF INFORMATION AND	Use of specialized logic programming software			
COMMUNICATION TECHNOLOGY	Learning support through Ope	n éclass platform.		
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Laboratory exercises on methodology application and case study analysis in smaller groups	26		
	Teamwork case study.	33		
	Presentation.			

	Educational trips / short individual assignments		
	Autonomous study	52	
	Total (25 hours of workload per credit unit)	150	
STUDENT ASSESSMENT	<ul> <li>I. Final written exam (50%) including:         <ul> <li>multiple choice questions</li> <li>role and interested part analysis on short case study</li> <li>comparative assessment of theory elements</li> </ul> </li> </ul>		
	II. Laboratory exams (50%)		

Suggested bibliography

- Βλαχάβας Ιωάννης, Κεφάλας Πέτρος, Βασιλειάδης Νίκος, Κόκκορας Φώτης & Σακελλαρίου Ηλίας. (2020). Τεχνητή νοημοσύνη (4<sup>η</sup> έκδ.). Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. [Κωδικός Βιβλίου στον Εύδοξο: 94700120]
- Russell, Stuart & Norvig, Peter. (2005). Τεχνητή Νοημοσύνη: Μια Σύγχρονη Προσέγγιση (4<sup>η</sup> έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13909]

- Suggested bibliography of scientific papers:

- Michael Dossis, "Automated Extraction of Hardware Accelerators via an Intelligent Knowledgebased System", International Journal of Intelligent Information Processing (IJIIP), vol. 1, no. 2, pp. 14-31, December 2010.
- Michael F. Dossis, "Use of XML Schema and Logic Programming Views as Formal Means to Validate a System Design Framework", Open Journal of Artificial Intelligence (OJAI), vol. 1, no. 2, August 2013, pp. 18-32.

## MICROPROCESSORS – MICROCONTROLLERS II

#### GENERAL

SCHOOL	SCIENCE			
DEPARTMENT	INFORMATICS			
STUDIES	Undergraduate	Undergraduate		
CODE			SEMESTER H	
TITLE	MICROPROCESSORS – N	ICR	OCONTROLLERS II	
TEACHING ACTI	TIVITIES HOURS PER CRE WEEK UN		CREDIT UNITS	
	Lectur	es	2	
	Laboratory and exercises 2			
	4 6		6	
ТҮРЕ	ELECTIVE COMPULSORY			
PREREQUISITE:	NONE Recommended courses: Combinatorial Electronics (2 <sup>nd</sup> semester), Microprocessors-Microcontrollers I (4 <sup>th</sup> semester)			
LANGUAGE OF TEACHING AND EXAMS:	Greek			
OFFERED TO ERASMUS STUDENTS	YES (in English)			
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS111/			

## LEARNING OUTCOMES

# Learning Outcomes

The goal of the course is to teach students basic principles of microcomputer systems and application implementation using microcontrollers of INTEL MCS51 family.

After the successful completion of the course students will:

- 1. Know the basic principles of microcomputer systems.
- 2. Know how timers/counters and interrupts are used in a microcontroller.
- 3. Be able to implement microcomputer system applications.
- 4. Understand the way peripheral devices are interconnected to a microcomputer system.

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Individual work
- Group work
- Promotion of free, creative and deductive thinking

#### **COURSE CONTENT**

- 1) Hardware description: Review of MCS-51 family, timers/counters.
- 2) *Interrupts:* Analysis of the way they operate, events that activate them, configuration, service queue, priority, interrupt start signals, interrupt exit, various interrupt type analysis, registers during interrupts, seize of subprogram interrupt service.
- 3) System applications using 8051 microcontroller: integrated system development using 8051 microcontroller and various peripherals (liquid crystal display (LCD), keyboard, serial devices, stepping motors, speakers, light sensitive transistors.

INSTRUCTION	Frontal teaching
USE OF INFORMATION AND	PowerPoint presentations, microcontroller programme
COMMUNICATION TECHNOLOGY	analysis using simulation software, laboratory exercises using
	computers and MCS-51 Microcomputer Trainer hardware,
	interaction with students, by using the Open eClass platform.

-				
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Laboratory exercises	26		
	Exercises	13		
	Study and analysis of books and articles	37		
	Autonomous study	48		
	Total (25 hours of workload per credit unit)	150		
STUDENT ASSESSMENT	There is a mid-term exam scoring 30% of the final grade			
	The final exam scores 40% of t	he final grade.		

## Suggested bibliography

 :Πογαρίδης, Δημήτριος. (2020). Ενσωματωμένα Συστήματα: Οι Μικροελεγκτές AVR και ARDUINO (3η έκδ.). Εκδόσεις ΔΙΣΙΓΜΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94689582]

Concerning the laboratory part, there is an exam with the use of hardware available in the laboratory (MCS-51 Microcomputer Trainer) scoring 30% of the final grade.

- Καλοφωλιάς, Δημήτριος. (2017). Προγραμματισμός του Μικροελεγκτή AVR ATMega328. Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 68369856]
- Καλοβρέκτης, Κωνσταντίνος. (2018). Βασικές Δομές Ενσωματωμένων Συστημάτων. Εκδόσεις Μαρκέλλα Ι. Βαρβαρήγου. [Κωδικός Βιβλίου στον Εύδοξο: 77119177]
- 4. Παπάζογλου, Παναγιώτης & Λιωνής, Σπύρος-Πολυχρόνης. (2021). *Ανάπτυξη Εφαρμογών με το Arduino* (3η έκδ.). Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102071811]
- Μπούρας, Αριστείδης Σ. & Κάππος, Ιωάννης Θ.,. (2021). ARDUINO: Αλγοριθμική, Προγραμματισμό και Εφαρμογές. Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 102070452]

### - Supplementary bibliography

- Φωτιάδης, Δημήτριος. (2010). Μικροεπεξεργαστές–Μικροελεγκτές: Ο Μικροελεγκτής 8051. Αυτοέκδοση. Θεσσαλονίκη. [ISBN: 9789609317900
- Καραΐσκος, Χρήστος. (2010). Ο Μικροελεγκτής 8051. Σύγχρονη Εκδοτική. Αθήνα. [ISBN: 9789606674518]
- Αλατσαθιανός, Σταμάτης. (2008). Ανάπτυξη Συστημάτων με Μικροελεγκτές 8051. Αυτοέκδοση. Αθήνα. [ISBN: 9789609259613]
- 4. Κόγιας, Γεώργιος. (2005). *Αρχιτεκτονική οργάνωση και προγραμματισμός μικροϋπολογιστών*. Σύγχρονη Εκδοτική. Αθήνα. [ISBN: 9608165873]
- Αλατσαθιανός, Σταμάτης. (2006). Ανάπτυξη συστημάτων με μικροελεγκτές. Εκδόσεις Χ. Γκιούρδα & ΣΙΑ ΕΕ. Αθήνα. [ISBN: 9603872148]
- 6. Myke, Predko. (2000). *Προγραμματίζοντας τον μικροελεγκτή 8051*, Εκδόσεις Α.Τζιόλα & Υιοί Α.Ε. Θεσσαλονίκη. [ISBN: 9608050340]
- Ayala, Kenneth J. (1991). The 8051 Microcontroller: Architecture, Programming, Applications. West Publishing Company St. Paul Inc. [ISBN: 0314772782]
- Suggested scientific magazines:
  - Περιοδικό RTC (www.rtcmagazine.com)

## DATA MINING

#### GENERAL

FACULTY	SCIENCE				
DEPARTMENT	INFORMATIC	INFORMATICS			
STUDIES	Undergradua	ate			
CODE	SEMESTER H				
TITLE	DATA MINING				
TEACHING ACTI	TIVITIES		HOURS PER WEEK	CREDIT UNITS	
	Lectures and exercises		4	6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS169/				

### LEARNING OUTCOMES

### **Learning Outcomes**

The course is the basic introductory course in Data Mining concepts. The course material aims to introduce students to the basic Data Mining Techniques (data, problems, applications). It also covers introductory concepts of Data Pre-processing, Classification, Clustering and Association Analysis so that the student has an overall understanding of the processes and methodologies/techniques used in Data Mining.

Upon successful completion of the course, students will:

- Understand the fundamentals of data mining
- Understand data pre-processing issues and can apply related techniques
- Understand issues related to data warehouses
- Know about classification algorithms and techniques
- Know about clustering algorithms and techniques
- Know about association analysis algorithms and techniques
- Know about anomaly detection algorithms and techniques
- Know how to use data mining software (e.g. Weka, Matlab)
- Be able to solve problems with real data

#### **General Competences**

- Individual work and Teamwork
- Project planning and management
- Decision making
- Search, analyze and synthesize/aggregate data and information, using the necessary technologies.

#### **COURSE CONTENT**

- 1) Introduction to Data Mining Techniques: data, problems, applications.
- 2) Data pre-processing: cleaning, transformation, dimensionality reduction techniques.
- 3) Classification: introduction, decision trees, overfitting, missing values, Nearest Neighbor classifiers, Support Vector Machine, Neural Networks.
- 4) Clustering: introduction, distance metrics, clustering estimation, k-Means, Hierarchical Clustering, DBSCAN, Density and Graph based Clustering.
- 5) Association Analysis: basic concepts and problem definition, rules generation, the Apriori algorithm, the FP-Growth algorithm, evaluation of association rules.
- 6) Advanced topics on Association Analysis.
- 7) Anomaly Detection: basic concepts, proximity and density based outlier detection, clustering based techniques.
- 8) Use of tools (e.g. Weka, MATLAB).

TEACHING AND LEARNING METHODS -	ASSESSMENT			
INSTRUCTION	Class			
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of Information and Communication Technologies in the teaching of the course: Projector, Computer, MS Office, Data Mining software packages and applications (Weka, MATLAB) Use of Information and Communication Technologies in laboratory education: Computers are used on which students are asked to implement their assignments and exercises. Use of Information and Communication Technologies in student assessment/evaluation: Computers on which the data mining algorithms are executed. Use of Information and Communication Technologies in communication with students: In the context of communication with students the Open eClass and e-mail are used.			
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	39		
	Laboratory Exercises	13		
	Exercises	26		
	Semester	26		
	assignment/project			
	Autonomous study 46			
	Total (25 hours of 150 workload per credit unit)			
STUDENT ASSESSMENT	<ol> <li>Final written exam.</li> <li>Homework/exercises.</li> <li>Use of multiple bibliograp</li> <li>Laboratory exercises.</li> <li>Monitoring students durin exercises.</li> <li>Receiving systematic feed</li> <li>Ensuring transparency in the performance:</li> <li>The course evaluation includes         <ul> <li>Final written exam (70%)</li> <li>Exercises/Project (30%).</li> </ul> </li> <li>The performance of the student eClass platform.</li> <li>Every student can see their wr any questions they may have at the same applies for everying</li> </ol>	hies. Ing the execution of practical back from students. the evaluation of student s: Ints is communicated in Open iting and get explanations of about their grading.		

- 1. Tan, Pang-Ning, Steinbach Michael, Kumar Vipin. (επιμ. Βερύκιος Βασίλειος). (2018). Εισαγωγή στην Εξόρυξη Δεδομένων (2η έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 77107675]
- 2. Rajaraman Anand, Ullman Jeffrey David & Leskovec Jure. (2020). Εξόρυξη από Μεγάλα Σύνολα Δεδομένων (3η έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 94700707]
- 3. Νανόπουλος, Αλ. & Μανωλόπουλος, Γ. (2008). Εισαγωγή στην Εξόρυξη Δεδομένων και τις Αποθήκες Δεδομένων. Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 3079]
- 4. Margaret, Dunham H. (2004). Data Mining, Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 395]

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## NETWORK SECURITY

#### GENERAL

SCHOOL	SCIENCE	SCIENCE			
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER H				
TITLE	NETWORK S	ECURITY			
TEACHING ACTI	IVITIES HOURS PER WEEK		2	CREDIT UNITS	
Lectures, exer	cises and labo	ratory practice	4		6
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
	Computer Systems Security course (7 <sup>th</sup> semester) is recommended				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS159/				

### LEARNING OUTCOMES

#### Learning Outcomes

The course aims at introducing students to the fundamental principles of Network and Data Communications Security, and the security problems of modern network information systems, their protection mechanisms and technologies, as well as practical training in a laboratory environment with implementation of cryptographic algorithms, vulnerability and intrusion detection, intrusion prevention, protective measure application and security policy management.

After the successful completion of the course students will :

- Know and explain the fundamental concepts of data and communications network security.
- Understand the fundamentals of symmetric and asymmetric cryptography, authentication and access control, protecting data confidentiality and integrity, and designing secure network systems.
- Distinguish and analyze the basic security characteristics of data networks and network applications, the particular vulnerabilities and threats that exist.
- Know and apply the security mechanisms and corresponding protocols at all levels of the TCP/IP networking model and the perimeter defense mechanisms of networks and Virtual Private Networks.
- Specify the security requirements for a data network based on the supported applications and the available computing resources of the network nodes.
- Detect and assess vulnerabilities, threats and risk assessment in data networks and implement risk prevention mechanisms.
- Evaluate and implement wireless communications security protocols and mechanisms.
- Know the security mechanisms of embedded devices
- Apply network penetration testing (penetration testing) as well as analysis of security incidents (digital forensics).
- Compare and evaluate fundamental access control models and policies and develop an appropriate security policy and the necessary mechanisms to support it.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Adaptation to new conditions
- Decision making
- Promotion of free, creative and deductive thinking
- Critical review and self-reflection
- Individual work and Group work

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## COURSE CONTENT

- 1) Basic Concepts and Fundamental Principles of Network Security
- 2) Internet Security Protocols and Standards.
- 3) Network security mechanisms and protocols at the TCP/IP layers (IPSec, SSL/TLS, etc.).
- 4) Access Control and AAA mechanisms over the Internet
- 5) Database and Cloud Computing Security
- 6) Denial of Service Attacks
- 7) Intrusion Detection
- 8) Firewalls and Intrusion Prevention Systems
- 9) Virtual Private Networks (VPNs)
- 10) Protocols and security mechanisms of wireless data and communications networks (WiFi, WPAN, Bluetooth, NFC, 3G/4G/5G, etc.)
- 11) IoT security (WSN security
- 12) Penetration Testing
- 13) Digital forensics

In the Practical Part of the course, students have the possibility of getting a practical experience on theory concepts, using a number of exercises that extensively cover the material, and gain experience in the use of encryption, authentication and access control mechanisms, network security control applications, using corresponding tools and software libraries (vulnerability detectors, penetration control and vulnerability exploitation tools, intruder detection and prevention systems, firewalls, etc.).

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INSTRUCTION.	Lecture using audiovisual media. Laboratory exercises - practice.			
USE OF INFORMATION AND	Use of specialized software			
COMMUNICATION TECHNOLOGY	Learning support through Open eClass	platform.		
	In the context of communication with	th students Open eClass		
	and e-mail are used.	-		
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	39		
	Laboratory exercises	13		
	Short individual assignments	52		
	Autonomous study	46		
	Total (25 hours of workload per credit unit)	150		
STUDENT ASSESSMENT	The course assessment includes:			
	<ol> <li>Written mid-course exam in Greek/English with a weight factor of 20% of the total grade, which includes:         <ul> <li>Multiple choice questions</li> <li>Matching Exercises</li> </ul> </li> </ol>			
	<ul> <li>2) Evaluation of the practical part with a weight factor of 30% of the total grade, which includes:</li> <li>a) Assessment of student's written reports</li> <li>b) Assessment of the practical skills acquired via online lab exercises.</li> </ul>			
	<ul> <li>Written final exam in Greek/English 50% of the total grade, which include</li> <li>Multiple choice questions</li> <li>Matching Exercises</li> <li>Short answer questions</li> <li>Problem solving</li> <li>Comparative assessment of theor</li> </ul>	with a weight factor of des: v elements		

Suggested bibliography

- 1. McClure, Stuart, Scambray, Joel & Kurtz, George. (2009). Ασφάλεια Δικτύων (6η αμερικανική έκδ.). Εκδόσεις Χ.Γκιούρδα & ΣΙΑ ΕΕ. Κωδικός Βιβλίου στον Εύδοξο: 12272
- 2. Stallings, William. (2011). Κρυπτογραφία για Ασφάλεια Δικτύων: Αρχές και Εφαρμογές. Εκδόσεις ΙΩΝ. [Κωδικός Βιβλίου στον Εύδοξο: 12777632]
- 3. Stallings, William (2008). ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΑΣΦΑΛΕΙΑΣ ΔΙΚΤΥΩΝ: Εφαρμογές και Πρότυπα (3η αμερικανική έκδ.). Εκδόσεις Κλειδάριθμος ΕΠΕ. [Κωδικός Βιβλίου στον Εύδοξο: 13618]
- 4. Κάτσικας, Σωκράτης, Γκρίτζαλης, Στέφανος, Λαμπρινουδάκης, Κωνσταντίνος. (2020).
   Ασφάλεια Πληροφοριών & Συστημάτων στον Κυβερνοχώρο. Εκδόσεις Νέων Τεχνολογιών
   ΙΚΕ. [Κωδικός Βιβλίου στον Εύδοξο: 94701556]
- Supplementary bibliography
- Μαυρίδης, Ιωάννης. (2016). Ασφάλεια Πληροφοριών στο Διαδίκτυο [ebook]. ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN: 978-960-603-193-9. [Κωδικός Βιβλίου στον Εύδοξο: 320065]
- Μαυρίδης, Ιωάννης. (2016). Εργαστήριο Ασφάλειας Πληροφοριών και Συστημάτων [ebook]. ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN: 978-960-603-192-2. [Κωδικός Βιβλίου στον Εύδοξο: 320025]
- Ζάχος, Ευστάθιος, Παγουρτζής, Αριστείδης & Γροντάς, Παναγιώτης (2016). Υπολογιστική Κρυπτογραφία [ebook] ΣΕΑΒ Αποθετήριο "Κάλλιπος". ISBN 978-960-603-276-9. [Κωδικός Βιβλίου στον Εύδοξο: 59303550]
- 4. Sanjib, Sinha. (2018). Beginning Ethical Hacking with Kali Linux [ebook]. HEAL-Link Springer ebooks. ISBN: 978-148-423-891-2. [Κωδικός Βιβλίου στον Εύδοξο: 91677533]
- 5. Sanjib, Sinha. (2017). Beginning Ethical Hacking with Python [ebook]. HEAL-Link Springer ebooks. Apress. ISBN: 978-148-422-541-7. [Κωδικός Βιβλίου στον Εύδοξο: 75482250]
- 6. Grimes, Roger A. (2017). Hacking the Hacker: Learn from the Experts Who Take Down Hackers HEAL-Link Wiley ebooks. ISBN: 978-111-939-626-0. [Κωδικός Βιβλίου στον Εύδοξο: 91696983]
- 7. Rahalkar, Sagar (2019). Quick Start Guide to Penetration Testing, First Edition [ebook]. 1st ed. HEAL-Link Springer ebooks. ISBN: 978-148-424-270-4. [Κωδικός Βιβλίου στον Εύδοξο: 91693727]
- 8. Allsopp, Wil. (2017). Advanced Penetration Testing, First Edition [ebook]. HEAL-Link Wiley ebooks. ISBN: 978-111-936-774-1. [Κωδικός Βιβλίου στον Εύδοξο: 91696983]
- 9. Oriyano, Sean-Philip. (2017). Penetration Testing Essentials, First Edition [ebook]. HEAL-Link Wiley ebooks. ISBN: 978-111-941-935-8. [Κωδικός Βιβλίου στον Εύδοξο: 805039093]

## WAITING SYSTEMS

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE	SEMESTER H				
TITLE	WAITING SYSTEMS				
TEACHING ACTI	VITIES	HOURS PEF WEEK	ł	CREDIT UNITS	
Lect	ures and labo	4		6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS162/				

## LEARNING OUTCOMES

Learning Outcomes

The course aims at introducing students to system performance analysis and Markov processes and offering the basic knowledge on queueing systems, probability and statistic use.

After the successful completion of the course students will:

- Understand the most basic methods of modeling and computer system performance analysis: analytical models, simulation models and empirical techniques.
- Estimate and assess the performance of a computer system.

#### **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

### COURSE CONTENT

- 1) Introduction to system performance analysis.
- 2) Basic principles of probabilities and statistics.
- 3) Markov processes.
- 4) Stochastic techniques, queuing line theory models.
- 5) Measurement techniques and tools
- 6) Simulation models

INSTRUCTION	Lecture, discussion and student participation. PowerPoint		
	presentations.		
USE OF INFORMATION AND	Theory presentation with Pow	erPoint.	
COMMUNICATION TECHNOLOGY	Electronic self-assessment exercises.		
	Learning support through Open eClass platform.		
TEACHING ORGANIZATION	Activities Semester workload		
	Lectures 26		
	Laboratory exercises 26		
	Teamwork case study		
	Autonomous study 98		
	Total (25 hours of 150 workload per credit unit)		

Suggested bibliography

- 1. Δάρας, Τρύφων Ι. & Σύψας, Παναγιώτης Θ. (2003). *Στοχαστικές Ανελίξεις Θεωρία και Εφαρμογές*. Εκδόσεις Ζήτη Πελαγία & ΣΙΑ Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 11281]
- Φακίνος, Δημήτρης. (2008). Ουρές Αναμονής: Θεωρία και Ασκήσεις (2η έκδ.). Εκδόσεις Συμμετρία. [Κωδικός Βιβλίου στον Εύδοξο: 45392]
- Papoulis, Athanasios & Pillai, Unnikrishna S. (επιμ. Παναγόπουλος Αθανάσιος). (2019). Πιθανότητες, Τυχαίες Μεταβλητές και Στοχαστικές Διαδικασίες (4η Βελτιωμένη έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & YIOI Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 86054120]

- Supplementary bibliography

- 1. Kleinrock, Leonard. (1975). *Queueing Systems (Volume 1: Theory)*. Wiley-Interscience Publications. USA. ISBN: 9780471491101
- 2. Kleinrock, Leonard. (1976). *Queueing Systems (Volume 2: Computer Applications)*. Wiley-Interscience Publications. USA. ISBN: 9780471491118

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## **OPERATION RESEARCH**

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	ate			
CODE	SEMESTER H				
TITLE	OPERATION RESEARCH				
TEACHING ACTIVITIES		HOURS PER WEEK	2	CREDIT UNITS	
Lectures and exercises		4		6	
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE (Recommended courses: Linear Algebra (1 <sup>st</sup> semester) and Discrete Mathematics (2 <sup>nd</sup> semester)				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	YES (in English)				
WEBSITE (URL)	https://eclass.uowm.gr/courses/CS137/				

## LEARNING OUTCOMES

#### Learning Outcomes

The course aims at introducing students to the basic principles of problem solving in operation research. It also helps them understand the basic principles of linear programming and respective mathematical model used in many practical applications.

After the successful completion of the course students will :

- Format a problem into a linear programming problem.
- Use software to solve linear programming problems.
- Program linear programming algorithms.

## General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Decision making
- Promotion of free, creative and deductive thinking

### COURSE CONTENT

- 1) Basic principles of linear programming. Formatting problems into linear programming problems. Graphical solution of linear programming problems.
- 2) Simplex method. Sensitivity analysis.
- 3) Special problems (transportation problem, assingment problem).
- 4) Network analysis. PERT and CPM techniques.
- 5) Software use in problem solving (MATLAB, MATHEMATICA, SOLVER, LINDO, QSB).
- 6) 6) Code writing for the solution of linear programming problems.

INSTRUCTION	Class			
USE OF INFORMATION AND	Electronic lectures (LATEX)			
COMMUNICATION TECHNOLOGY	Matlab, Mathematica, SOLVER	(EXCEL), LINDO, QSB software		
	Learning support through Ope	Learning support through Open eClass platform.		
TEACHING ORGANIZATION	Activities	Semester workload		
	Lectures	26		
	Exercises 26			
	Group work 48			
	Autonomous study 50			
	Total (25 hours of workload per credit unit)	150		
STUDENT ASSESSMENT	Assignments 50%			
	Final written exam 50%			

Suggested bibliography

- Κολέτσος, Ιωάννης & Στογιάννης, Δημήτρης. (2021). Εισαγωγή στην Επιχειρησιακή έρευνα (4η έκδ.). Εκδόσεις Συμεών. [Κωδικός Βιβλίου στον Εύδοξο: 102071126]
- Κώστογλου, Βασίλειος Ι. (2015). Επιχειρησιακή Έρευνα, Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 50655958]
- Υψηλάντης, Παντελής Γ., Επιχειρησιακή έρευνα: Εφαρμογές στη σημερινή επιχείρηση (5η έκδ.). Εκδόσεις Προπομπός. [Κωδικός Βιβλίου στον Εύδοξο: 50659326]
- Hillier, Frederick S. & Lieberman, Gerald J. (επιμ. Διαμαντίδης Αλ.). (2022). Εισαγωγή στην Επιχειρησιακή Έρευνα (11<sup>η</sup> έκδ.). Εκδόσεις Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 102072205]

## - Supplementary bibliography

- Σίσκος Γ. (2000). Γραμμικός Προγραμματισμός (2<sup>η</sup> έκδ.). Εκδόσεις Νέων Τεχνολογιών Ι.Κ.Ε. [Κωδικός Βιβλίου στον Εύδοξο: 2599]
- Παπαρρίζος Κ. (1999). Γραμμικός Προγραμματισμός: Αλγόριθμοι και Εφαρμογές. Εκδόσεις Ζυγός. [Κωδικός Βιβλίου στον Εύδοξο: 1781]

## DISSERTATION

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergradua	te			
CODE	SEMESTER H				
TITLE	DISSERTATION				
TEACHING ACTI	TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS
	12		12		
ТҮРЕ	ELECTIVE COMPULSORY				
PREREQUISITE:	NONE Research Methodology and Ethics course (7 <sup>th</sup> semester) is recommended				
LANGUAGE OF TEACHING AND	Greek / English				
	VES (in English)				
WERSITE (IIDI)	http://cc.uoum.gr/				
WEDSITE (UKL)					

#### LEARNING OUTCOMES

#### **Learning Outcomes**

The Dissertation (Bachelor Thesis) aims to familiarize undergraduate students with scientific research and project development issues in areas related to the academic subjects covered in the Department's curriculum. Students learn how to present a scientific paper, which is likely to be needed in their careers.

Upon successful completion of the Dissertation project, students:

- Understand the concept of scientific research.
- Learn how to search in scientific literature and bibliographic sources in order to acquire the appropriate scientific information for the relevant research topics.
- Develop the compositional ability and skills in writing a scientific text
- Develop critical thinking and professional awareness
- Develop presentation skills

## **General Competences**

- Search, analysis and synthesis of data and information using the necessary technologies
- Individual work and/or Group work
- Adaptation to new conditions
- Promotion of free, creative and deductive thinking
- Critical review and self-reflection
- Decision making
- Presentation Skills.

## COURSE CONTENT

The Dissertation (Bachelor Thesis) is prepared by the student in collaboration with a supervising member of the Department's teaching staff. The Dissertation is presented before a three-member examination committee (including the supervisor). A joint Dissertation project may be assigned to a group of two (2) students upon approval by the respective supervisor.

The minimum duration for the successful completion of the Dissertation project is one (1) academic semester (at minimum), and it can be extended (upon approval by the respective supervisor) up to one year, depending on the needs and requirements of the subject.

Students, in collaboration with their supervisors, prepare a basic draft of the Dissertation project and

a preliminary timeplan, define its objectives and issues to be analyzed.

Based on these tasks the Dissertation project work progress may be summarized as follows:

- 1) Scientific research and literature study in the context of the Dissertation Assignment
- 2) Application development or conducting experimental work or case study analysis on the subject of the Dissertation Assignment
- 3) Processing and analyzing Dissertation project work results
- 4) Dissertation Assignment Writing
- 5) Prepape a Presentation of the complete Dissertation project
- 6) Defend the complete Dissertation project before the three-member examination committee (including the supervisor)

TEACHING AND	LEARNING	METHODS	- ASSESSMENT

INSTRUCTION	Meetings between the supervising professor and the student.			
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	<ul> <li>In the context of communication with students Open eClass and e-mail are used.</li> <li>Use of ICT and available electronic services provided by the University (<u>https://noc.uowm.gr/www/services/</u>).</li> <li>Use of specialized software.</li> </ul>			
TEACHING ORGANIZATION	Activities	Semester workload		
	Guided study	25		
	Autonomous study	75		
	Experimental / Computational /	50		
	Lab work			
	Assignment Writing	125		
	Presentation	25		
	(preparation and defense			
	Total (25 nours of workload	300		
	per creat ant)			
	per creat unit)When the Dissertation project work preparation is completed and meets the basic conditions for examination and upon approval by the respective supervisor, the student submits to the Department's Secretariat an application form for the presentation-examination of his/her Dissertation.Folowing the submission of the Dissertation project work, the Department appoints a three-member examination committee which consists of members of the Department's teaching staff (including the supervisor). The dates and the program of Dissertation presentations are announced in the Department's website. All members of teaching staff, and students of the 			
	After the presentation of the Dissertation, each member of the examining committee grades the overall performance of the student based on the following criteria:			

<ul> <li>a. For the Dissertation deliverables' content and appearance (comprehensive work, enriched text, application development, etc.).</li> <li>b. For the way of presenting the Dissertation project work (direct speech, ease of speech, enriched slides, etc.) and</li> <li>c. For the student's overall knowledge acquired on the Dissertation topic (to have a deep understanding of the subject, to be able to analyze and synthesize the acquired knowledge, to have a quick-effortless response to questions and to defend his/her work in an understandable way)</li> </ul>
In case of inadequacy even in one of the three axes above (according to the majority of the examining committee), then the Dissertation is rejected or referred.
In the event of non-rejection, each member of the examination committee submits a grade for the entire procedure. The final grade results from the average of the grades marked by the three members of the examination board and the final Evaluation Report is submitted to the Department's Secretariat.
In case of rejection of the Dissertation, then the student repeats the process of undertaking the Dissertation Assignment with a new topic.
In the event that additional processing (partial improvements in the Dissertation deliverables) is requested by the examination board, within a specific timeframe, then the student has to resubmit a newer improved version of his/her Dissertation, and his/her work is re-evaluated (a second referral is not allowed). If it is adequate the final Evaluation Report is re-submitted (new grade) to the Department's Secretariat.

1. Regulation of the Undergraduate Studies Program of the Department of Informatics: <u>https://cs.uowm.gr</u>

Guidelines for the search, analysis and synthesis of data and information from the main sources of scientific literature and writing of the Bachelor Thesis are determined by the respective supervising professor.
#### INTERNSHIP

#### GENERAL

SCHOOL	SCIENCE				
DEPARTMENT	INFORMATICS				
STUDIES	Undergraduate				
CODE	SEMESTER E/F/G/H			F/G/H	
TITLE	INTERNSHIP				
TEACHING ACTIVITIES		HOURS PER WEEK		CREDIT UNITS	
				6	
ТҮРЕ	ELECTIVE OPTIONAL				
PREREQUISITE:	NONE				
LANGUAGE OF TEACHING AND	Greek / English				
EXAMS:					
OFFERED TO ERASMUS STUDENTS	NO				
WEBSITE (URL)	http://cs.uov	vm.gr/			

#### LEARNING OUTCOMES

#### Learning Outcomes Internship is an important part of Higher Education, as it concerns the acquisition of work experience and the students' contact with the job market.

The Internship aims to adequately prepare the students to work effectively in a field relevant to their studies. The activities developed within the framework of the Internship focus on strengthening students by seeking the best utilization at a professional level of the knowledge and skills they acquired during their studies, and their easier and more beneficial integration into the job market.

Upon successful completion of the Internship, students will:

- acquire basic work experience in the specialty related to their studies
- develop additional qualifications and skills in the field of Computer Science and Information Technology.
- develop practical skills that can be useful to them in finding a job after obtaining their degree and in the right career orientation..

#### General Competences

- Adaptation to new conditions
- Individual work
- Group work
- Decision making
- Search, analysis and synthesis of data and information using the necessary technologies

#### COURSE CONTENT

The Internship is optional as an elective, is not graded and receives six (6) ECTS.

The ECTS of the Internship will not be taken into account in the total number of ECTS required to obtain the BSc degree but will be listed in the Diploma Supplement.

The Internship does not replace any other course and is written on the student's detailed score list.

The Internship's duration is 3 months and there is no predetermined start period.

The Internship can be implemented from the 5th semester of studies onwards.

Each undergraduate student of the Department can do Internship only once during his/her studies.

The Internship should be carried out in workplaces related to the subject of the Department's studies and students should be engaged in subjects related to their studies with the aim of consolidating knowledge, providing the opportunity to develop initiatives and abilities to solve problems and teamwork. The aim of the internship is to help students gain practical experience and apply their knowledge acquired at the Department of Informatics in related tasks of the working environment.

More specifically, the Internship concerns the following subjects:

- 1) Design, development, testing, documentation and installation of programs, improvement and maintenance of applications.
- 2) Design, coding and testing of scientific programs, databases, management information systems and decision support systems.
- 3) Analyzing problems, writing reports and managing security issues of computer systems and networks.
- 4) Drafting of technical and economic reports
- 5) Implementation of e-commerce applications and online transactions.
- 6) Study, design, supervision, installation, operation control and maintenance of Information Systems and Industrial Automation Systems controlled or supported by computers.
- 7) Study, design, installation and management of data communication networks (cable, optical and wireless) with the necessary peripherals.
- 8) Study, design and configure peripheral units to the computer systems.
- 9) Design, analysis and management of digital processing systems.
- 10) Technical support and maintenance of commercial computer systems.

#### **TEACHING AND LEARNING METHODS - ASSESSMENT**

INSTRUCTION	Cooperating organizations, agencies and/or businesses, of the public and/or private sector.		
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	<ul> <li>Use of specialized software.</li> <li>Student support through the Open eClass platform.</li> <li>Communicating with students electronically via email.</li> </ul>		
TEACHING ORGANIZATION	Activities	Semester workload	
	Internship	150	
	Total (25 hours of workload	150	
	per credit unit)	150	
STUDENT ASSESSMENT	Report from the student intern's er and the Department's Internship Si	nployer upervisor.	

#### **RECOMMENDED BIBLIOGRAPHY**

- 1. Regulation of the Undergraduate Studies Program of the Department of Informatics: <u>https://cs.uowm.gr</u>
- 2. Official website of the Internship Office of the University of Western Macedonia: https://internship.uowm.gr/

### **INTERNSHIP**

According to Decision 1/2022 of the Assembly of the Department of Informatics, the Department's Undergraduate Study Programme was amended with the addition of the **Internship** in the 8th semester of studies.

The **Internship** is **optional** as an **elective course** and receives **6 ECTS**. The **Internship** does not count towards obtaining the Degree, does not replace any another course, and it will be stated in the student's analytical grade form.

The **Internship's duration is 3 months** and there will be no predetermined start period. Each student can do only one Internship during his/her undergraduate studies at the Department.

The Internship should be carried out in workplaces related to the subject of the Department's studies and the students should be engaged in subjects related to their studies with the aim of consolidating knowledge, providing the opportunity to develop initiatives and abilities to solve problems and teamwork Internship is optional as a course and receives 6 ECTS and lasts 3 months. Students who do internships develop practical skills that can be useful in finding work after graduation.

#### SCOPE OF THE INTERNSHIP

The scope of the internship of the Department's students is the practical application of the acquired knowledge in matters of the working environment. During the internship they will gain basic work experience in the specialty and develop additional qualifications and skills in the field of Information Technology and Computer Technology.

More specifically, the internship concerns the following thematic subjects:

- the design, development, testing, documentation and installation of programs, improvement and maintenance of applications.
- the design, coding and testing of scientific programs, databases, management information systems and decision support systems.
- analyzing problems, writing reports and managing security issues of computer systems and networks.
- the drafting of technical and economic reports and the implementation of e-commerce applications and online transactions.
- the study, design, supervision, installation, operation control and maintenance of Information Systems and Industrial Automation Systems controlled or supported by computers.
- the study, design, installation and management of data communication networks (cable, optical and wireless) with the necessary peripherals.
- the study, design and configure peripheral units to the computer systems
- the design, analysis and management of digital processing systems.
- the technical support and maintenance of commercial computer systems

#### INTERNSHIP WORKPLACES

The workplace for carrying out the internship can be either the public or the private sector. In particular, the internship can be carried out:

• to IT companies that design, develop and implement IT products whether they are software or computer hardware, such as operating systems, compiler routines, databases, information

systems, decision management systems, computer systems and Industrial Systems, controlled by computers, digital data processing and analysis transfer systems, e-commerce and online transaction applications, computer networks, security systems for computer systems and network transactions, computer peripherals, etc.

- to companies, businesses, organizations, bodies in both the private and public sector that use IT products (e.g. companies and service providers, SMEs, Municipal Companies, Local/Regional Government Organizations, Public Utility Companies, Public or Private Legal Entities, etc.)
- in educational organizations, in Lifelong Learning Institutes, in training centers and in general in companies active in the provision of IT knowledge.
- in scientific research centers, which require specialized programming and technical support of their computing systems.
- in IT companies and commercial enterprises active in e-commerce and e-business.
- in IT companies that provide technical and consulting support.

### INTERNSHIP PROGRAM

The internship supervisor, in collaboration with the person in charge of the appropriate unit or service, distributes the internship time to all Departments of the unit so that the student intern acquires experiences that cover the largest possible part of the cognitive areas, listed above.

For this purpose, it is possible to move the student to different units at the discretion of the internship committee.

#### **DURATION OF THE INTERNSHIP**

This outline of the internship concerns a period of three months, during which the student should practice in all the activities of the unit or service or company, related to his specialty.

### HIGHER EDUCATION INTERNSHIP (ESPA)

The Department of Informatics, as a newly established Department of U.W.M. participates in the "Tertiary Education Practice of the University of Western Macedonia" of the Operational Program "Development of Human Resources, Education and Lifelong Learning" which is co-financed by the European Union (European Community Fund) and by National Resources with the new Call of NSRF in 2022.

The Internship program of the University of Western Macedonia aims to adequately prepare students in order to effectively apply the knowledge they acquire during their studies and to work in a field of work directly or indirectly related to their studies. The activities developed in the context of the Internship concern the strengthening of the students' activities, seeking the best utilization at a professional level of the knowledge and skills they acquired during their studies and their easier and more beneficial integration into the labor market.

The Internship in the IT Department has been instituted and will last for three months. It will be implemented from the 5th semester of studies onwards.

Students will apply on the program's online platform and then the Internship positions will be given to the Department each year (always depending on the funding received by the program) will be distributed according to a published algorithm. Internship is a mandatory optional course for those who are beneficiaries of the program. The students during the implementation of the internship are supervised by a teacher who is the same for everyone. The beneficiaries are insured through the National Social Insurance Agency for the months of the internship.

It can be done in Public or Private Institutions in a ratio of 45% and 55% respectively. This quota is imposed by the European Commission and is inexorable. The hosting organization declares the internship positions that it wishes on the ATLAS platform (Central Support System for the Internship of University students (<u>https://atlas.grnet.gr/</u>) and from there the position is reserved for the prospective student. The whole process concerning the deliverables of students and supervising professors is done electronically from the website: <u>https://arch.icte.uowm.gr/iposition/index.php?=site/login</u>

The official website of the UoWM Internship Office is: <u>https://internship.uowm.gr/</u>

#### **BEFORE THE INTERNSHIP**

The actions required for the process of inclusion of students in Internship are the following:

- A. The student who wishes to carry out the Internship, is informed by the announcements of the Internship Office on the page <u>https://internship.uowm.gr/</u> when is the predetermined period for submitting the electronic application for participation as well as the link (site) where the online application is posted.
- B. When submitting the online application, the student should know:
  - 1) his/her personal information as well as further information such as VAT number, how to obtain an "AMA IKA" (social security member registration number). The student must visit the nearest EFKA branch either of his/her permanent residence or of the city where the institution he/she is studying is located and submit an application with his/her police ID in order to be given the DIRECTLY INSURED CENSUS CERTIFICATE. A copy of this certificate should be submitted to the Internship Office after the student has been selected and the necessary supporting documents have been completed to start the Internship.
  - 2) the student must provide the Internship office with a copy of a bank account from any bank, as long as the student is a beneficiary or co-beneficiary of the bank account. Therefore, the first page of the bank book is a necessary document.
- C. After the completion of the deadline for the submission of online applications, the relevant committee of the School meets, decides based on evaluation criteria, and announces the tables with the names of the students who have been selected for Internship and also of the runners-up, in case of an obstacle of the first candidate for the Internship position.
- D. The student searches for and finds the institution (Public or Private) where he/she will do his/her internship. This search can be supported by the Internship Office. You can also find information about Internship positions, if they are available online, on the official website of Atlas: <a href="https://atlas.grnet.gr/">https://atlas.grnet.gr/</a>

The student is encouraged to come into personal contact and communication with the institutions, to negotiate the working conditions, the period during which he will carry out his internship and to gain their trust. The student has an obligation to inform the Internship Office about the implementation period of the internship 2 months before its start, so that the internship in cooperation with the Special Account for Research Grants of the UOWM to start the administrative process required for the start of the implementation of each student's Internship. In addition, for further clarifications, the student can contact the Internship Office.

- E. The registration process requires:
  - 1) The student must register in the Atlas information system: <u>https://submit-atlas.grnet.gr/</u> with his institutional e-mail and password.
  - 2) The organization chosen by the student must create an account in the Atlas information system as "Host Organization (from Greece)" in the event that the internship will take place in Greece and publicize the vacancy (or vacancies ) of Internship offered during the current period.
  - 3) After the end of this procedure, he notes the six-digit code of the position that appears on the screen, in order to communicate it to the prospective student intern. For more information, you can visit the website link <u>https://submit-atlas.grnet.gr/</u> and contact the system's user help desk.
  - 4) The student should be informed by the organization about the six-digit code of the position that he/she has declared in the Atlas system and immediately inform the Internship Office.
- F. The Internship Office is able to reserve the position and assign each student to the institution to which he/she has registered 10 days before the start of the Internship.

### DURING THE INTERNSHIP

On the first days of the student's presence at the institution, he/she must contact the Internship Office and his/her scientific supervisor or professor and inform about the start of his/her internship. The student should be informed about the completion of the necessary forms posted on the website <a href="https://internship.uowm.gr/entypa/">https://internship.uowm.gr/entypa/</a> such as:

- 1) Entry Form (completed at the start of the internship)
- 2) Attendance log (120 hours/month, signed by the host organization, completed during the internship)
- 3) Report (completed on the last day of practice)
- 4) Student Questionnaire (to be completed on the last day of the internship)
- 5) Exit Census Form (to be completed on the last day of practice)

#### AFTER COMPLETING THE INTERNSHIP

After completing the internship, the student is required to send the above forms to the Internship Office (<u>intern@uowm.gr</u>).

#### INTERNSHIP INSURANCE

During his/her Internship, the student is insured with the EFKA, only against occupational accident risk and not for the sickness and maternity benefits sector (in kind and in money). This insurance contribution is paid by the University of Western Macedonia in accordance with the written provisions. The students doing practical training are assigned the corresponding stamps, which in this particular case are for sickness. Their working days are not recapitulated and insurance days are not taken into account in any other case. It is clarified that the above special way of insuring students of this category, against the risk of accidents, is valid for as long as their Internship lasts. These students are not entitled to gifts and regular leave allowance and do not establish a right to pension coverage.

Attention: In normal circumstances, the right of intern students to medical care is ensured either by their family (protected members) or by their student status. Students who for any reason do not reserve this right are invited to inform the Internship Office before the start of their internship.

#### INTERNSHIP COMPENSATION

Each student must deliver on time, both in between (for a 3-month Internship) and/or at the end, within 2 weeks, all his/her deliverables, in electronic and printed form, to the Internship Office. Along with the course of implementation of the Internship but also the consistency of the students regarding their presence at the implementing body and in the submission of deliverables, Internship forms as well as entry and exit census forms the Special Research Funds Account deposits the Internship fee in the student's personal account in any bank in the amount of  $\in 280$  per month of Internship (the amount of  $\notin 280$  includes the student's insurance coverage, i.e.  $\notin 10.11$ ), as long as the student is the beneficiary of the bank account he/she has declared. The Internship Office is not responsible for any delay, nor is the UOWM Special Research Funds Account.

#### **RIGHTS AND OBLIGATIONS OF STUDENTS**

During the Internship, the student is accompanied by two supervisors:

- The "facility supervisor" is an employee of the student's host institution. He holds a university degree , as close as possible to the field of specialization covered by the Internship.
- The "scientifically responsible or supervising professor" is a member of the institution's permanent or temporary teaching staff.

The student is entitled to 2 days off per month during the two-month or three-month Internship. The student at the workplace is obliged to follow the operating hours of the business or organization, the safety and work, hygiene and safety regulations as well as everything else that applies to the organization's staff.

In case the student does not comply with the above or creates problems in any way, the supervising professor is informed and brings the matter to the Internship Committee, so that recommendations can be made for compliance of the student.

#### FUNCTIONALITY OF PRACTICE AND UTILIZATION OF THE RESULTS OF THE INTERNSHIP

The Internship Office is responsible for the preparation, coordination, implementation and monitoring of the Internship. The Institutional Manager with experience in organizing and executing programs can carry out the management, administration and monitoring of the project. The correct implementation of the Practice requires its systematic monitoring, through supervision mechanisms in terms of the offered quality for the students themselves and by extension for the University. The proposed method of monitoring and supervising the operation program is as follows:

1) The aim of the act is for the students to understand the fact that they represent the Department of Informatics and the University of Western Macedonia in the workplace. Their successful presence in the workplace benefits them, but at the same time it benefits the Practice itself as this is a condition for continued cooperation with the organization or company that offers the job. At the same time, a condition for their smooth integration into the environment in which they will work is the most complete information possible about the organization or company they will join, the position they will fill and the tasks they will have.

2) The students, in cooperation with the Internship Office of the University of Western Macedonia, its partnerships and networking, are placed in the host institution (public or private) where they will practice. Then the office in collaboration with the institution performs the additional technical and administrative procedures required from the date of entry (Entry Form) of the student to the host institution until the date of exit (Exit Form). Throughout the internship period, there is gradual communication between the institution office, the host organization and the student for the smooth operation and achievement of the program's goals. Additionally, at the same time, the corresponding deliverables of the act are completed, which are consistent with the study framework of the Department of Informatics, the knowledge of the students, their specialization, as the initial resource for their entry into the labor market. Tools (educational) that help them are the Evaluation Questionnaire, from the completion of which information is collected for the evaluation of the student for the degree of satisfaction with the participation in the Program and for the institution as a whole. For this purpose, material obtained from the Questionnaires, Interim and Final Progress Reports of the Internship but also the Evaluation Forms (student evaluation, host institution evaluation) and the Monitoring Issues are used. In addition, contacts are also made with the businesses, where the degree of satisfaction, possible problems and suggestions are investigated with an interview (or questionnaire).

# DESCRIPTION OF PROPOSED INDICATIVE COMMUNICATION ACTIVITIES TO INFORM THE PUBLIC AND PARTICIPANTS ABOUT THE PURPOSE OF THE INTERNSHIP AND ITS FUNDING BY THE NSRF.

The University of Western Macedonia follows all the commitments of the national and community framework regarding publicity and information of the potential beneficiaries and the public opinion as well as regarding the procedure regarding the publicity and dissemination of the results from the implementation of the co-financed Action (Reg. (EU) No. 1303/2013 and Executive Regulation (EU) No. 821/2014).

The Internship website, which informs the students and the public about the Internship project, is updated regularly. Information days are held. Posters and invitations are printed to inform the public. Advertising entries are made and press releases are sent to the local (Florina, Kastoria, Kozani) press and radio stations. There is constant communication with productive bodies and professional associations.

At a central level, through the Internship Office, the progress of the Internship is constantly monitored.

#### **FINAL EXAMS**

Each semester and after the end of the courses, examinations are conducted. Students sit written exams that last up to three (3) weeks, which include the syllabus of the taught courses. There is also a re-sit exam scheduled for September.

Exams are obligatory for all the students who have registered in them and are conducted in accordance with the timetable formed by a three-member committee, which is appointed by the Head of the Department and approved by the council of the Faculty. The Head is responsible for the announcement of the timetable at least ten days before the beginning of the exams.

If final exams of a course or courses in one or both periods are not conducted, they take place in the following semester after the end of the courses. In this case, students do not have to re-state these courses in order to participate in the exams.

All students who have registered for a specific course at the beginning of the semester have the right to take part in the exams of this course

An oral examination takes place only when a student cannot be examined in written, such as in case of dyslexia, physical handicap, etc., according to the current legislation.

A student who has failed a course in more than (3) examination periods may request his reexamination in that particular course by a three-member committee of teachers of the same or a related specialty, defined by an act of the Department President.

In order to answer the topics, the examined students are given specially sealed (and hand-signed by the course examiner) sheets of paper (pieces of paper or printed questionnaires) under the responsibility of the invigilators.

A student who is caught cheating by using books or notes or other students' exam papers or by talking with another student or students or obstructs the smooth conduct of the exams: a) will be zeroed out, after his writing has been noted and initialed by the invigilator and b) referred to the Department Assembly for disciplinary sanctions.

Within fifteen (15) working days of the examination of the course, the examiner submits the score of the period examinations as well as the final grade of the course to the Department. After a relevant check, the Department proceeds with the announcement of the results and the archiving of the scores.

The written essays are kept under the responsibility of the examiner for two semesters, after which they can be destroyed by decision of the Dean's Office. During this time the student can ask the examiner to consult his writing.

#### EXAM REGULATION

Written exams are conducted according to the following rules

- Examiners and invigilators should be in the examination room at least fifteen minutes before the examination starts.
- Students are admitted to the room fifteen minutes before the examination is due to start.
- Invigilators report to the examiner ten minutes prior to the start of the examination.
- Invigilators who are not in attendance on time are considered to be absent.
- Students should not be seated in fewer rooms than the ones defined in the exams schedule, even if their number is smaller.

- Problems that arise during the examination are solved by the examiner.
- The examiner has to ensure the implementation of the exams regulation and report to the Head of the Department.
- Examiners have to remain in the university during exams.
- Examiners have to deliver two copies of question papers to the registrar's offices of the Department.
- Examiners have to give the question papers to all students who ask for them after they exit the examination room.
- Invigilators are forbidden to do other activities, such as reading newspapers, discussing, etc.
- Invigilators can leave the examination room only for a few minutes, in special cases and with the examiner's permission.
- Invigilators have to check students' university or ID cards..
- Invigilators do not give explanations individually or loudly.
- Changes at the invigilators' programme cause frustration, so they should be avoided. If, therefore, it is needed, invigilators have to submit a written statement to the Registrar's office a day prior to the examination day in order to notify them about the change.
- Invigilators make a list of students' attendance, where the course, room, date, time and the names of the examiner and the invigilators are written. This list is signed by the invigilators and delivered to the examiner along with the students' paper after the end of the examination.
- Invigilators write their initials twice on each student's paper. The initials are written on the top of the first page and each time the student gets another page, and at the end of the answers when he finishes writing.
- When a student is caught cheating, (s)he receives a mark of zero with the invigilator's initials on the paper. If a problem occurs, the examiner is informed and takes further action.
- Smoking, coffee and the use of mobile phones are strictly forbidden during exams.
- Examiners and invigilators who do not comply with the aforementioned rules are considered to be offering inadequate educational services.

### ASSESSMENT/EVALUATION REGULATION

Students are obliged to attend all courses of the curriculum, according to their courses statement.

The use or not of an intermediate evaluation system in courses, the specific forms of evaluation (written assignments, written tests, exercises, etc.), the percentage of participation of the intermediate evaluation (progress) in the final grade of the course and the other details concerning progress is decided by the course instructor.

The conduct of the mid-term evaluation, in the Departments that are decided, is announced under the responsibility of the teacher at least five (5) days before the day of their conduct.

The final course grade is the sum of the credits earned by the Student from his progress performance, where applicable, and the final exam. The final grade of a course can include the grade of written assignments prepared by the students within the course.

Grading of progress and the final exam is based on a ten-point scale.

Students who come from graduate admission exams are marked as following: the Department by decision of its Council in accordance with the written provisions, exempts these students from courses or exercises that have been successfully examined in the Faculty or Department which they

have previously attended, adjusts the grades of these courses, where it is required and defines the courses and exercises of previous semesters in which they must be examined if they were not taught or practiced fully or sufficiently in the Faculty or Department, regardless of the semester in which the placement was made.

Attendance in a course is considered successful if the grade is at least "good". A student who did not successfully attend a compulsory course must repeat it during the next semester in which it is taught. If he failed an elective compulsory course, he must repeat it in the next semester that is taught or he is entitled to change the course and choose another elective compulsory course.

Each course the Student signs up for, he/she can participate in the examination period that follows the semester as well as in September of each year.

All courses are marked on a scale from one to ten and, in order to succeed, students should at least get the grade five.

Students' performance is classified as following:

- 8.50-10.0 : "Excellent"
- 6.50-8.49 : "Very Good"
- 5.00-6.49 : "Good"
- 4.00-4.99 : "Insufficiently"
- 0.00-3.99 : "Badly"

### **STUDENT SERVICES**

According to the current provisions students are provided with:

#### COURSEBOOKS/TEXTBOOKS



Each student is entitled to free books that are equal to the total number of compulsory and elective courses required for graduation.

Moreover, additional material (notes, slides, exercises) can be given under the person in charge of a course or the tutor's responsibility.

Undergraduate students can select and be entitled to free books through the information system "Eudoxus" (<u>https://www.eudoxus.gr</u>).

They can select a book for each compulsory and elective course from the list of recommended books through the information system "Eudoxus".

If they select more elective courses than those required to graduate, they cannot be entitled to free books for the additional courses which they chose and were examined, even if these courses are included in the degree.

In order to select the books, students have to sign in to "Eudoxus" and choose a coursebook for each compulsory and elective courses that is included in their statement form. They also have to use the central information system in order to state that the selected coursebook corresponds to the course stated at the Secretariat. In the second semester, students have to start stating the number of courses for which they receive free coursebooks.

After the students have selected their coursebooks, they get a PIN through e-mail or SMS in order to receive the selected books from the distribution points. In case that a student does not receive his/her free book and passes a course, he can no longer get them. The password to "Eudoxus" is the same with the one we use for electronic secretariat platform. There are guidelines on how to use electronic secretariat platform and get the password.

For more information and to access "Eudoxus", visit: <u>https://www.eudoxus.gr</u>

#### ACADEMIC IDENTITY CARD

After registration, students can apply for the issue of their academic identity card. The academic ID is valid for as long as the student membership lasts and has many other uses apart from the student Student Ticket (Pass).

The academic ID indicates the exact period of the validity of the Student Ticket. If a student is not entitled to a Student Ticket, the card stands solely as an ID. Students have a discount at means of transport (buses, coaches, ships, trains), theatre, cinema and archaeologogical sites by showing their card and as long as the student ticket is valid. The maximum duration of a student ticket is 6 years.

The application to issue a pass is conducted electronically through an information system on the page of Education and Lifelong Learning Ministry. For more information visit: <u>http://academicid.minedu.gov.gr</u>

#### ACCOMMODATION

At the moment, there are no student halls of residence available in the town of Kastoria. Despite this, every year a sum of money (housing allowance) is allocated for the rental of houses/flats, to students who meet specific criteria. The institution's website (<u>https://www.uowm.gr</u>) describes in detail the procedure by which a student can claim this housing allowance.

#### FOOD SERVICE



Students who meet certain financial and social criteria are provided with a food service card and are offered three meals per day on a daily basis free of charge. These food services are offered free by showing the catering service card. The maximum duration of free catering service is six years.

The validity of the catering service card lasts for an academic year, and its owner is the only one who can use it. The duration can be extended for the period of September – October of the following academic year under a decision by the Council of the University announced on its website.

#### HOUSEHOLD ALLOWANCE



Students are provided with an annual one-off benefit for house rental that amounts from 1000 up to 2000 euros.

The amount is provided by the Ministry of Finance for as many years as the studies last for all the undergraduate students if:

- they are Greek citizens or citizens of another country of the European Union
- they reside in a rented house because of their studying in a town other than their hometown
- their annual family income of the previous year is not more than 30.000 euros plus 3.000 euros for each dependent child except one
- they study to acquire their first degree, regardless of the way of their admission
- they have at least succeeded in a number of courses equal to half of the total number of courses of the typical studies programme of the Department in the previous year. Registration is adequate for first-year students.

Students who wish to receive the allowance, should submit their applications and the prerequisites to <a href="https://stegastiko.minedu.gov.gr/">https://stegastiko.minedu.gov.gr/</a>

### **UNIVERSITY INFRASTRUCTURE - SERVICES**

#### LIBRARY

The University Library in Kastoria is a fully organized library, which has the necessary equipment, information material and specialized staff in order to support the curriculums of the three undergraduate and postgraduate programmes operating in Kastoria.



The Library is located in the specially designed are of the University campus in Kastoria, in an area of 560 square metres. Its design and high-standards equipment create a pleasant and attractive environment for the users. The library includes:

- information desk, where specialized personnel is eager to support students in searching for information
- electronic study room which can seat 50 people

In the electronic study room the students of the Department can use the electronic and internet services.

Through the library website, students can use the online catalogue to search for a book, a thesis or a journal. Also, through the Hellenic Academic Libraries Link (HEAL LINK), they can have full access to a great number of scientific journals.

Through cooperation tools, such as the collaborative catalogue of Greek academic libraries, students have the opportunity to explore material from other academic libraries and gain access either electronically or through a special network developed among the academic libraries of our country, which helps students borrow material.

There is a printer and a scanner for the students to use in the library.

The room of the library is cozy, well-lighted and seats 80 people. There students prepare their projects and study for their exams.

Each user is issued a card, which helps him/her borrow and give back the material (s)he has used.

The library is also open to the public so that anyone can use its material, and organizes events in collaboration with other bodies and services of the town.

Library website: <u>https://library.uowm.gr/</u>

#### INFRASTRUCTURE

There are four teaching rooms, a big auditorium (seats 450), two smaller auditoriums (each one seats 120), six (6) IT laboratories (each on seats 20 students), a Cisco Networking Academy laboratory (seats 30 students), a specially designed Server Room and a technical support laboratory for maintenance of ICT equipment.



The following laboratories have been legally established according to the Institution's regulations:

- Laboratory of Telecommunications, Networks and Distributed Systems
- Laboratory of Microprocessors-Microcontrollers, Electronic Automatic Control Systems and Robotics
- Laboratory of Artificial Intelligence Applications, Data and Signal Processing



All the teaching rooms and auditoriums have computers and projectors, access to the internet, sound systems (DVD player, amplifier and speakers), so that teaching is combined with ICT. Laser printers (full-colour and black-and-white) and photocopiers are available in specially designed rooms for the teaching staff and students to use.

The members of the teaching staff have their own offices, which are equipped with multifunction devices (printer/photocopier/scanner), VoIP phone connection and internet access through a broadband network. They are also cozy to meet students.

The secretariat of the Department is located in an office equipped with computers, printers, phone devices and has internet access through a broadband network.

There are two meeting rooms with phone connection, teleconference services and internet access through a broadband network.

The auditoriums can host various symposiums, seminars, conferences or cultural events (concerts, plays etc.), and high-quality event organization is provided thanks to the audiovisual systems and wireless internet access. Wireless internet access is free everywhere in the Department.

There are special laboratories for student groups (IEEE Student Branch, Linux Team and Kastoria Robotics).

# University of Western Macedonia, Kastoria IEEE Student Branch



Special attention has been given to provide access and use in all the facilities for disabled people. Special ramps allow them to enter the buildings, lifts are available to access other floors and toilets are properly designed to meet their needs.

## INFORMATION AND TELECOMMUNICATION TECHNOLOGIES

The Department of Informatics utilizes synchronous ICT technologies and tools and gives special attention to communications and information transfer. It has an excellent VoIP phone network and broadband information transfer network and services, based on synchronous wired and wireless network in order to offer the academic community the opportunity to communicate with the whole world and be directly informed.

ICT is widely used during courses and in the laboratories. For more information please refer to the official university website: <u>https://noc.uowm.gr/www/services/</u>

#### ASYNCHRONOUS DISTANCE LEARNING PLATFORM (Open eClass)

The Foundation's asynchronous distance learning platform (<u>https://eclass.uowm.gr/</u>) is an integrated Electronic Course Management System which has been designed with the aim of reinforcing traditional teaching by making use of the widely used information technology in the field of

education. The asynchronous distance learning platform provides the teacher with the possibility to electronically organize and present the educational material of the course and the learner with an

communication between the trainer and the trainee because:
instructors can add educational material (notes, activities, announcements, bibliography, useful links, tests, etc.) and students can upload their projects

alternative channel of personalized learning. In addition, it is an important tool for continuous

- instructors can create the framework for learning progress: make an outline for the courses per week and deadlines for project submission
- students can communicate with instructors or other students by e-mail
- students can access the webpage of the course.

### E-SECRETARIAT

This electronic secretariat platform aims at helping students quickly by accessing the provided services of the secretariat online. It is a specially designed application which meets students' needs and offers interaction with the secretariat of the Department through internet.

Students can submit their courses statement electronically, change it, check their registered details, get informed for related issues, submit applications for certificates and have them delivered through fax with the use of automatized processes. Thus, the personnel of the secretariat are less engaged in time-consuming procedures and students of the Department are provided with high-quality services.

#### GOOGLE APPS FOR EDUCATION

Since 2011 Google supports a single area of information to use together with websites, where academic members can freely use the products, software, services or websites of Google

#### OTHER ONLINE SERVICES

ICT is also used to enable the student assessment process under the internal evaluation of the Department, according to the provisions in force. More specifically, a software has been developed for the registration and statistical analysis of students' answers in questionnaires. Moreover, the communication network of the Department provides ICT services so that students can contact the teaching staff. This communication is achieved through:

- e-mail
- the aforementioned e-learning platform
- announcement service on the webpage of the Department
- remote access with the use of VPN

Important information is also provided at the website of the Department (<u>https://cs.uowm.gr</u>), including the academic calendar, the timetable of each semester, the course programme of the Department, the exam timetable, the recommended bibliography (through EUDOXUS), new and old announcements, etc. The website of the Department is refreshed almost every day.

All the members of the teaching, administrative and other staff make best use of the available electronic media to support learning and secretariat services, and to handle any administrative issues. The members of the teaching staff of the Department have their personal webpages on the website of the Department, where students can search for useful information such as consultation hours, course related announcements, etc.

Free wireless access to the internet (WiFi) in the entire campus enables the use of ICT even more.

#### STUDENT MOBILITY PROGRAMMES



The University has developed research collaborative relationships in Greece and abroad and has made good use of student-exchange programmes, which aim at improving quality and developing the European dimension in tertiary education through the promotion of transnational cooperation among universities, European mobility, transparency and recognition of academic studies and diplomas throughout the European Union.

ERASMUS+ concerns all the categories of tertiary education institutions and all the fields and levels of education, up to doctoral degree. The basic condition for the Universities to participate in the programme is a contract between universities and the European Commission. Inter-institutional agreements between programme countries define the specific actions of the programme.

The actions between institutions include:

- student mobility
- staff mobility for short-term teaching
- short-term intensive study programmes where students and teaching staff from at least three European countries participate
- thematic networks to improve the quality and develop the European dimension in the framework of an academic field, with the participation of institutions from all the European programme countries.

Through ERASMUS+ students can attend part of their studies and have an academic recognition of it in a partner European institution, and create new perspectives for furthering their studies and career development. More specifically, they can select and attend courses in EU countries for 3 to 12 months, in partner universities with UOWM.

ERASMUS+ aims at:

- improving the quality of education,
- promoting collaboration among European educational,
- encouraging undergraduate and postgraduate student, PhD candidate and staff mobility,
- promoting information and experience exchange,
- providing students with opportunities to take advantage of the experience of meeting different linguistic, cultural and educational contexts,
- contributing to the mobility expenses and providing the chance to attend a part of studies abroad.

Moreover, ERASMUS+ offers students internship abroad and academic recognition. Students can move to all EU member-states, Norway, Lichtenstein, Iceland and Turkey. Internship abroad helps students:

- acquire professional experience abroad
- practice their knowledge in an international environment
- become aware of the culture of a European corporation
- improve their skills in a foreign European language
- understand the cultural differences among European countries

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#### PRACTICAL INFORMATION FOR ERASMUS+ STUDENTS

Students who wish to take part in the mobility programme Erasmus+ should have completed their first year of studies and passed 2/3 of their first-year courses.

A scholarship is provided to partly cover the expenses of staying in the host country and the amount differs and depends on the destination.

Students attend a series of courses in the host Department, according to the agreement between the student and the host institution. The courses they will pass in the host institution abroad are recognized by the Department.

The Erasmus coordinator of the Department is Dr Fotiadis Dimitrios.

For more information visit: <u>https://erasmus.uowm.gr/</u>

#### **STUDENT UNIONS**

#### **IEEE STUDENT BRANCH**



The Institute of Electrical and Electronic Engineers is an international technical professional organization, whose mission is to promote the profession and advance technology for the benefit of humanity. More than 377.000 Electrical Engineers, scientists, students and other professionals from more than 150 countries are members of IEEE, which makes it the world's largest technical professional community.

Today there are more than 1100 IEEE student branches worldwide. One of them is IEEE Student Branch of the Informatics Department, UOWM. Its goal is to provide the undergraduate and postgraduate students of the Department, who are interested in the field of Electrical Engineer or related fields, with opportunities to develop in the academic, technological and professional area. Some of the activities that student branches organize are:

- seminars, workshops and lectures by distinguished scientist in order to train and inform students on issues concerning Electrical Engineering or related sciences
- educational excursions and visits to companies and institutions on research development of related scientific fields
- participation in student competitions under the auspices of IEEE or other technological organizations
- student briefing on the actions and provided opportunities by IEEE
- contests and awards to promote scientific or educational activity.

#### LINUX TEAM



Kastoria's Linux Team of the Department of Informatics, UOWM, is a group of students whose purpose is to promote Free Software (Linux) and collaboration among students in order to develop various technological issues by organizing regular meetings, events, seminars, etc.

For more information visit: <u>linux@kastoria.teiwm.gr</u> IRC : linuxteamkastorias (Server: Freenode)

#### **KASTORIA ROBOTICS TEAM**



The Robotics team of the Department of Informatics is a group of students and members of the educational and technical staff of the Department that engages in technologies such as Lego Mindstorms, Arduino, Raspberry Pi, etc. in order to familiarize students and others interested with the various technologies. Depending on the team's engagement and capacities, the target is to participate in robotics contests in Greece or abroad. A laboratory in the facilities in Kastoria (lab C2), and equipment are available for teams or individual students who wish to engage in robotics.

For more information: dfotiadis@uowm.gr, https://kastoria.teiwm.gr/robotics/

## **GENERAL INFORMATION**

#### **KASTORIA**







Kastoria is a town located in Greece and capital of the prefecture. It is on the west part of Western Macedonia and its population is 13.387 citizens (2011). It is built on a peninsula surrounded by a lake, at an altitude of 703 m and between the mountains Vitsi and Grammos. Although it was besieged and conquered by Bulgarians, Normans and Turkish throughout its history, there is still an adequate number of byzantine churches, relics and mansions showing its former wealth due to fur trade.

The lake which surrounds Kastoria is at an altitude of 620 m., occupies 28.655 square meters, is maximum 7.500 m. in length and 5.425 m. in width, and is the eighth largest lake in Greece. Its depth varies from 8 to 12 metres and the average temperature is 22 degrees Celcius. There are many inflows of water in the west and one outflow into the river Aliakmonas. In the past the lake was all around the hill forming an islet. Apart from the lake, another well-known characteristic of the town is the engagement in fur craft for more than five hundred years.

Kastoria protects the byzantine and metabyzantine history, which is obvious due to the presence of 72 churches in the town. The great number of mansions, where people used to live, is an indication of the artisan and trade flourishing. The complex and unique interior of the mansions, which stand as typical examples of the architecture in Macedonia, includes separate rooms, carved wood-panelling on the ceilings, skylights with coloured glass panes and exquisite painted decorations.

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#### COST OF LIVING

The cost of living for a student in Kastoria is estimated (at minimum) at 500 euros per month.

Renting a flat will cost from 200 to 350 euros per month, plus the charges for maintenance, water and electricity depending on the building and consumption.

Moreover, students should take care of their personal expenses according to their needs and requirements.

#### FREE TIME AND HOBBIES

In Kastoria students have the chance to take up rowing, hiking, climbing, skiing, theatre, painting, pottery, dancing, cinema, music, etc.

The University of Western Macedonia supports the members of the academic community holistically.

Holistic support includes a set of biopsychosocial services and actions, such as sports and cultural activities, information, as well as prevention, health promotion, counseling and psychological support services.





#### **TRANSPORT TO KASTORIA**



CAR



By car via the Egnatia Road highway, comfortably and quickly. By car, Kastoria is:

500 kilometers from Athens and travel time is estimated at 6 hours 190 kilometers from Thessaloniki and travel time is estimated at 1 hour and 50 minutes

160  $\chi kilometers$  from Ioannina and travel time is estimated at 1 hour and 35 minutes

#### BUS



Kastoria has frequent bus services connecting both Athens to Thessaloniki and loannina as well as to other areas of the prefecture. For more information: <u>http://www.ktel-kastorias.gr</u> and the phones numbers:
KTEL Kastorias Intercity Bus Station Ticket Office Tel.: 24670.83.455
KTEL Kastorias Intercity Bus Station Storage Area Tel.: 24670.83.609
KTEL Kastorias - Argos Orestiko Bus Station Tel.: 24670.42.202
KTEL Kastorias - Athens Bus Station Ticket Office Tel.: 210.51.29.308
KTEL Kastorias - Thessaloniki Bus Station Ticket Office Tel.: 2310.595.440



In the Municipality of Kastoria, urban transport operates with regular routes to/from the University Campus in the Fourka Area of Kastoria. More information about the routes can be found on the Kastoria Urban Buses website: <u>https://astikoktelkastorias.gr/</u>

#### AIRPLANE



Kastoria Airport "Aristotle" in Argos Orestiko is connected with Athens International Airport (Eleftherios Venizelos) via frequent flights by SKY EXPRESS (<u>https://www.skyexpress.gr/en/discover/destinations/kastoria</u>).

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# USEFUL CONTACT INFORMATION

Body	Tel	Body	Tel
Dean of the School of Science	2467440043	Secretariat of the School of Science	2467440001
Secretariat of the Department of Informatics	2467440030	Head of the Department of Informatics	2467440034
Library	2467440006	Canteen	2467440055
Career office	2467440003	Security	2467440013

Body	Tel	Body	Tel
KTEL (Kastoria intercity bus service) https://www.ktel-kastorias.gr/	2467083455	Kastoria City bus service https://astikoktelkastorias.gr/	2467024348
Kastoria Airport "Aristotelis" http://www.ypa.gr/en/our- airports/kratikos-aerolimenas- kastorias-aristotelhs-kakta	2467022275	SKY Express	2467042515
Kastoria Taxi Services Kastoria Radio Taxi Services	2467082100 6979985619 2467082200 6944858577	TAXI TIME Kastoria	2467083820 18300 6989936888 6984644866
Kastoria Police Department	2467082100 100	Kastoria General Hospital Emergency Medical service	2467350600 166
EU Emergency Number	112	Kastoria Firebrigade	2467082464 199

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